

# Queensland Development Code

Mandatory Part 3.8 – Public cyclone shelters

Version 1



**Queensland**  
Government

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## Guide to using the Queensland Development Code part

This guide is intended to provide information to help readers understand and apply the *Queensland Development Code, MP 3.8 – Public Cyclone Shelters (MP 3.8)*, which is a mandatory part of that code. The guide does not form part of MP 3.8.

### What is the Queensland Development Code?

The Queensland Development Code (QDC) consolidates Queensland specific building standards into a single document. The QDC covers Queensland matters which are outside the scope of, and in addition to the Building Code of Australia (BCA).

### Building Code of Australia

The Building Code of Australia (BCA) refers to Volumes One and Two of the National Construction Code (NCC) as defined in section 12 of the *Building Act 1975*.

### Relationship between the Building Code of Australia and the Queensland Development Code

The requirements under the BCA continue to apply. This QDC part overrides the BCA to the extent that it is inconsistent with the provisions of the BCA.

### Terminology between the Building Code of Australia and Queensland Development Code

The following terms are used interchangeably between the BCA and QDC:

Building Code of Australia	Queensland Development Code
Performance requirement	Performance criteria
Deemed to satisfy solution	Acceptable solution
Performance solution	Performance (or alternative) solution

## Chapter 1 Preliminary

### 1 Name of the QDC part

This part of the Queensland Development Code (QDC part) may be cited as the *Queensland Development Code, MP 3.8 – Public cyclone shelters*.

### 2 Purpose

The main purpose of this QDC part is to ensure particular buildings or parts of buildings (relevant buildings) used, or intended to be used, to accommodate members of the public requiring shelter during a cyclone can-

- a) withstand the impacts of cyclones; and
- b) safeguard the health and safety of people sheltering within the building or part of the building during a cyclone.

This QDC part achieves the main purpose of the part primarily by introducing requirements relating to the design, siting, construction, management, maintenance and use of relevant buildings to ensure those buildings are fit for the purpose mentioned in section 2, paragraph 1.

Some of the requirements introduced by this QDC part vary particular requirements that apply to relevant buildings under the BCA.

Note-

All requirements that apply to relevant buildings under the BCA, other than those mentioned in section 2, paragraph 3, continue to apply to those buildings without variation.

Other requirements introduced by this QDC part are additional to those that apply to relevant buildings under the BCA.

MP 3.8 is intended to be used by architects, engineers, building contractors, and designers and manufacturers of building materials.

### 3 Commencement

This version of *MP 3.8 – Public cyclone shelters* commences on 4 August 2023.

Version	Commencement date	Publication date
1	4 August 2023	9 May 2023

### 4 Application

This QDC part applies to a *building* or part of a *building* that is, or is intended to be, a shelter for occupation by the public during a cyclone under a *local disaster management plan*.

However, the QDC part does not apply as a mandatory part of the QDC, to a building or part of a building if the building or part is owned by the State or a local government.

Note: The design, construction and maintenance of a building, or part of a building, mentioned in section 4, paragraph 2, is usually undertaken in accordance with a non-regulatory framework consisting of design and maintenance guidelines issued by the State. However, the owner of such a building, or part, may decide to comply with MP 3.8 voluntarily instead of complying with the guidelines.

Under the Building Regulation 2021, section 78D, the owner or occupier of a building or part of a building must not, without a reasonable excuse, use the words ‘public cyclone shelter’ in a broadcast or publication to indicate the building or part is a public cyclone shelter, unless the building or part is a public cyclone shelter within the meaning of the Regulation, section 78C.

A building or part of a building owned by the State or a local government will meet the definition of ‘public cyclone shelter’ in the Regulation if it is a shelter for occupation by the public during a cyclone under a local disaster management plan (for the local government area where the shelter is located), under the *Disaster Management Act 2003*.

A building or part of a building that is not owned by the State or a local government (i.e. is privately owned) will meet the definition of ‘public cyclone shelter’ only if:

- the building or part is a shelter for occupation by the public during a cyclone under a local disaster management plan (for the local government area where the shelter is located), under the *Disaster Management Act 2003*; and
- a certificate of occupancy has been issued for the building; and
- the owner of the building has, in the past 12 months, obtained an annual compliance statement indicating the building complies with MP 3.8 and is suitable for occupation by the public during a cyclone.

A compliance statement may be obtained from a person who holds a certificate of accreditation from an accreditation standards body that is suitable for obtaining a licence at the level of building certifier-level 1.

## 5 Compliance

Compliance with QDC parts is governed by section 14 of the *Building Act 1975*.

Section 14 of the *Building Act 1975*:

- a) complying with the acceptable solutions; or
- b) formulating a performance solution which complies with the performance criteria or is shown to be at least equivalent to the acceptable solutions; or
- c) a combination of a) and b).

## 6 Referral agency

N/A

## 7 Associated requirements

The following legislation and code apply to buildings that are to be used as public cyclone shelters. These requirements apply to those buildings in addition to those in MP 3.8.

- *Body Corporate and Community Management Act 1997*
- *Building Act 1975*
- Building Code of Australia (BCA)
- Building Regulation 2021
- *Planning Act 2016*
- Planning Regulation 2017.

Public cyclone shelters are designed to be operated under a local government disaster management plan. Other legislation, such as the *Disaster Management Act 2003*, applies to operational activities relating to public cyclone shelters.

## 8 Requirements of the Building Code of Australia not varied

Where a requirement of the BCA is not varied by this QDC part, that requirement continues to apply.

## 9 Referenced documents

The table below sets out the number and title of each Australian Standard referred to in this QDC part. The Australian Standards are the editions as amended from time to time by Standards Australia and as referenced by the BCA.

**Table 1 – Referenced documents**

Number	Year	Title
AS/NZS 1158.3.1	2005	Lighting for roads and public spaces – Pedestrian area (Category P) lighting – performance and design requirements including Amendments 1, 2, 3 and 4
AS/NZS 1170.1	2002	Structural design actions – Permanent, imposed and other actions including Amendment 1 and 2
AS/NZS 1170.2	2021	Structural design actions – Wind actions
AS 1379	2007	Specification and supply of concrete
AS 1428.1	2009	Design for access and mobility – General requirements for access – New building work including Amendment 1 and 2
AS/NZS 1530.3	1999	Methods for fire tests on building materials, components and structures – Simultaneous determination of ignitability, flame propagation, heat release and smoke release
AS 1530.4	2014	Methods for fire tests on building materials, components and structures- Fire-resistance test of elements of construction
AS/NZS 1604.3	2012	Specification for preservative treatment – Part 3 – Plywood
AS 1668.2	2012	The use of ventilation and air conditioning in buildings – Mechanical ventilation in buildings including Amendments 1 and 2
AS 1670.1	2018	Fire detection, warning, control and intercom systems – Systems design, installation and commissioning – Fire
AS 1670.4	2018	Fire detection, warning, control and intercom systems – Systems design, installation and commissioning – Sound systems and intercom systems for emergency purposes
AS/NZS 1680.0	1998	Interior lightning Part 0: Safe movement
AS 1692	2006	Steel tanks for flammable and combustible liquids including Amendment 1

Number	Year	Title
AS/NZS 1768	2007	Lightning protection
AS 1940	2017	The storage and handling of flammable and combustible liquids
AS/NZS 2293.1	2018	Emergency escape lighting and exit signs for buildings Part 1: System design, installation and operation including Amendment 1
AS/NZS 2293.3	2018	Emergency escape lighting and exit signs for buildings Part 3: Emergency escape luminaires and exit signs
AS 2441	2005	Installation of fire hose reels including Amendment 1
AS 2444	2001	Portable fire extinguishers and fire blankets– Selection and location
AS 2676.2	1992	Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings Part 2: Sealed cells
AS 2941	2013	Fixed fire protection installations – pump set systems
AS/NZS 3500.3	2018	Plumbing and drainage – Stormwater drainage
AS 3600	2018	Concrete structures Including Amendment 1 and 2
AS 3700	2018	Masonry structures Including Amendment 1
AS 4040.0	1992	Methods of testing sheet roof and wall cladding – Introduction, list of methods and general requirements
AS 4040.3	2018	Methods of testing sheet roof and wall cladding – Resistance to wind pressures for cyclone regions
AS 4254.2	2012	Ductwork for air-handling systems in buildings Part 2: Rigid duct
AS 4420.1	2016	Windows, external glazed, timber and composite doors – Method of test Part 1: Test sequence, sampling and test methods
AS 4420.5	2016	Windows, external glazed, timber and composite doors – Method of test Part 5: Windows – methods of test – water penetration resistance test
AS/NZS 4505	2012	Garage doors and other large access doors including Amendment 1
AS 4586	2013	Slip resistance classification of new pedestrian surface materials

Number	Year	Title
		Notes in the BCA about tests carried out prior to the 2013 version also apply to this QDC Part including Amendment 1
AS 4997-2005	2005	Guidelines for the design of maritime structures
AS 5100.2	2017	Bridge design – Design loads Including Amendment 1
DA09	1998	Australian Institute of Refrigeration, Air Conditioning and Heating – Air Conditioning Load Estimating

## 10 Explanatory information

Not applicable to this part.

## 11 Exemptions

Not applicable to this part.

## 12 Definitions

**Acceptable solution** as defined in Schedule 10 to the Building Regulation 2021:

*acceptable solution, for a particular performance criteria, means the acceptable solution for the performance criteria stated in the QDC.*

**Accessible** as defined in Schedule 1 of the BCA:

*Having features to enable use by people with a disability.*

**Accommodation area**, for a public cyclone shelter-

- (a) *means the area or areas within the shelter where members of the public are accommodated during an occupancy period, as identified in the shelter's operational management procedures plan; and*
- (b) *does not include the shelter's kitchen, office area, first-aid area, generator area, battery area or amenities area.*

**Accredited testing laboratory** as defined in Schedule 1 of the BCA:

*One of the following:*

- (a) *An organisation accredited by the National Association of Testing Authorities Australia (NATA) to undertake the relevant tests.*
- (b) *An organisation outside Australia accredited to undertake the relevant tests by an authority recognised by NATA through a mutual recognition agreement.*
- (c) *An organisation recognised as being an Accredited Testing Laboratory under legislation at the time the test was undertaken.*

**AHD** *means the Australian height datum adopted by the National Mapping Council of Australia for referencing a level or height back to a standard base level.*

**Amenities area**, for a public cyclone shelter, *means an area within the shelter-*

- (a) *in which sanitary facilities are located; and*
- (b) *that is accessible during a lockdown period.*

**Annual probability of exceedance** means the chance of an event of a given magnitude being equaled or exceeded in any one year.

**Aperture dimension** means the diameter of the largest sphere that can fit through the aperture.

**Azimuthal direction** means a horizontal angle measured clockwise from a fixed reference plane.

**Baffled entry**, for a public cyclone shelter, means an entry door protected by walls and a roof soffit or ceiling that prevents debris loads impacting the entry door, while permitting entry to the shelter during a strong winds period.

**Battery area**, for a public cyclone shelter, means a room or space in the shelter that houses a battery system required to maintain equipment operating in emergency mode.

**Building Code of Australia (BCA)** as defined in section 12 of the Building Act 1975:

- (1) The Building Code of Australia (or BCA) is the document called 'National Construction Code', volume 1 and volume 2 (including the Queensland Appendixes) published by the entity known as the Australian Building Codes Board (the board).
- (2) The reference to the document called 'National Construction Code' in subsection (1) includes the edition of the code as amended from time to time by amendments published by the board.

**Building** as defined in Schedule 2 of the Building Act 1975:

- (1) A building is a fixed structure that is wholly or partly enclosed by walls or is roofed.
- (2) The term includes a floating building and any part of a building.

**Building work** as defined in section 5 of the Building Act 1975:

- (1) Building work is-
  - (a) building, repairing, altering, underpinning (whether by vertical or lateral support), moving or demolishing a building or other structure; or
  - (b) excavating or filling-
    - (i) for, or incidental to, the activities mentioned in paragraph (a); or
    - (ii) that may adversely affect the stability of a building or other structure, whether on the land on which the building or other structure is situated or on adjoining land; or
  - (c) supporting, whether vertically or laterally, land for activities mentioned in paragraph (a); or
  - (d) other work regulated under the building assessment provisions.
- (2) For subsection (1)(d), work includes a management procedure or other activity relating to a building or structure even though the activity does not involve a structural change to the building or structure.

Examples:

- a management procedure under the fire safety standard relating to a budget accommodation building
- a management procedure under the fire safety standard (RCB) relating to a residential care building.

**Class**, for a building or structure, means its classification under the BCA.

**Coastal margin—**

(a) means the interface between land and ocean defined by the extent of inundation by the highest astronomical tide; and

(b) includes river and creek estuaries that are affected by the highest astronomical tide.

**Debris screen**, for a public cyclone shelter, means a screen capable of restricting windborne debris from causing impact damage to openings or elements in the shelter shielded by the screen.

**Deemed-to-satisfy solution** as defined in Schedule 1 of the BCA:

A method of satisfying the Deemed-to-Satisfy Provisions.

**Designated landslide area** means an area designated by a local government as an area that is susceptible to landslide.

**Debris impact load A** see schedule 1, section 2(1) of this QDC.

**Debris impact load B** see schedule 1, section 2(3) of this QDC.

**Design event water level**, for a public cyclone shelter, means the higher of the following for the shelter—

(a) the design flood level; and

(b) the storm tide height.

**Design flood event**, for a public cyclone shelter, means the flood event for the design of the shelter, based on an annual probability of exceedance of 1:500.

**Design flood level**, for river and creek water affecting a public cyclone shelter, means the flood level, measured in AHD, determined based on-

(a) the design flood event for the shelter; and

(b) the backwater effects on flood levels caused by the design storm tide event for the shelter.

**Design storm tide event**, for a public cyclone shelter, means the storm tide event for the design of the shelter, based on an annual probability of exceedance of 1:10,000.

**Design working life**, for a public cyclone shelter, means the assumed period for which the shelter is to be used for its intended purpose with anticipated maintenance but without major repair being necessary.

**Emergency lighting** as defined in AS/NZS 2293.1:

Lighting for use when the supply to the normal lighting fails; it includes emergency evacuation lighting, illuminated emergency exit signage, high-risk -task-area lighting and stand-by lighting.

**Entry point**, for a public cyclone shelter, means a particular place identified in the shelter's operational management procedures plan as a place where a person can enter the shelter during an occupancy period.

**Exit** as defined in Schedule 1 of the BCA:

(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.
  - (iii) A fire-isolated passageway.
  - (iv) A doorway opening to a road or open space; or
- (b) A horizontal exit or a fire-isolated passageway leading to a horizontal exit.

**Exit device**, for a public cyclone shelter, means a single device that is required under the BCA, volume 1 to make a door forming part of a required exit, or located in the path of travel to a required exit, readily openable without a key from the side that faces a person seeking egress, by a single-hand downward action on the device.

**External door**, for public cyclone shelter, includes—

- (a) a hinged, roller, folding, sectional or counterweight door; and
- (b) elements that secure the door to the structure, including the door hinges, door frames and any lock, latch or exit device attached to the door.

**External envelope**, of a public cyclone shelter—

- (a) means the elements, cladding and supporting structure that enclose the shelter; and
- (b) includes the shelter's roofs, fascias, barges, soffits, external doors and external walls, windows, louvres, grills and flashings.

**External fabric**, of a public cyclone shelter, includes elements that—

- (a) form the external envelope of the building; and
- (b) are attached to or penetrate the external envelope, such as air-conditioning units, antennas, awnings, debris screens, exhausts, gutters, down-pipes, panels, and venturi ducts.

**Finished ground surface level**, for a building or part of a building, means the ground level adjacent to footing systems at the completion of construction of the building, or part of a building, and associated landscaping.

**Fire and evacuation plan**, for a public cyclone shelter, means a plan—

- (a) required by s104E of the Fire and Emergency Services Act 1990 to be maintained for the shelter; and
- (b) included in an operational management procedures plan for the shelter.

**Fire hazard** as defined in Schedule 1 of the BCA:

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

**Fire load** as defined in Schedule 1 of the BCA:

*The sum of the net calorific values of the combustible contents which can reasonably be expected to burn within a fire compartment, including furnishings, built-in and removable materials, and building elements.*

**Fire safety installation** as defined in Schedule 2 of the Building Act 1975:

*A fire safety installation, for a building or structure, means any of the following items for the building or structure—*

- (a) structural features—

- *access panels through fire-rated construction*
  - *fire control centres*
  - *fire curtains*
  - *fire dampers*
  - *fire shutters and fire doors*
  - *fire windows*
  - *penetrations through fire-rated construction*
  - *structural fire protection*
  - *systems required to have a fire-resistance level*
- (b) *fire protection systems—*
- *air-handling systems*
  - *fire detection and alarm systems*
  - *smoke and heat venting systems*
  - *smoke exhaust systems*
  - *special automatic fire suppression systems (including foam, deluge and gas flooding systems)*
  - *sprinklers (including wall-wetting sprinklers)*
  - *stairwell pressurisation systems*
- (c) *firefighting equipment—*
- *fire extinguishers (portable)*
  - *fire hose reels*
  - *fire hydrants (including hydrant boosters)*
  - *fire mains*
- (d) *occupant safety features—*
- *emergency lifts*
  - *emergency lighting*
  - *emergency power supply*
  - *emergency warning and intercommunication systems*
  - *exit door hardware*
  - *exit signs*
  - *fire doors*
  - *smoke proof doors*
  - *solid core doors*
- (e) *other features—*
- *services provided under conditions imposed under section 79*
  - *services required under BCA, clause E1.10*
  - *vehicular access for large isolated buildings.*

*However, the term does not include interconnected alarms in budget accommodation buildings to which chapter 7, part 3 applies.*

*Also, if a performance solution to a performance requirement under the BCA relating to the fire safety system has been used for a building or structure, a fire safety installation, for the building or structure, includes any thing required to comply with the performance solution.*

**Fire-resisting construction** as described in the BCA, volume 1, part C1.

**Fire safety system** as defined in Schedule 1 of the BCA:

One or any combination of the methods used in a building to—

- (a) warn people of an emergency; or
  - (b) provide for safe evacuation; or
  - (c) restrict the spread of fire; or
  - (d) extinguish a fire,
- and includes both active and passive systems.

**First aid area**, for a public cyclone shelter, means a room or space in the shelter that is dedicated to the provision of first aid.

**Floor area** as defined in Schedule 1 of the BCA:

in relation to a building - the total area of all storeys; and

- (a) in relation to a storey - the area of all floors of that storey measured over the enclosing walls, and includes-
- (b) the area of a mezzanine within the storey, measured within the finished surfaces of any external walls; and
- (c) the area occupied by any internal wall or partitions, any cupboard, or other built-in furniture, fixture or fitting; and
- (d) if there is no enclosing wall, an area which has a use that contributes to the fire load or impacts on the safety, health or amenity of the occupants in relation to the provisions of the BCA; and
- (e) in relation to a room - the area of the room measured within the internal finished surfaces of the walls, and includes the area occupied by any cupboard or other built-in furniture, fixture or fitting; and
- (f) in relation to a fire compartment - the total area of all floors within the fire compartment measured within the finished internal surfaces of the bounding construction, and if there is no bounding construction, includes an area which has a use which contributes to the fire load; and
- (g) in relation to an atrium - the total area of all floors within the atrium measured within the finished surfaces of the bounding construction and if no bounding construction, within the external walls.

**Generator area**, for a public cyclone shelter, means a room or space in the shelter, dedicated to housing a diesel generator mentioned in A7.2.0, that is accessible from—

- (a) within the shelter without the need to go outside the shelter; and
- (b) outside the shelter.

**GVM** means gross vehicle mass.

**Highest astronomical tide (HAT)**, for a coastal margin, means the highest water level predicted to occur for the coastal margin based on the latest tide predictions for the coastal margin published by Maritime Safety Queensland at [sq.qld.gov.au/tides/tide-tables](http://sq.qld.gov.au/tides/tide-tables).

Note: The HAT, for a coastal margin, is shown specially on the Queensland Globe available at: [Queensland Globe \(information.qld.gov.au\)](http://QueenslandGlobe.information.qld.gov.au)

**Illuminance** means the luminous lux arriving at a surface divided by the area of the illuminated surface.

**Internal fabric**, of a public cyclone shelter, means elements that enclose-

- (a) a space adjacent to an external wall; and
- (b) spaces within the building, including walls ceilings, floors, doors, windows, ducts, plenums and grills.

**Local disaster management group (LDMG)**, for a public cyclone shelter, means the local disaster management group established under the Disaster Management Act 2003, section 29 by the local government for the area in which the shelter is located.

**Local disaster management plan** as described in section 57 of the Disaster Management Act 2003:

- (1) A local government must prepare a plan (a local disaster management plan) for disaster management in the local government's area.
- (2) The plan must include provision for the following-
  - (a) the State group's strategic policy framework for disaster management for the State, and the local government's policies for disaster management;
  - (b) the roles and responsibilities of entities involved in disaster operations and disaster management in the area;
  - (c) the coordination of disaster operations and activities relating to disaster management performed by the entities mentioned in paragraph (b);
  - (d) events that are likely to happen in the area;
  - (e) strategies and priorities for disaster management for the area;
  - (f) the matters stated in the disaster management guidelines as matters to be included in the plan;
  - (g) other matters about disaster management in the area the local government considers appropriate.

**Lockdown**, for a public cyclone shelter, means a state in which the shelter windows and doors are closed, limiting entry to and exit from the shelter.

**Lockdown period**, for a public cyclone shelter, means the period determined by the LDMG for which the shelter is required to be in lockdown.

**Luminous reflectance value** represents the amount of visible light that a colour will reflect.

**Lux** means a unit of illuminance equal to one lumen per square metre.

**Maintenance management procedures plan**, for a public cyclone shelter, means a document prepared and kept by the owner of the shelter that-

- (a) states management procedures for maintenance work required to ensure the shelter continues to comply with this QDC part, including procedures requiring-
  - (i) each mechanical system for the shelter, including circulation fans, exhaust fans, supply air fans and control systems, is tested and commissioned annually-
    - I. by a technician registered with the National Environmental Balancing Bureau (NEBB) or an equivalent association; and
    - II. in accordance with the procedures published by the Chartered Institute of Building Services Engineers; and
  - (ii) each mechanical ventilation system for the shelter to be performance tested annually; and

- (iii) any maintenance work required for the aspects of the shelter mentioned in schedule 10 to be carried out-
  - I. annually; and
  - II. in accordance with maintenance and testing requirements under relevant Australian Standards; and
- (b) includes a check list stating-
  - (i) the details of maintenance work that has been completed in accordance with subparagraph (a)(iii); and
  - (ii) when the work was completed.

**Management procedure** as described in section 5 of the the Building Act 1975:

For subsection (1)(d), work includes a management procedure or other activity relating to a building or structure even though the activity does not involve a structural change to the building or structure.

Examples-

- a management procedure under the fire safety standard relating to a budget accommodation building
- a management procedure under the fire safety standard (RCB) relating to a residential care building

**Maximum flood level**, for a design flood event for a sit—

- (a) means a flood event affecting the site, having an annual probability of exceedance of 1:500; and
- (b) includes the backwater effects of a relevant design storm tide event.

**Maximum number of occupants**, for a public cyclone shelter, means the total number of occupants calculated by adding the following numbers—

- (a) the number of occupants that may be accommodated in the shelter's accommodation area during an occupancy period as determined under A3.2.1; and
- (b) the maximum number of occupants that may be accommodated in other parts of the shelter space determined by applying the provisions for occupancy limits set out in the BCA, volume 1.

Note: Examples of other parts of the shelter space of a public cyclone shelter include a kitchen, an office area and areas where waste is stored.

**Mechanical ventilation system**, for a public cyclone shelter, means a system installed in the shelter for the purpose of directing air in a controlled manner to or from specific enclosures, or parts of enclosures, in the shelter by means of an air-handling plant, ducts, plenums, air-distribution devices, including fans, and automatic controls.

**Natural ventilation device**, for a public cyclone shelter, means a system of ductwork, including a plenum, internal and external openings with grills and manually operable systems enabling the provision of outdoor air to naturally ventilate the inside of the shelter, with minimal water ingress, during a strong winds period.

**Non-combustible** as defined in Schedule 1 of the BCA:

Applied to-

- (a) a material - means not deemed combustible as determined by AS 1530.1 - Combustibility Tests for Materials; or
- (b) construction or part of a building - means constructed wholly of materials that are not deemed combustible.

**Normal use**, for a public cyclone shelter, means the use of the building, if any, when the building is not used as a public cyclone shelter.

**Occupancy period**, for a public cyclone shelter affected by a cyclone—

- (a) means the period determined by the LDMG during which the shelter is in operation and members of the public seeking shelter from the cyclone may be in the shelter; and
- (b) includes the pre-lockdown period, the lockdown period and the post-lockdown period relevant to the cyclone; and
- (c) for the purpose of designing the shelter-is assumed to be a minimum of 36 hours.

**Office area**, for a public cyclone shelter, means a room or space within the shelter used for carrying out management and communication functions.

**Operational management procedures plan**, for a public cyclone shelter, means a document prepared and kept by the owner of the shelter that-

- (a) states management procedures for the way the shelter must be operated in relation to the occupancy period for a cyclone; and
- (b) includes the matters stated in schedule 9, including the fire and evacuation plan for the shelter; and
- (c) has been endorsed by the LDMG.

**Passenger set-down area** see acceptable solution A1.2.0(1).

**Performance requirement** as defined in schedule 2 of the Building Act 1975:

performance requirements means any of the following—

- (a) the performance requirements under the BCA;
- (b) the performance criteria under the QDC;
- (c) the performance criteria under the QDC;
- (d) a requirement for the assessment of building work for which a discretion may need to be exercised under this Act.

**Plumbing Code of Australia** as defined in section 8 of the Plumbing and Drainage Act 2018:

The Plumbing Code of Australia is the document in force from time to time called 'National Construction Code, volume 3-Plumbing Code of Australia' published by the Australian Building Codes Board.

**Post-lockdown period**, for a public cyclone shelter, means a period within the occupancy period for a cyclone—

- (a) beginning after the lockdown period for the cyclone has ended, during which the effects of a cyclone are reduced; and
- (b) ending immediately before members of the public start leaving the shelter.

**Power services and equipment**, for a public cyclone shelter, means the following items for the shelter—

- (a) the main electrical switchboard;
- (b) the emergency power switchboard;
- (c) a diesel generator mentioned in A7.2.0;
- (d) emergency lighting central batteries;
- (e) a UPS mentioned in A7.2.0.

**Predicted mean vote** means an index for thermal comfort that predicts the mean value of the votes of a large group of persons on the 7-point thermal sensation scale.

**Pre-lockdown period**, for a public cyclone shelter, means a period within the occupancy period for a cyclone—

- (a) beginning when members of the public seeking shelter from the cyclone start arriving at the shelter; and
- (b) ending immediately before the start of the lockdown period.

**Primary entry point**, for a public cyclone shelter, means the place identified in the shelter's operational management procedures plan as the primary entry point for the shelter or the place where it is intended that most individuals will enter the shelter.

**Probable maximum flood level**, for a public cyclone shelter, means the flood level determined for the largest conceivable flood event for the site where the shelter is located, determined from the probable maximum precipitation and catchment characteristics for the area.

**Public cyclone shelter** means a building or part of a building that is, or is intended to be, a public cyclone shelter within the meaning of the Building Regulation 2021.

**Queensland Development Code (QDC)** as defined in section 13 of the Building Act 1975:

*the parts, or aspects of the parts, of the document called 'Queensland Development Code' that are prescribed by regulation.*

**Required** as defined in Schedule 1 of the BCA:

*Required to satisfy a Performance Requirement or a Deemed-to-Satisfy Provision of the NCC as appropriate.*

**Roof and wall bracing system**, for a public cyclone shelter, means the combined structural elements designed to withstand horizontal forces affecting the shelter.

**Serviceability limit states**, means states beyond which service criteria specified in AS/NZS 1170.0 Appendix C are no longer met.

**Sewage** as defined in Schedule 3 of the the Water Supply (Safety and Reliability) Act:

*sewage means household and commercial wastewater that contains, or may contain, faecal, urinary or other human waste.*

**Sewerage system** as defined in Schedule 1 of the Plumbing and Drainage Act 2018:

*sewerage system means infrastructure used to receive, transport and treat sewage or effluent, including, for example, access chambers, engines, machinery, outfalls, pumps, sewers, structures and vents.*

**Shelter management team** means a team appointed by the LDMG to manage a public cyclone shelter in the event of a cyclone.

**Shelter space**, for a public cyclone shelter, means all areas within the shelter required to support the operation of the shelter, except any amenities area, the battery area and the generator area.

**Storm tide height**, for coastal water affecting a public cyclone shelter, means the height of the water, measured in AHD, determined based on the design storm tide event, taking into account—

- (a) the effect on the water of a storm surge, including any wave effect; and
- (b) the normally occurring astronomical tide.

**Strong winds period** means a period, during an occupancy period for a public cyclone shelter, when wind affecting the shelter has—

- (a) a 3 second gust wind speed greater than 100 kilometre per hour; or
- (b) a 10 minute mean wind speed greater than 70 kilometre per hour.

**Structure** as defined in Schedule 2 of the Building Act 1975:

*structure includes a wall or fence and anything fixed to or projecting from a building, wall, fence or other structure.*

**Uninterruptible power supply (UPS)**, for a public cyclone shelter, means an electrical apparatus that provides emergency power for particular items in the shelter when the mains electricity fails.

**Untenable conditions**, for a public cyclone shelter, means conditions generated during a fire that present a threat to the life of the occupants of the shelter, including the presence of—

- (a) excessive heat and smoke; and
- (b) combustible materials.

**Ventilation control panel**, for a public cyclone shelter means a control panel comprising a wall mounted panel, located in the shelter's office area, that complies with schedule 8, section 4.

**Venturi suction system**, for a public cyclone shelter, means a natural ventilation device that extracts air from within the shelter by means of a tube that kilometre—

- (a) projects through the roof of the shelter to an area where wind from any direction causes suction; and
- (b) is narrower at its base than at its top to restrict air flowing from its base; and
- (c) allows rainwater to drain at its base; and
- (d) is connected to a duct passing through an external wall to extract air from within the shelter.

**Water storage tank**, for a public cyclone shelter, means a storage tank located inside or outside the shelter that is used for storing drinking water, water for firefighting, or water for toilets. **wave effect**, for coastal water, means the rise in sea level caused by waves breaking on an adjacent beach or structure as a result of the combined effect of the wave set-up for the water and the wave run-up for the beach or structure.

**Wave run-up**, for a beach or structure—

- (a) means the maximum extent to which waves travel up the beach or structure above the still water level, measured vertically; and
- (b) includes the wave set-up for the beach or structure.

**Water service provider**, for a public cyclone shelter, means the service provider under the Water Supply (Safety and Reliability) Act 2008, chapter 2, part 3 who provides a retail water service for the shelter.

**Wave set-up**, for coastal water, means the vertical increase in the mean level of the water towards the shoreline caused by wave action.

## Chapter 2 Performance criteria and acceptable solutions

### 1 Siting, design and construction

#### Storm tide, flood and landslide hazards

##### Performance criteria

###### P1.0

- 1) A *public cyclone shelter* must be located to avoid, or designed and constructed to resist, the impacts of any of the following during a cyclone-
  - a) storm tide hazards;
  - b) river and creek flood hazards;
  - c) landslide hazards.

##### Acceptable solution

###### *Storm tide hazards*

###### A1.0.0

- 1) This section applies if a *public cyclone shelter* is to be located in a local government area.
- 2) The shelter must be located at least 200 metres from a *coastal margin*.
- 3) Also, if the *local disaster management plan* for the local government area designates a location in the area where a *public cyclone shelter* may be located, the shelter must not be located in the area other than in the designated location.
- 4) In addition, if the *local disaster management plan* for the local government area designates evacuation zones for the area, the shelter must not be located in one of the evacuation zones.
- 5) A1.0.0(6) applies if the *local disaster management plan* for the local government area does not designate-
  - a) a location mentioned in A1.0.0(3); or
  - b) evacuation zones mentioned in A1.0.0(4).
- 6) The shelter must have a minimum finished floor level that is higher than the sum of the following, rounded up to the nearest half meter increment in *AHD*-
  - a) the *storm tide height* for the *design storm tide event* for the site where the shelter is located; and
  - b) 2 metres.

###### *River and creek flood hazards*

###### A1.0.1

- 1) A *public cyclone shelter* must have a minimum finished floor level that is higher than the highest of the following for the site where the shelter is located –
  - a) the *design flood level*;
  - b) the *probable maximum flood level*, minus 1 metres;
  - c) if the product of the probable maximum flood depth times the water flow velocity exceeds 0.6 metre squared the *probable maximum flood level*.

### Landslide hazards

#### A1.0.2

- 1) A *public cyclone shelter* located in a *designated landslide area* must be assessed for landslide risk and designed to manage the landslide risk by a geo-technical engineer who is a practising professional engineer within the meaning of the *Professional Engineers Act 2002*.
- 2) An assessment under A1.0.2(1) must be conducted in accordance with the Practice Note Guidelines for Landslide Risk Management 2007 issued by the Australian Geomechanics Society Landslide Taskforce.

### Other hazards

#### Performance criteria

##### P1.1

- 1) A *public cyclone shelter* must be located a sufficient distance away from built and natural hazards to ensure those hazards pose no more than a very low risk hazard to the shelter during a cyclone.
- 2) For P1.1(1), a very low risk hazard has an annual probability less than  $10^{-6}$ .

#### Acceptable solution

##### A1.1.0

- 1) A *public cyclone shelter* must be located the following distance away from each of the following objects or substances:
  - a) for a mature tree with a trunk with a diameter greater than 100 millimetres-a distance that is at least equivalent to the height of the tree;
  - b) for a building or structure-a distance that is at least equivalent to the maximum height of the building or structure;
  - c) for an above ground water storage container holding more than 500 kilolitres -at least 100 metres;
  - d) the following fuel or flammable liquid kept in storage if the fuel or liquid is not dedicated for use for the diesel generator mentioned in A7.2.0-
    - I) up to 100 kilolitres of fuel or flammable liquid (or a combination of both), other than liquid petroleum gas (LPG)-at least 100 metres; or
    - II) over 100kL of fuel or flammable liquid (or a combination of both), other than LPGA-at least 1000 metres; or
    - III) up to 400L of LPG-at least 100 metres; or
    - IV) over 400L of LPG-at least 1000 metres.

### Vehicle and pedestrian access and parking facilities

#### Performance criteria

##### P1.2

- 1) A *public cyclone shelter* must be provided with suitable access for members of the public travelling by car, bus or on foot-
  - a) to the shelter before a cyclone; or
  - b) from the shelter after a cyclone.
- 2) Also, the shelter must be provided with adequate access to an area that members of the public may use to park their cars.

#### Acceptable solution

##### A1.2.0

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- 1) A *public cyclone shelter* must be provided with access for vehicles which includes a set-down area (*passenger set-down area*) for car and bus passengers -
  - a) that is located -
    - I) at least 20m from the shelter's primary entry point; and
    - II) within 200m of the *primary entry point*; and
  - b) allows vehicles to travel to and depart from the area in a forward direction.
- 2) If the set-down area is located within the site, an all-weather sealed access for a vehicle with a gross vehicle mass (GVM) of 15 tonnes must be provided.
- 3) The shelter must have an area suitable for members of the public to use for car parking that is located no more than 1 kilometre from the shelter.

## 2 Structural design

### Wind actions

#### Performance criteria

##### P2.0

- 1) A *public cyclone shelter* must be designed and constructed to resist the impacts of wind actions associated with severe cyclones.

#### Acceptable solution

##### *Wind actions and shelter's resistance to those wind actions*

##### A2.0.0

- 1) A *public cyclone shelter* must be able to resist the magnitude of wind actions associated with a severe cyclone with-
  - a) an annual probability of exceedance of the design event for safety of 1:10,000; and
  - b) an annual probability of exceedance for *serviceability limit states* of 1:50; and
  - c) shape factors for external pressures—
    - I) mentioned in clause 5.4, Appendices A, B and C of AS/NZS1170.2; or
    - II) determined by specific wind-tunnel testing for the proposed shelter geometry; and
  - d) internal wind pressure calculated on the basis of a large opening on one wall, using coefficients mentioned in clause 5.3 of AS/NZS 1170.2.
  - e) a windborne debris loading mentioned in clause 2.5.8 of AS/NZS1170.2.

Note: For details about simulated windborne debris impact testing, see schedule 1.

- 2) A *public cyclone shelter* must have—
  - a) an *external fabric* designed and constructed to resist the magnitude of wind actions mentioned in A2.0.0(1); and
  - b) an *internal fabric* that resists the internal wind pressure mentioned in A2.0.0(1)(d); and
  - c) an *external envelope* designed and constructed to resist the windborne debris loading mentioned in A2.0.0(1)(e).

##### *Demonstrating external fabric's resistance to wind actions*

##### A2.0.1

- 1) This acceptable solution applies for the resistance of the *external fabric* of a *public cyclone shelter* to the magnitude of wind actions mentioned in A2.0.0(1).

- 2) The resistance of the *external envelope* and any *debris* screens forming part of the *external fabric* must be demonstrated by—
  - a) evidence from an *accredited testing laboratory* that—
    - I) either-
      - (i) each element of the *external envelope* has passed the tests specified in schedule 2 after passing the tests specified in schedule 1; and
      - (ii) each *debris screen* has passed the tests specified in schedule 1 and complies with A2.0.0(2)(b) as demonstrated in the manner mentioned in A2.0.1(3); or
    - II) each of the following applies—
      - (i) the cladding, without the imperforate lining material, is tested in accordance with schedule 1; and
      - (ii) a separate test sample of the cladding, without the imperforate lining material, is tested in accordance with schedule 2; and
      - (iii) the imperforate lining, and fixings independent of the cladding, resist wind actions mentioned in A2.0.0(1) except for the windborne debris impacts mentioned in A2.0.0(1)(e); or
  - b) engineering calculations for each element of the *external envelope* and each *debris screen* undertaken using the analysis methods specified under an Australian Standard referenced in the BCA, volume 1 that is relevant to the element or screen and the wind actions.
- 3) The resistance of other elements of the external fabric must be demonstrated by -
  - a) evidence from an accredited testing laboratory that each element has passed the tests specified in schedule 2; or
  - b) engineering calculations for each element using analysis methods specified under an Australian Standard referenced in the BCA, volume 1 that is relevant to the element and the wind actions.
- 4) Compliance with this acceptable solution must be recorded in test reports that -
  - a) are provided by an accredited testing laboratory; and
  - b) comply with -
    - I) schedule 1, section 5; and
    - II) schedule 2, section 4.

*External envelope's resistance to windborne debris impact*

A2.0.2

- 1) If an external wall for the shelter extend to the underside of the roof sheeting, the external wall, and windows and *external doors* in the wall, and the roof must resist the windborne debris loading mentioned in A2.0.0(1)(e).
- 2) If an external wall does not extend to the underside of the roof sheeting, for the loading mentioned in clause 2.5.8 of AS/NZS1170.2-
  - a) the roof barge and fascia is taken to be a wall; and
  - b) a roof soffit that is flat or sloping downward from the wall is taken to be a roof of less than 15o pitch; and
  - c) any other roof soffit is taken to be a roof of greater than 15o pitch.
- 3) A *required exit* must be able to resist *debris impact load A* and *debris impact load B*.
- 4) A window, *natural ventilation device*, or *external door* that is not a *required exit*, must -
  - a) be designed and constructed to resist *debris impact load A* and *debris impact load B*; or
  - b) if it is designed and constructed to resist *debris impact load B* but not *debris impact load A*-be protected by a *debris screen* constructed to resist *debris impact load A*; and
  - c) if it is not designed and constructed to resist *debris impact load A* and *debris impact load B*-be protected by a *debris screen* constructed to resist *debris impact load A* and *debris impact load B*.

- 5) Compliance with A2.0.2(1) to (4) must be demonstrated against the test specifications set out in schedules 1 and 2.
- 6) Compliance with the test specifications must be recorded in test reports that-
  - a) are provided by an *accredited testing laboratory*; and
  - b) comply with -
    - I) schedule 1, section 5; and
    - II) schedule 2, section 4.
- 7) The following types of wall are taken to be able to resist the windborne debris loading mentioned in A2.0.0(1)(e) -
  - a) a concrete wall, other than a concrete blockwork wall, that is -
    - I) 150mm thick; and
    - II) comprised of grade N32 concrete, within the meaning of AS 1379; and
    - III) reinforced with at least SL92, within the meaning of AS/NZS 4671, that is centrally located within the wall; and
    - IV) constructed in accordance with AS 3600; and
  - b) a concrete blockwork wall -
    - I) that is 190mm thick; and
    - II) that is comprised of 'H' blocks (20.48), within the meaning of the Concrete Masonry Handbook CM01, that have a characteristic unconfined compressive strength of 15MPa; and
    - III) all cores of which are -
      - (i) reinforced by at least N12 bars, within the meaning of AS 4671, that are centrally located within the wall; and
      - (ii) filled with grade N20 concrete, within the meaning of AS 1379; and
      - (iii) that is constructed in accordance with AS 3700.

#### *Debris screens*

##### A2.0.3

- 1) A debris screen used to protect an element of the external fabric of a public cyclone shelter must -
  - a) if required to resist debris impact load A-have an aperture dimension of not more than 40mm; and
  - b) if required to resist debris impact load B-have an aperture dimension of not more than 8mm; and
  - c) be located at least 1.25 times the distance of the maximum instantaneous deflection under the relevant design debris impact load away from the surface of the element it is protecting; and
  - d) provide adequate coverage over the element protected, by -
    - I) returning to the external surface surrounding the element on all sides; or
    - II) if the distance between the surrounding element and the debris screen is less than 300mm-overlapping the protected element by a distance that is at least-
      - (i) twice the distance between the external surface surrounding the element and the edge of the debris screen when resisting debris impact load A or debris impact load B; or
      - (ii) twice the distance between the external surface surrounding the element and the edge of the debris screen less 30mm, when resisting debris impact load A; or
      - (iii) a combination of A2.0.3(d)(I)(i) and (II)(ii).

#### *Robustness*

##### A2.0.4

#### *Roof and external wall elements*

- 1) Roof and wall bracing systems must be provided for a public cyclone shelter such that –
  - a) the design loads in each direction are resisted by a combined capacity of at least -
    - I) 2 spatially separated roof bracing elements; and
    - II) 2 spatially separated wall bracing elements; and
  - b) the notional removal of any single bracing element mentioned in A2.0.4(1)(a) does not result in the structure being unable to resist the applied design loads.
- 2) For A2.0.4(1)(a), the bracing systems are taken to be spatially separated when they are separated by the lesser of -
  - a) a distance of 6m measured horizontally; or
  - b) a distance equivalent to one quarter of the length of the building in the direction under consideration.
- 3) Roof and wall steel sheeting must be mechanically fixed on -
  - a) the roof with crest fixings that have cyclone washers and seals; and
  - b) the walls with valley fixings and sealing washers.
- 4) Roof and wall flashings must be mechanically fixed -
  - a) to steel or timber with screws with multi-seal washers; and
  - b) to concrete with drive or chemical adhesive anchors.

#### *Ceilings and internal walls*

- 5) The ceilings of the shelter must -
  - a) be mechanically fixed to the supporting structure; and
  - b) retain adequate stability in wet conditions to avoid collapse; and
  - c) not dislodge under internal wind pressures calculated as mentioned in A2.0.0(1)(a).
- 6) The internal ceilings and walls of the shelter that do not form a permanent seal as mentioned in clause 5.3.3 of AS1170.2 must be vented by permanent openings, vents or maintenance access panels with an area of at least 0.5% of the surface area of the wall or ceiling between the spaces.
- 7) The shelter must have an *operational management procedures plan* that states a procedure to ensure access panels and vents between the spaces mentioned in A2.0.4(6) are open when the shelter is being used.

#### *External windows and doors*

- 8) External glazing for the shelter must be laminated.
- 9) *External doors*, windows and similar external openings for the shelter must be designed and constructed to resist the wind actions mentioned in A2.0.0(2)(a) and (c).

#### Note -

The definition external door includes elements that secure the door to the structure, including the door hinges, door frames and any lock, latch or exit device attached to the door.

- 10) Any *external doors* for the shelter that are folding doors must be fixed to resist differential wind pressures determined by applying the applicable local pressure factor mentioned in clause 5.4.4. of AS/NZS 1170.2 to alternate surfaces of the door or doors to obtain the most adverse loading.
- 11) Door frames for external doors for the shelter must be -
  - a) be mounted parallel to the roof and screw fixed to the roof purlins; and
  - b) be located to ensure the design strength of the roof purlins is not exceeded; and
  - c) not impede rainwater flow on the roof.

### Solar panels

- 12) Solar panels and fixings for the shelter must -
  - a) the uniformly distributed imposed loading as determined under AS/NZS1170.1 for the design use; and
  - b) a uniformly distributed imposed load of 1.8kPa.

## Imposed actions for roofs

### Performance criteria

#### P2.1

- 1) A *public cyclone shelter* must be designed and constructed to resist the additional loading of debris build-up on horizontal exposed surfaces associated with cyclones.

### Acceptable solution

#### A2.1.0

- 1) For the purposes of designing the roof and supporting structure of a *public cyclone shelter*, in accordance with the BCA, volume 1, the applicable uniformly distributed imposed loading under AS/NZS1170.1 must be the greater of -
  - a) the uniformly distributed imposed loading as determined under AS/NZS1170.1 for the design use; and
  - b) a uniformly distributed imposed load of 1.8kPa.

## Wave and water flow actions

### Performance criteria

#### P2.2

- 1) If a *public cyclone shelter* is located on a site that is below the *design flood level* or *design storm tide level*, the structure of the shelter must be designed and constructed to resist the impacts of wave and water flow actions.

### Acceptable solution

#### A2.2.0

- 1) For determining the applicable loads on an element of the building in accordance with the BCA -
  - a) if the element is exposed to a *design storm tide event*, water loads for the event must -
    - I) be calculated in accordance with AS 4997-2005; and
    - II) take account of the effect of waves, currents, and hydrostatic actions; and
    - III) in estuaries, take account of-
      - (i) if the water level is above 0.6m below the soffit of the structure-the effects of any debris mats that are 1.2m thick; and
      - (ii) the impact of floating logs; and
  - b) if the element is exposed to a *design flood event* resulting from a river or creek, water loads calculated for the event must-
    - I) be calculated in accordance with section 16 of AS 5100.2; and

- II) take account of-
  - (i) if the water level is above 0.6m below the soffit of the structure-the effect of water flow, buoyancy, lift and debris mats that are 1.2m thick; and
  - (ii) the impact of floating logs.
- 2) Water loads calculated under A2.2.0(1)(a) or (b) must be applied to the element concurrently with the magnitude of wind loads impacting the element, mentioned in A2.0.0.
- 3) The wind loads mentioned in A2.2.0(2) are taken to act above the design event water level. (a) have a durability that is at least equivalent to that required for structural elements outside and above ground; and
  - a) if made of plywood or another timber product-be suitable for use in hazard class H3 within the meaning of AS/NZS1604.1.

## Design working life

### Performance criteria

#### P2.3

- 1) The *public cyclone shelter* must be constructed to perform for its intended purpose with expected maintenance but without major structural repair for its *design working life*.

### Acceptable solution

#### A2.3.0

- 1) The *design working life* for a *public cyclone shelter* must not be less than 50 years.
- 2) Non accessible structural elements must have a life to first maintenance of not less than the design working life.
- 3) All external steelwork accessible for maintenance must have a coating with a corrosion protection system with a life to first maintenance that is at least equal to that of hot dipped galvanising.
- 4) An imperforated lining beneath external cladding must-
- 5) The external fabric of the shelter must be designed so that direct contact between incompatible metals or alloys does not occur.

## 3 Access, occupancy and egress

### Building signage

#### Performance criteria

##### P3.0

- 1) Signage for a *public cyclone shelter* must be designed, constructed and located to ensure occupants are provided with sufficient information to identify the location and entrance of the shelter.

#### Acceptable solution

##### A3.0.0

- 1) Signage for a *public cyclone shelter* must be located adjacent to each *passenger set-down area*, directing members of the public arriving at the *passenger set-down area* to the *shelter's primary entry point*.
- 2) Signage for the shelter must also be located on the *external fabric* of the shelter, immediately adjacent to the *shelter's primary entry point*.
- 3) Signage mentioned in A3.0.0(1) or (2) must comply with schedule 3.

- 4) Signage mentioned in A3.0.0(2) must be fixed -
  - a) at least 1.2m above the finished ground surface level; and
  - b) no more than 2.1m above that level.

## Access

### Performance criteria

#### P3.1

- 1) A *public cyclone shelter* must be designed and constructed with points of entry to the shelter that allow members of the public generally to enter the shelter safely.

*Access before lockdown period starts*

### Acceptable solution

#### A3.1.0

- 1) Each *entry point* for a *public cyclone shelter* must have a minimum clear width of 1m, except if it is a single doorway.

Note -

The width of a single doorway is determined by the BCA, volume 1.

- 2) A door for an *entry point* must have a door handle, located on each side of the door, that is -
  - a) positioned vertically; and
  - b) at least 600mm in length; and
  - c) capable of transferring to the door a push or pull force of 1kN applied at any location on the handle; and
  - d) located within 100mm of the latch edge of the door and has a gap of at least 50mm between the door stop and the edge of the handle.
- 3) At least 200mm of the length of each door handle mentioned in A3.1.0(2) must be located above and below 1200mm above the entry's *finished floor level*.
- 4) The *primary entry point* and each *baffled entry* for the shelter must have sufficient area to manoeuvre a horizontal stretcher, 2m long and 600mm wide, through the entry point.
- 5) If the *primary entry point* for the shelter is not the same as the point of entry most individuals will use to enter the building or part of a building for its *normal use* (the *normal use entrance*), at least one entry point for the shelter must be located within the line of sight of an individual entering the shelter using the *normal use entrance*.

*Access during lockdown period*

### Acceptable solution

#### A3.1.1

- 1) At least one entry point for the shelter must consist of either –
  - a) 2 doors in series which form part of an enclosure that is-
    - I) located between the entry point and the remainder of the shelter; and
    - II) comprised of the doors and surrounding walls; or
- 2) The 2 doors mentioned in A3.1.1(1)(a) must -
  - a) be at least 3m apart; and
  - b) be no more than 0.9m wide; and
  - c) be no more than 2.1m high; and

- d) have door handles that comply with A3.1.0(2) and (3)
- 3) The outer door of the entry point mentioned in A3.1.1(1)(a) must open outwards and the inner door of the entry point must open inwards.
- 4) An entry point mentioned in A3.1.1(1)(a) must not also be a required fire exit.
- 5) The entry point mentioned in A3.1.1(1) must be located more than the height of the building away from a corner of the building.
- 6) If the *entry point* mentioned in A3.1.0(1) and A3.1.1 (1) is not the same as the point of entry most individuals will use to enter the building or part of a building for its *normal use* (the *normal use entrance*), a concrete path with signage must direct an individual entering the shelter using the *normal use entrance* to the *entry point* mentioned in A3.1.1(1).

#### *Baffled entries*

##### A3.1.2

- 1) A *baffled entry* for an *entry point* for a *public cyclone shelter* must -
  - a) prevent *debris impact load A* from impacting the external face of the door from any angle, including after a single rebound at any angle from another wall; and
  - b) include walls that resist *debris impact load A* and *debris impact load B*; and
  - c) include a *roof soffit* or ceiling that resists *design debris impact load A* and *design debris impact load B* which, for clause 2.5.8 of AS/NZS1170.2, is the loading applied to:
    - I) a roof of less than 15o pitch when the roof soffit or ceiling is flat, or has a slope of less than 15o pitch, or is sloping downward from the wall; or
    - II) a roof of greater than 15o pitch to other roof soffits or ceilings.
  - d) include a door that resists *debris impact load B*.
- 2) For A2.0.4(1)(a), if a debris missile impacts a wall of the *baffled entry* at an angle of 90° or less to the face of the wall, the potential rebound trajectory must be taken to occur at any angle from 90° to 180° to the wall.

## Safe movement and occupancy

### Performance criteria

#### P3.2

- 1) A *public cyclone shelter* must be designed and constructed, and have appropriate documented management procedures, to ensure occupants of the shelter are provided with the following -
  - a) an environment in which occupants can move safely -
    - I) to the shelter; and
    - II) within the shelter during an occupancy period; and
    - III) away from the shelter during a post-lockdown period; and
  - b) sufficient space for each occupant while inside the shelter.

#### Note -

The requirements in P3.2 are additional to the requirements in the BCA that apply for the building's normal use, such as requirements for handrails and balustrades.

### Acceptable solution

#### *Environment in which occupants can move safety*

##### A3.2.0

- 1) The floor surface areas of a *public cyclone shelter* extending internally and externally for 2m from each *entry point* and extending the full width of the door at each *entry point* must have a slip resistance of at least classification R11 or P4, as determined by AS 4586.
- 2) At least 50% of the surface area of each wall in a *public cyclone shelter* must have a minimum *luminous reflectance value* of 60%.
- 3) The surface area of each ceiling in a *public cyclone shelter* must have an average minimum *luminous reflectance value* of 80%.
- 4) Any internal area of the roof of a *public cyclone shelter* that does not have a ceiling must be covered by reflective foil.
- 5) A *public cyclone shelter* must have a path of travel for individuals with disabilities that complies with AS 1428.1, allowing those individuals to travel between each of the following areas -
  - a) a *passenger set-down area*; and
  - b) an *office area*; and
  - c) the *accommodation area*; and
  - d) kitchen areas in the shelter; and
  - e) an *amenities area*.
- 6) All parts of the shelter must be -
  - a) accessible from within the shelter without the need to enter other parts of the building outside the shelter; and
  - b) illuminated as mentioned in A6.1.

#### *Space for each occupant*

##### A3.2.1

- 1) The maximum number of occupants, other than staff nominated by the LDMG, that may be accommodated in the *accommodation area* in a *public cyclone shelter* during an *occupancy period* is to be determined by dividing the floor area of the accommodation area by 1.2m<sup>2</sup>.
- 2) The shelter must have an *operational management procedures plan* that includes a floor plan of the shelter that shows the layout of the *shelter space* and states the maximum number of occupants, other than staff nominated by the LDMG, that may be accommodated in the *accommodation area*, during an *occupancy period*.

Note -

1. The maximum number of occupants that may be accommodated in areas within the shelter space, other than the accommodation area, such as a kitchen, an office area and storage spaces and the like, is determined by the provisions of the BCA, volume 1.

#### *Egress*

## **Performance criteria**

### P3.3

- 1) A *public cyclone shelter* must -
  - a) be designed and constructed to ensure *required exits* are available to allow occupants of the shelter to evacuate safely in the event of a fire or other emergency; and
  - b) have documented management procedures that ensure that evacuation occurs when the conditions outside the shelter are safer than inside the shelter.

## Acceptable solution

### A3.3.0

- 1) *Required exits for a public cyclone shelter* must comply with -
  - a) the requirements for *required exits* set out in the BCA, volume 1; and
  - b) A2.0.0.
- 2) The resistance of the required exits to wind actions must be demonstrated in accordance with A2.0.1(2)(a)(i).

## 4 Fire safety

### Fire hazard management

#### Performance criteria

##### P4.0

- 1) A *public cyclone shelter* must be designed and constructed, and have appropriate documented management procedures, to minimise the risk of the occupants becoming exposed to *untenable conditions* as a result of a fire within the shelter.

#### Acceptable solution

##### *Smoke reservoir height*

##### A4.0.0

- 1) The height of the ceiling for at least 80% of the floor area of the *accommodation area* must be least 6m.

##### *Internal access to permit manual fire suppression etc*

##### A4.0.1

- 1) All rooms and spaces in a *public cyclone shelter* must be capable of being accessed from within the shelter without the need to travel outside the shelter.

##### *Fire hazard properties of materials*

##### A4.0.2

- 1) The *fire hazard* properties of materials used in a *public cyclone shelter* must comply with the BCA, volume 1.
- 2) For the purposes of the BCA, volume 1, the *shelter space* in a *public cyclone shelter* is a specific area.
- 3) Any fixed or loose seating in the *accommodation area* of a *public cyclone shelter* must -
  - a) be *non-combustible*; or
  - b) have a maximum spread-of-flame index of 0, and a maximum smoke-developed index of 5, as determined in accordance with AS/NZS 1530.3.

##### *Areas of high fire hazard*

##### A4.0.3

- 1) If a *public cyclone shelter* constitutes only a part of a *building*, the shelter must be separated from any rooms or spaces that are not part of the shelter, by fire-resisting construction having an *FRL* of at least 120/120/120.
- 2) Any area within a *public cyclone shelter* and outside the *shelter space* that contains a *fire hazard*, including any area mentioned in A4.0.3(4) that is outside the *shelter space*, must be separated from the *shelter space* by fire-resisting construction having an *FRL* of at least 120/120/120.
- 3) Any area within the *shelter space* for a *public cyclone shelter* that contains a *fire hazard*, including any area mentioned in A4.0.3(4) that is within the *shelter space*, must be separated from the remainder of the *shelter space* by fire-resisting construction having an *FRL* of at least 120/120/120.
- 4) For A4.0.3(2) and (3), the areas are as follows -
  - a) a laboratory;
  - b) a storeroom housing combustible items;  
Examples - a carpentry or welding workshop, a storeroom housing sports equipment
  - c) a room housing the communication main distribution frame;
  - d) a laundry, if it houses a gas-fired dryer or another item that poses a high *fire hazard*;
  - e) a kitchen;
  - f) a room housing a diesel generator or batteries;
  - g) any other area identified in the shelter's *operational management procedures plan* as posing a fire hazard.
- 5) Any doorway in the construction must be protected with a self-closing fire door having an *FRL* of at least -/120/30.
- 6) Any openings in the construction must be protected with automated fire shutters having an *FRL* of at least -/120/-.
- 7) If gas is installed in the shelter, it must be possible to turn off the gas supply to the shelter before the *lockdown period*.

## Separation of equipment

### Performance criteria

#### P4.1

- 1) A *public cyclone shelter* must be designed and constructed to prevent fire or smoke from spreading within the shelter from or to an item of the shelter's power services and equipment that -
  - a) has a *fire hazard*; or
  - b) has the potential to cause an explosion; or
  - c) is required to be capable of continued operation during an occupancy period.

### Acceptable solution

#### A4.1.0

- 1) Each item of the *power services and equipment* for a *public cyclone shelter* must be separated, by construction elements achieving an *FRL* of at least 120/120/120 in accordance with BCA volume 1 from -
  - a) the *shelter space*; and
  - b) each other item.
- 2) Any doorway in the construction mentioned in A4.1.0(1) must -
  - a) be protected with a self-closing fire door having an *FRL* of at least -/120/30; and

- b) provide access from within the shelter.

## Smoke detection and alarm system

### Performance criteria

#### P4.2

- 1) A *public cyclone shelter* must be designed and constructed to include an automatic warning system that operates when it detects smoke so, in the event of a fire -
  - a) an appropriate fire attack response can be initiated; and
  - b) if necessary and safe to do so, occupants of the shelter can evacuate the *building*.

### Acceptable solution

#### A4.2.0

- 1) A *public cyclone shelter* must have -
  - a) a smoke detection and alarm system and a fire indicator panel (FIP) that are located and accessible within the shelter in compliance with AS1670.1; and
  - b) an occupant warning system that -
    - I) complies with clause 3.22 of AS 1670.1, and
    - II) incorporates a device located at the FIP that has a live speech facility that complies with AS 1670.1; and
    - III) incorporates a warning speaker system that has a speech intelligibility facility that complies with clause 4.9 of AS 1670.4; and
    - IV) provides an alert signal prior to the evacuation signal; and
  - c) a separate smoke detection zone for each room where the main source of *required* ventilation is provided by natural ventilation; and
  - d) zone isolation switches located at the FIP to enable the isolation of the rooms mentioned in A4.2.0(c). (1) A public cyclone shelter must be equipped with firefighting services and equipment, for use for the shelter, at all times.

## Fire-fighting services and equipment

### Performance criteria

#### P4.3

- 1) A *public cyclone shelter* must be equipped with firefighting services and equipment, for use for the shelter, at all times.
- 2) The services and equipment must be kept in locations that best facilitate rapid deployment of them by occupants of the shelter, so occupants can effectively suppress a fire during a cyclone.

### Acceptable solution

#### *Fire hose reels*

#### A4.3.0

- 1) A *public cyclone shelter* must, at all times, be equipped with a fire hose reel system that -
  - a) complies with AS 2441; and

- b) is located -
  - I) inside the shelter; and
  - II) so the hose reels can be used for all spaces within the shelter without the need for a person using the hose reels, to travel outside the building; and
  - III) so the hose does not need to pass through fire or smoke doors.
- 2) Any part of the fire hose reel system located outside the shelter must be capable of resisting the wind actions mentioned in A2.0.0 and A2.1.0.
- 3) In addition to having a connection to the *water service provider's* water service, the fire hose reel system must be supplied by -
  - a) a *water storage tank*, kept within the shelter, that-
    - I) has a capacity of at least 5000 litres; and
    - II) holds at least 5000 litres of water at all times during an occupancy period; and
    - III) is provided with a pump set in accordance with AS 2941, that is connected to the diesel generator mentioned in A7.2.0; or
  - b) two equally sized pressurised bladder tanks, kept within the shelter, that -
    - I) can deliver a total of at least 2,000 litres of water in compliance with AS 2441-2005, clause 6; and
    - II) are re-supplied from a non-potable water storage tank; and
    - III) are provided with a pump set in accordance with AS 2941, that is connected to the mains power and the diesel generator mentioned in A7.2.0.
- 4) The water storage mentioned in A4.3.0(3)(a) may be provided within the same water storage tanks as the water storage required under A8.0.0, provided that -
  - a) suitable backflow prevention devices are installed for the tanks; and
  - b) any outlet that is used to draw off water to meet the requirements mentioned in A8.0.0 is installed in a position that will ensure the minimum amount of water mentioned in A4.3.0(3)(b) is stored in addition to the amount required to be stored under A8.0.0.
- 5) The non-potable water storage tank mentioned in A4.3.0(3)(b)(II) must -
  - a) have a combined supply capacity of at least 5,000 litres for fire hose reels and toilets; and
  - b) be supplemented by rainwater from a total roof area of at least 100m<sup>2</sup> that is collected by 2 downpipes with one collecting the rainwater from at least a third of the area; and
  - c) have suitable backflow prevention devices installed for the tanks; and
  - d) meet the requirements mentioned in A8.0.0.

### *Fire extinguishers*

#### A4.3.1

- 1) A *public cyclone shelter* must be equipped with fire extinguishers that-
  - a) comply with AS 2444; and
  - b) meet the requirements set out in table 2.

**Table 2 - Requirements for fire extinguishers for a public cyclone shelter**

Type	Size	Rating	Minimum number	Location
Water	9.1 litre	3A	2	Adjacent to each hose reel within the shelter
			1	Office
	4.5kg	4A:60B:E	2	Office

Dry chemical			1	Adjacent to a <i>generator</i> area
			1	Adjacent to a <i>battery</i> area
			1	Per 300m <sup>2</sup> of <i>floor area</i> and within 15m travel distance to any point in the shelter
			1	Kitchen
Carbon dioxide	5.0kg	5b:E	1	Adjacent to a <i>battery</i> area
			1	Adjacent to any communication/server room

- 2) A fire blanket that is at least 1m<sup>2</sup> and complies with AS 2444 must be kept in each kitchen in the shelter.
- 3) All fire extinguishers must be within the shelter and accessible from the shelter space.

## Maintenance and operational management procedures

### Performance criteria

#### P4.4

- 1) A *public cyclone shelter* must have documented management procedures -
  - a) for -
    - I) maintaining the shelter's compliance with this QDC part; and
    - II) operating the shelter during an *occupancy period*; and
  - b) that incorporate a plan of the action to be taken by persons within the shelter in the event of a fire threatening the shelter that is adequate to ensure the safety of occupants.

### Acceptable solution

#### A4.4.0

- 1) A *public cyclone shelter* must have -
  - a) a *maintenance management procedures plan*; and
  - b) an *operational management procedures plan*.
- 2) The *operational management procedures plan* must include the *fire and evacuation plan* for the shelter.
- 3) The *maintenance management procedures plan* must be implemented in accordance with the terms of the plan.

#### Notes -

1. If a fire occurs within a public cyclone shelter during a lockdown period, the cyclone shelter management team appointed by the shelter management team may determine that conditions outside the building are such that it is not safe for occupants of the shelter to evacuate.
2. It is imperative that the fire safety system, in particular, is maintained, and procedures under the operational management procedures plan are followed, to reduce the risk of a fire developing to such a size that it presents a danger to the occupants during a strong winds period.
3. In preparing the maintenance management procedures plan, the owner of the shelter may have regard to the Queensland Public Cyclone Shelters – Maintenance Guidelines for guidance.

## 5 Health and amenity

### External weatherproofing

#### Performance criteria

P5.0

- 1) A *public cyclone shelter* must be designed and constructed with materials that are sufficiently durable to resist rainfall events associated with a cyclone.

#### Acceptable solution

A5.0.0

- 1) A *public cyclone shelter* must be able to prevent stormwater from entering the shelter during a rainfall event with an annual probability of exceedance of 1 in 500.
- 2) The roof eave gutters, external downpipe, and piped site drainage must be designed in accordance with AS/NZS 3500.3 to cater for a rainfall event with an annual probability of exceedance of 1 in 20.
- 3) The roof of the shelter must -
  - a) have a slope of at least 5 degrees; and
  - b) have sarking; and
  - c) be designed so that direct contact between incompatible metals or alloys does not occur; and
  - d) have suitable fixings and connections for the top, bottom and edges of each corrugation of roof sheeting; and
  - e) have suitable fixings to flashings within 50mm of the roof's edge that are capable of remaining in position and withstanding any permanent distortion under pressure; and
  - f) not include, within the line of the external wall -
    - I) any penetrations through the roof for ventilation, plant or equipment; or
    - II) any penetrations through the roof for rainwater goods, including downpipes, sumps, rainwater heads; or
    - III) any gutters, including valley gutters or box gutters.
- 4) The external envelope must be resistant to water penetration.

Example -

This could be achieved by using closed-cell foam strips under ridge and apron flashings to minimise rainwater being blown between the flashings and roof cladding.

- 5) The doors and windows must be resistant to the penetration of uncontrolled water when tested in accordance with AS 4420.5 under a water penetration resistance test pressure of 770 Pa.
- 6) *Natural ventilation devices* must have a minimum resistance to water penetration mentioned in schedule 8, part 2.

### Ventilation generally

#### Performance criteria

P5.1

- 1) A *public cyclone shelter* must have a means of ventilation that will maintain adequate air quality during an *occupancy period*.

#### Acceptable solution

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## A5.1.0

- 1) A *public cyclone shelter* must have a *mechanical ventilation system* and *natural ventilation devices* to ensure that, during an *occupancy period*, the shelter -
  - a) complies with the BCA, volume 1, except as varied by A5.1.0 (1)(b) and (2); and
  - b) provides -
    - I) no more than 1,000 parts per million (PPM) of CO<sub>2</sub>; and
    - II) a thermal comfort range complying with the Predicted Mean Vote (PMV) Index of  $\pm 2.5$ ; and
    - III) a temperature of not more than 3 degrees Celsius above normal ambient temperature.
- 2) Compliance with A5.1.0(1) may be -
  - a) demonstrated by the shelter's *mechanical ventilation system* and *natural ventilation devices* meeting the dynamic thermal and computational fluid dynamic simulation assessments set out in schedule 7; or
  - b) achieved by compliance with acceptable solutions A5.2.0 to A5.2.8.

## Note-

The total temperature rise in the shelter may be 6 degrees Celsius being 3 degrees above normal ambient temperature, plus a reduction in normal ambient temperature due to the cyclone of 3 degrees as mentioned in Schedule 7 clause 5(2).

- 3) A *public cyclone shelter* must have one CO<sub>2</sub> sensor per 200 people or part thereof in the *accommodation area*.

## A5.1.1

- 1) Circulation, exhaust-air and supply-air fans used in a *mechanical ventilation system* in a *public cyclone shelter* must be capable of operating on -
  - a) mains electricity; and
  - b) electricity produced by a diesel generator.

## Ventilation of the shelter

### Performance criteria

## P5.2

- 1) A *public cyclone shelter* must be designed and constructed to maintain adequate air quality and air movement for occupants and safe operation of equipment in the shelter during an *occupancy period*.
- 2) The *ventilation system* installed in a *public cyclone shelter* must be capable of controlling the following during an *occupancy period* -
  - a) the circulation of odours that are objectionable to humans; and
  - b) the accumulation of micro-organisms, pathogens and toxins that are harmful to humans.
- 3) The shelter must be naturally ventilated during a *strong winds period*.

### Acceptable solution

*Supply air, exhaust air and air movement capacity in shelter space*

## A5.2.0

- 1) A5.2.0 applies for the *shelter space* in a *public cyclone shelter*.

- 2) A *mechanical ventilation system* installed in the shelter must be capable of providing the following for the shelter space, during an *occupancy period* other than during a *strong winds period* -
  - a) for supply air-ventilation rates of at least 10 L/s/m<sup>2</sup> of outside air; and
  - b) for exhaust air-ventilation rates of at least 11 L/s/m<sup>2</sup>.
- 3) Recirculating fans capable of providing air movement that complies with the air movement rates mentioned in table 3, during an *occupancy period*, must be permanently fixed to the walls or a ceiling in the shelter.
- 4) At least 80% of the air movement required under A5.2.0(3) must flow in a downward direction.

**Table 3 - Air movement rates**

Occupied area	Air movement rate
less than 50m <sup>2</sup>	not less than 100 L/s/m <sup>2</sup>
50m <sup>2</sup> up to 100m <sup>2</sup>	not less than 200 L/s/m <sup>2</sup>
100m <sup>2</sup> up to 200m <sup>2</sup>	not less than 300 L/s/m <sup>2</sup>
200m <sup>2</sup> and above	not less than 400 L/s/m <sup>2</sup>

Note -

1. Air movement rate is the sum of all recirculating fan air movements, irrespective of air movement direction, within a space divided by the floor area of that space.
2. Calculated fan air movement rates must take account of losses associated with proximity to adjacent fans and building elements.

#### *Configuration of equipment in mechanical ventilation systems*

##### A5.2.1

- 1) A5.2.1 applies for a *mechanical ventilation system* installed in a *public cyclone shelter*.
- 2) Fans in the *mechanical ventilation system* that are used for supply air, exhaust air or circulation must be configured so failure of any one fan within the *ventilation system* does not result in -
  - a) for an area greater than 150m<sup>2</sup>-a reduction of more than 55% of -
    - I) for supply air-the minimum ventilation rate mentioned in A5.2.0(2)(a); or
    - II) for exhaust air-the minimum ventilation rate mentioned in A5.2.0(2)(b); or
  - b) for an area greater than 500m<sup>2</sup>-a reduction of more than 35% of-
    - I) for supply air-the minimum ventilation rate mentioned in A5.2.0(1)(a); or
    - II) for exhaust air-the minimum ventilation rate mentioned in A5.2.0(1)(b).
- 3) Supply air distribution outlets forming part of the *mechanical ventilation system* must be-
  - a) configured so that 90% of the *floor area* served is not greater than 12m from a supply air outlet measured from the outlet; and
  - b) located no higher than the lower of the following levels -
    - I) 3m above the finished floor level;
    - II) one third of the height of the relevant space; and
  - c) selected and directed to achieve an air speed of not less than 0.25 m/s at the level of the occupants.
- 4) Exhaust air intake locations for the *mechanical ventilation system* must be located at a level that is higher than two thirds of the height of the relevant space.

- 5) A *mechanical ventilation system* used for supply air or exhaust air must-
  - a) include a manual control on the *ventilation control panel* to switch the ventilation system to natural ventilation mode during a strong winds period; and
  - b) isolate fans from the effects of natural air flow during a strong winds period.
- 6) The ductwork and accessories in the *mechanical ventilation system* must comply with schedule 8.

*Natural ventilation devices required for strong winds period*

A5.2.2

- 1) A *public cyclone shelter* must have *natural ventilation devices* located on the external walls of the shelter.
- 2) Each device must -
  - a) be connected to internal parts of the shelter by -
    - I) ductwork that complies with schedule 8; or
    - II) plenums that comply with schedule 8; or
    - III) a combination of the ducts and plenums mentioned in A5.2.2(2)(a)(I) and (II); and
  - b) be capable of being modulated manually; and
  - c) have a manual control that has signage that complies with, schedule 3, part 2; and
  - d) include -
    - I) a two-stage louvre, or a one-stage louvre, mentioned in schedule 8, part 2; and
    - II) controls with signage, mentioned in schedule 8, part 3.
- 3) The ductwork and ductwork plenums mentioned in A5.2.2(2)(a) must include the weather-proofing features mentioned in schedule 8, part 2.
- 4) The total area of the external openings of the natural ventilation devices must comply with table 4.
- 5) A reference in table 4 to -
  - a) an occupant is a reference to one of the *maximum number of occupants* for the shelter; and
  - b) the volume of the *shelter space* is a reference to the floor area of the space multiplied by the average height of the space divided by the number of occupants in the space, where the maximum average height of the space is taken to be 10m; and
  - c) the number of occupants in the accommodation area is a reference to the number of occupants mentioned in A3.2.1(1); and
  - d) the number of occupants in other areas in the *shelter space* is a reference to the number of occupants determined by the room occupancy required under the *BCA*, volume 1, and is at least one person per 2.4m<sup>2</sup> of the floor area; and
  - e) the area of the external openings of a *natural ventilation device* -
    - I) does not include the edge frame and mullions of the device; and
    - II) includes the area of the device determined based on a two-stage louvre having a resistance of -
      - (i) 50Pa at an air volume of 1.5m/s face velocity multiplied by the louvre face area; and
      - (ii) 250 kPa at a face velocity of 3.5m/s.

**Table 4 – Total area of external openings of natural ventilation devices**

Volume of shelter space	Natural ventilation area of external opening
0 - 3m <sup>3</sup> per occupant	Larger of 0.06m <sup>2</sup> per occupant or 3% of the <i>floor area</i> of the <i>shelter space</i>

3m <sup>3</sup> to 12m <sup>3</sup> per occupant	Interpolate linearly
More than 12m <sup>3</sup> per occupant	Larger of 0.04m <sup>2</sup> per occupant or 2% of the <i>floor area</i> of the <i>shelter space</i>

- 6) A *debris screen* used to protect a *natural ventilation device* must have an open area of at least 90% of the face area of the ventilation device.

*Pressure drop of natural ventilation devices during a strong winds period*

A5.2.3

- 1) A5.2.3 applies to a *natural ventilation device* installed in a *public cyclone shelter*.
- 2) If the resistance of the *natural ventilation device* at a face velocity of 1.5 m/s is greater than or less than a pressure difference of 50 Pa the areas of *natural ventilation devices* mentioned in table 4 must be proportionally increased or decreased.
- 3) However, if there is a decrease in pressure of more than 50 Pa in the device, changes to the areas mentioned in table 4 for *natural ventilation devices* must not exceed 50%.

*Configuration of external openings for natural ventilation devices*

A5.2.4

- 1) The external openings of a *natural ventilation device* installed in a *public cyclone shelter* must be -
  - a) located on the external walls of the shelter so that at least 20% of an area mentioned in table 4 is in each of the following ranges of an *azimuthal direction* -
    - I) 0 up to 90 degrees;
    - II) 90 up to 180 degrees;
    - III) 180 up to 270 degrees;
    - IV) 270 up to 360 degrees; and
  - b) resistant to windborne debris as required under A2.0.2.

*Configuration of internal openings for natural ventilation devices*

A5.2.5

- 1) An internal opening for a *natural ventilation device* installed in a *public cyclone shelter* must -
  - a) have -
    - I) a face area that is at least 30% of the area of the device; and
    - II) a free area that is at least 80% of the area of the device; and
    - III) a pressure drop of less than 20 Pa at a face velocity of 2 m/s; and
  - b) be configured -
    - I) so that at least 90% of the internal *floor area* of the shelter served by the *ventilation system* is within 20m of an internal opening; and
    - II) in accordance with table 5; and
    - III) to minimise ventilation short circuiting between internal openings located on adjacent walls, with an internal angle of less than 120 degrees, by having a distance between openings of at least one-sixteenth of the internal wall perimeter of the occupied space.

**Table 5 - Location of internal openings**

Min % of face area required	Required location
30	Below the lower of the following levels- (a) 3m above the finished floor level; (b) halfway between the finished floor level and the ceiling, measured internally.
30	Below 9m above the <i>finished ground surface level</i> ; and above the lower of the following levels- (a) 3m above the finished floor level; (b) halfway between the finished floor level and the ceiling, measured internally.

*Ventilation of amenities areas*

## A5.2.6

- 1) This acceptable solution applies for an *amenities area* in a *public cyclone shelter*.
- 2) The *amenities area* must have one or more mechanical exhaust systems each of which complies with AS 1668.2.
- 3) Each mechanical exhaust system must be configured so that during an *occupancy period*, other than during a *strong winds period*, the system -
  - a) discharges -
    - I) vertically above the roof outside the line of external walls; and
    - II) in an area subject to suction for all wind directions; and
  - b) has fans capable of operating on both -
    - I) mains electricity; and
    - II) electricity produced by a diesel generator.
- 4) The *amenities area* must have *natural ventilation devices* for use during a strong winds period.
- 5) Each exhaust system forming part of a *natural ventilation device* for the *amenities area* must -
  - a) be configured so that during a strong winds period, the amenities area is naturally ventilated by a venturi suction system that -
    - I) complies with schedules 4 and 8; and
    - II) is able to be modulated manually; and
  - b) be configured with a manual control on the *ventilation control panel* to switch the ventilation system to natural ventilation mode during a *strong winds period*; and
  - c) isolate fans from the effects of natural air flow during a *strong winds period*, and
  - d) cause status lights for each exhaust fan in the system to display on the *ventilation control panel*.

*Ventilation of generator areas*

## A5.2.7

- 1) This acceptable solution applies for a *generator area* in a *public cyclone shelter*.
- 2) The *generator area* must have one or more mechanical exhaust systems that comply with AS 1668.2.
- 3) Each mechanical exhaust system must be configured so that during an *occupancy period*, other than during a *strong winds period*, the system -
  - a) discharges -
    - I) vertically above the roof outside the line of external walls; and

- II) in an area subject to suction for all wind directions; and
- b) has fans capable of operating on both -
  - I) mains electricity; and
  - II) electricity produced by a diesel generator.
- 4) The generator area must have natural ventilation devices for use during a strong winds period.
- 5) Each exhaust system forming part of a natural ventilation device for the generator area must -
  - a) be configured with sensors so it automatically stops operating during a strong winds period; and
  - b) isolate fans from the effects of natural air flow during a strong winds period; and
  - c) when the generator is operating-cause status lights for each exhaust fan in the device to display on the ventilation control panel.
- 6) The natural ventilation devices for the generator area must, together, have a minimum ventilation area of at least 0.07m<sup>2</sup> per kVA and be configured so they are located on at least -
  - a) 3 external walls of the area with a minimum azimuth angle separation angle of 90° and each device comprises at least 25% of the minimum area required; or
  - b) 2 external walls of the area with a minimum azimuthal angle separation of 90° and a venturi suction system projecting above the roof in compliance with the following -
 
$$W1 + W2 + 3V \geq A$$

$$W1 \text{ and } W2 \geq 0.25A$$

where-

A = Minimum natural ventilation device area (m<sup>2</sup>)

W1 and W2 = Natural ventilation device area on each wall (m<sup>2</sup>)

V = Free area of the venturi suction system (m<sup>2</sup>)
- 7) The venturi suction system mentioned in A5.2.7(6)(b) must comply with schedules 4 and 8.

#### *Ventilation of battery areas*

##### A5.2.8

- 1) This acceptable solution applies for a battery area in a public cyclone shelter.
- 2) The battery area must have a mechanical exhaust system that complies with AS 2676.2.
- 3) The mechanical exhaust system must be configured so that during an occupancy period, other than during a strong winds period, the system -
  - a) discharges -
    - I) vertically above the roof outside the line of external walls; and
    - II) in an area subject to suction for all wind directions; and
  - b) has fans capable of operating on both -
    - I) mains electricity; and
    - II) electricity produced by a diesel generator.
- 4) The battery area must have natural ventilation devices for use during a strong winds period.
- 5) Each exhaust system forming part of a natural ventilation device for the battery area must -
  - a) be configured with a manual control on the ventilation control panel to switch the ventilation system to natural ventilation mode during a strong winds period; and
  - b) isolate fans from the effects of natural air flow during that period; and
  - c) cause status lights for each exhaust fan in the system to display on the ventilation control panel.

- 6) The battery area must have a venturi suction system that complies with schedules 4 and 8, for use during a strong winds period.

## 6 Lighting

### Artificial lighting

#### Performance criteria

##### P6.0

- 1) A public cyclone shelter is designed and constructed with a level of illuminance that -
  - a) is appropriate to the function of the shelter; and
  - b) helps ensure occupants can move to, from and within the shelter safely.

#### Acceptable solution

##### *Power sources for internal and external lighting*

##### A6.0.0

- 1) Artificial lighting for the internal and external parts of a public cyclone shelter must be connected to -
  - a) mains electricity; and
  - b) the diesel generator mentioned in A7.2.0.

##### *Internal lighting*

##### A6.0.1

- 1) The artificial lighting for the internal parts of a public cyclone shelter must provide a minimum of -
  - a) 400 lux for a space to be used for any of the following purposes -
    - I) the provision of first aid;
    - II) food preparation and cooking;
    - III) administrative activities for the operation of the shelter; and
  - b) 160 lux for each other area in the shelter, including each amenities area.
- 2) The artificial lighting in the accommodation area must be dimmable from the illuminance mentioned in A6.0.1(1)(b) to a minimum level of 10 lux.

##### *External lighting*

##### A6.0.2

- 1) External lighting for a public cyclone shelter must be provided for -
  - a) any pathway between the shelter's primary entry point and the passenger set-down area; and
  - b) the primary entry point; and
  - c) any other entry point for the shelter used during a strong winds period.
- 2) External lighting for the shelter must be visible from the passenger set-down area.
- 3) External lighting for any pathway between the primary entry point and the passenger set-down area must comply with the requirements in AS/NZS 1158.3.1, Table 2.2 for category 'PP'.
- 4) External lighting for the primary entry point and any other entry point for the shelter must comply with the requirements in AS/NZS 1158.3.1, Table 2.3 for category 'PA'.

### *Emergency lighting*

## **Performance criteria**

### P6.1

- 1) To facilitate proper management of an emergency, a public cyclone shelter must have an emergency lighting system that -
  - a) ensures a level of visibility sufficient to enable exits, paths of travel to exits and any obstacles along a path of travel to an exit to be identified; and
  - b) activates instantaneously upon failure of an artificial lighting system.

## **Acceptable solution**

### A6.1.0

- 1) A public cyclone shelter must have emergency lighting for the internal parts of the shelter.
- 2) The emergency lighting must -
  - a) comply with -
    - I) the requirements of BCA, volume 1; and
    - II) AS/NZS 2293.1 and AS/NZS 2293.3, except as varied by A6.1.0 (2)(b); and
  - b) provide a minimum of -
    - I) 15 lux in each space to be used for any of the following purposes -
      - (i) the provision of first aid; and
      - (ii) food preparation and cooking; and
      - (iii) administrative activities for the operation of the shelter; and
    - II) 1 lux to all other areas; and
  - c) in the accommodation area-be dimmable to 1 lux if illumination greater than 1 lux is provided; and
  - d) be connected to a central, 24-hour battery operated backup system that complies with schedule 6.
- 3) The battery system mentioned in A6.1.0(2)(c) must not be shared with any UPS.

## **7 Electrical services and equipment**

### **Power distribution**

## **Performance criteria**

### P7.0

- 1) A public cyclone shelter must -
  - a) be designed and constructed with electrical services and equipment that, during a strong winds period -
    - I) are accessible; and
    - II) provide adequate electrical power for minimum operational and emergency services; and
  - b) have documented management procedures that will ensure the risk of a fire occurring in the shelter is minimised.

## **Acceptable solution**

### A7.0.0

- 1) A public cyclone shelter must have electrical distribution switchboards that are -

- a) located inside the shelter; and
  - b) accessible without having to leave the internal parts of the shelter.
- 2) The shelter must have an operational management procedures plan that states procedures for restricting the use of electrical socket outlets in the shelter, during a strong winds period, to ensure that, during that period -
- a) adequate electrical power is available for minimum operational and emergency services; and
  - b) the risk of a fire occurring in the shelter is controlled; and
  - c) sockets in the accommodation area may be used to charge mobile phones.
- 3) All electrical socket outlets in the shelter that are connected to the generator emergency power for the shelter must be identified by the colour of the outlet.
- 4) All external wiring for the shelter must be contained within conduits and secured to resist wind pressures.

## Lightning protection

### Performance criteria

#### P7.1

- 1) A public cyclone shelter must have a means of protecting occupants and electrical equipment from the effects of lightning.

### Acceptable solution

#### A7.1.0

- 1) A public cyclone shelter must comply with the requirements of AS/NZS 1768 for -
  - a) lightning protection risk assessment; and
  - b) protection measures to limit the risk of a lightning strike affecting occupants or electrical equipment.

## Emergency power

### Performance criteria

#### P7.2

- 1) A public cyclone shelter must have -
  - a) alternative sources of electricity supply that are sufficient to support the operation of the shelter during an occupancy period; and
  - b) management procedures for ensuring the alternative sources of electricity supply are operational during an occupancy period.

### Acceptable solution

#### A7.2.0

- 1) A public cyclone shelter must have -
  - a) mains electricity; and
  - b) a diesel generator that complies with schedule 5; and
  - c) a central, 24-hour battery operated system that complies with schedule 6; and

- d) a UPS that complies with schedule 6; and
- e) a maintenance management procedures plan and an operational management procedures plan, each of which states procedures for ensuring the alternative sources of electricity supply mentioned in A7.2.0(b) to (d) are operational during an occupancy period.

## 8 Water supply

### Performance criteria

#### P8.0

- 1) A public cyclone shelter must have a suitable and reliable water supply that -
  - a) is not disrupted by wind, flooding, erosion, landslips, trees or loss of power; and
  - b) is capable of supplying -
    - I) water for drinking, personal hygiene and food preparation that is suitable for human consumption; and
    - II) water for flushing toilets and firefighting; and
    - III) water for use in the event of a mains or generator power failure.
- 2) The shelter must have documented management procedures for restricting the use of water in the shelter, during an occupancy period, to ensure there is sufficient water for the requirements mentioned in P8.0(1)(b) during that period.

### Acceptable solution

#### *Stored water supply*

#### A8.0.0

- 1) A public cyclone shelter must have one or more water tanks suitable for storing water that, in combination -
  - a) are capable of holding the volume of drinking and non-drinking water mentioned in table 6 for each of the maximum number of occupants for the shelter; and
  - b) provide storage for at least 5,000 litres of non-drinking water.
- 2) The water tanks must -
  - a) be located to allow water stored in the tanks to gravity flow to drinking fountains, sinks or toilets in the event of a failure of the diesel generator mentioned in A7.2.0; and
  - b) be capable of being filled with water from the water service provider's water service, within a period of 6 hours; and
  - c) be fitted with pumps that -
    - I) provide pressure required for delivering water; and
    - II) are connected to -
      - (i) mains electricity; and
      - (ii) the diesel generator; and
  - d) be fitted with bypass valves installed to allow the stored water to gravity flow to drinking fountains, sinks or toilets in the event of a failure of the diesel generator.
- 3) The water-level gauges for any water tanks located inside the shelter must be visible from a single place within the shelter.
- 4) The water-level gauges for any water tanks located outside the shelter must be visible from a single place within the shelter.

- 5) Each water tank that stores drinking water for the shelter must be connected in a manner that ensures drinking water from the tank can be used in the shelter for drinking, hand hygiene, showering, preparing food and washing kitchen facilities during an occupancy period.
- 6) Each water tank that stores non-drinking water for the shelter -
  - a) must -
    - I) be connected in a manner that ensures non-drinking water can be used for toilet flushing or firefighting; and
    - II) if located outside the shelter-be capable of resisting the magnitude of wind actions mentioned in A2.0.0 without rupturing or the function of the tanks, valves or pipework being lost; and
  - b) may be supplemented by rainwater that –
    - I) falls on an area of the shelter’s roof that is -
      - (i) at least 0.25m<sup>2</sup> multiplied by the maximum number of occupants; and
      - (ii) not less than 100m<sup>2</sup>; and
    - II) is transported to the tanks via at least 2 downpipes, each collecting rainwater from at least 40% of the roof area mentioned.
- 7) If a water tank is to supply non-drinking water by gravity flow to toilets in an amenities area in the shelter-
  - a) a low-pressure inlet valve must be fitted to each of the toilets; and
  - b) if the gravity flow head from the tank is less than the minimum operating head of the inlet valve for the toilets-a lockable tap must be located 0.6m above the floor in the amenities area to enable toilet flushing with buckets of water.

### *Water conservation*

#### A8.0.1

- 1) Each tap in a public cyclone shelter must be operated by a lever and fitted with a water saving auto-closure mechanism.
- 2) The shelter must have -
  - a) drinking fountains fitted with dual drinking and water bottle filling functions; and
  - b) valves to isolate leaking toilets, taps and drinking fountains; and
  - c) an operational management procedures plan that states procedures for restricting water use in the shelter during an occupancy period which require the shelter management team to do the following during the occupancy period -
    - I) supervise water use via the facilities mentioned in table 6; and
    - II) restrict the use of the shower in the accessible unisex sanitary compartment to any individuals who are soiled as a result of urinal or bowel incontinence; and
    - III) ensure taps and toilets are not leaking.

**Table 6 - Requirements for water tank storage**

Facility	Water	Stored tank water volume litres per occupant
Toilet	Non-drinking	25
Wash basin	Drinking	15
Drinking and kitchen fixtures		10
Total amount	Non-drinking	25
	Drinking	25

Note-

During periods of normal use of a building that may be used as a public cyclone shelter, it is not necessary for the water storage tanks for the shelter to be at full capacity, or to service the facilities mentioned in the table, provided that the tanks are able to be readily filled and deployed during an occupancy period.

## 9 Ancillary provisions

### Kitchen

#### Performance criteria

##### P9.0

- 1) A public cyclone shelter must have suitable spaces, fittings and fixtures for -
  - a) storing food and medication; and
  - b) preparing and serving basic food.

#### Acceptable solution

##### A9.0.0

- 1) A public cyclone shelter must have a kitchen for -
  - a) storing food and medication; and
  - b) preparing and serving basic food.
- 2) The kitchen must -
  - a) be located -
    - I) adjacent to an entry point for the shelter; and
    - II) where it is accessible from the foyer or other circulation space; and
  - b) have a minimum floor area that is the greater of the following -
    - III) 1.5m<sup>2</sup> per 100 persons;
    - IV) 13m<sup>2</sup>; and
  - c) have the following -
    - I) a hand wash basin with automatic controls no more than 5m from any part of a bench used for the preparation of food;
    - II) a commercial refrigerator with a volume of 500 litres for each group of 400 occupants or part thereof;
    - III) a domestic electric rangehood;
    - IV) a microwave for each group of 800 occupants or part thereof;
    - V) a boiling/chilled water unit;
    - VI) mains power outlets connected to the diesel generator mentioned in A7.2.0 for the equipment mentioned in A9.0.0(2)(d);

- VII) an additional double power outlet for each group of 1,000 occupants or part thereof;
- VIII) stainless-steel benches for use for preparing and serving food.

- 3) The length of the benches that are to be used for preparing food must be -
  - a) if the maximum number of occupants for the shelter is not more 400- at least 2.4m; or
  - b) otherwise-2.4m plus an additional 0.6m for each additional group of 400 people.
- 4) The length of the benches that are to be used for serving food must be -
  - a) if the maximum number of occupants for the shelter is not more 400- at least 2.1m; or
  - b) otherwise-2.1m plus an additional 0.3m for each additional group of 400 people.

## Office area

### Performance criteria

#### P9.1

- 1) A public cyclone shelter must have a suitable space and power sources for the administrative and external communication functions required to be carried out during an occupancy period.

### Acceptable solution

#### A9.1.0

- 1) A space, in a public cyclone shelter, that is to be used as an office must -
  - a) be located -
    - I) adjacent to the shelter's primary entry point and the accommodation area; and
    - II) so there is a line of sight to the majority of the floor area of the accommodation area from the entrance of the office; and
  - b) have a minimum floor area of 10m<sup>2</sup>; and
  - c) have a minimum of 4, 10 amps, electrical socket outlets connected to each of the following sources of power -
    - I) mains electricity;
    - II) the diesel generator mentioned in A7.2.0;
    - III) the UPS mentioned in A7.2.0; and
  - d) have, for external communication -
    - I) an underground cable-based system that is -
      - (i) independent of any other communications system on the site; and
      - (ii) capable of functioning for 24 hours after a mains power failure; and
    - II) a radio system that is -
      - (i) connected to an aerial mounted on an external wall facing the receiver; and
      - (ii) approved by the LDMG.

## Emergency first aid area

### Performance criteria

#### P9.2

- 1) A public cyclone shelter must have a first aid area that has -
  - a) the space required -

- I) for carrying out first aid activities; and
  - II) to store items used for those activities; and
- b) power sources required for first aid activities.

## Acceptable solution

### A9.2.0

- 1) A public cyclone shelter must have a first aid area that has -
  - a) a minimum floor area of 12m<sup>2</sup>; and
  - b) a minimum of 2, 10 amps, electrical socket outlets connected to each of the following sources of power -
    - I) mains electricity;
    - II) the diesel generator mentioned in A7.2.0;
    - III) the UPS mentioned in A7.2.0; and
  - c) sufficient storage space for first aid medical supplies.

## Chair storage

### Performance criteria

#### P9.3

- 1) A public cyclone shelter must have suitable space in which to store chairs for use during an occupancy period.

### Acceptable solution

#### A9.3.0

- 1) A public cyclone shelter must have one or more rooms in which chairs, other than fixed seats, to be used during an occupancy period, may be stored.
- 2) The area for storing the chairs must -
  - a) have a floor area sufficient to store chairs for the maximum number of occupants for the shelter, less the number of fixed seats in the accommodation area; and
  - b) have a minimum floor area of at least 0.6m x 0.6m for each stack of 12 stored chairs; and
  - c) be accessible from the accommodation area; and
  - d) from part of the accommodation area of the shelter; and
  - e) have -
    - I) ventilation of the type mentioned in P5.1 and P5.2; and
    - II) lighting of the type mentioned in P6.0 and P6.1.
- 3) All of the chairs stored must comply with the fire hazard properties mentioned in A4.0.2(3).

## Storage of waste

### Performance criteria

#### P9.4

- 1) A public cyclone shelter must have a suitable space for storing waste during an occupancy period.

## Acceptable solution

### A9.4.0

- 1) A public cyclone shelter must have a room that may be used for storing waste during an occupancy period.
- 2) The room must -
  - a) have a minimum area of 4m<sup>2</sup>; and
  - b) be separated from the shelter space by construction having a minimum FRL of -/120/30 to the walls, roof and floor; and
  - c) be ventilated as mentioned in A5.2.6.
- 3) Any doorway in the construction mentioned in A9.4.0(2)(b) must be -
  - a) protected with a self-closing fire door having an FRL of 120/120/120; and
  - b) accessible from the accommodation area.

## Sanitary facilities

### Performance criteria

#### P9.5

- 1) A public cyclone shelter must have an amenities area with suitable sanitary facilities for the maximum number of occupants for the shelter.

## Acceptable solution

### A9.5.0

- 1) A public cyclone shelter must -
  - a) have the types of sanitary facilities stated in column 1 of table 7; and
  - b) have the minimum number of those sanitary facilities stated in column 2 of the table; and
  - c) comply with the requirements mentioned in A9.5.0(2) and (4).

**Table 7 - Requirements for sanitary facilities**

Facility type	Minimum number of facilities
Toilets	1 for each group of 50 occupants or part thereof included in the maximum number of occupants
Washbasins	1 per 100 of the maximum number of occupants
Drinking fountains incorporating a water bottle filling station	1 per 200 of the maximum number of occupants
Accessible unisex sanitary compartment with shower	At least 1

- 2) If the toilet facilities mentioned in table 7 are segregated, equal numbers of male and female facilities must be provided.
- 3) Up to 50% of the male toilets mentioned in table 7 may be substituted with urinals.
- 4) The accessible unisex sanitary compartment mentioned in table 7 must comply with the BCA, volume 1.
- 5) For the avoidance of doubt, if the normal use of a building that may be used as a public cyclone shelter requires the provision of more sanitary facilities than the number stated in table 7, the requirement for a higher number of facilities takes precedence over the requirement for the number of facilities stated in table 7.

- 6) Each shower located within the shelter space that is additional to that mentioned in table 7 must be lockable.

Note -

This QDC part does not include a requirement for the provision of showers in a public cyclone shelter, apart from the one for the accessible unisex sanitary compartment mentioned in table 7. This is the case because it is necessary to conserve drinking water, held in the shelter, during an occupancy period. It is expected that the shelter management team will regulate the use of the shower in the accessible unisex sanitary compartment to ensure water is conserved to the extent appropriate. The shelter's operational management procedures plan is required to state procedures for locking any additional showers that are in the shelter for an occupancy period.

## Wastewater

### Performance criteria

P9.6

- 1) A public cyclone shelter must be designed and constructed to facilitate the disposal of wastewater during an occupancy period in a manner that does not adversely affect public health and safety, including the health and safety of occupants of the shelter.

### Acceptable solution

A9.6.0

- 1) A public cyclone shelter must facilitate the disposal of sewage into a sewerage system by -
  - a) a sanitary drain providing for gravity flow installed on the shelter site; or
  - b) if a pump station is installed on the shelter site under a permit issued by the local government under the Plumbing and Drainage Act 2018-use of the pump station.
- 2) If the connection between the shelter and the sewerage system is by means of a pump station-
  - a) in addition to a duty pump, the pump station must include a stand-by pump that is set to operate automatically if the duty pump fails; and
  - b) the duty pump and stand-by pump must be connected to-
    - I) the mains power; and
    - II) the diesel generator mentioned in A7.2.0; and
  - c) the control panel enclosure for the pump station must be capable of resisting the magnitude of wind actions mentioned in A2.0.0(1).
- 3) If a pump station is installed on the shelter site as mentioned in A9.6.0(1)(b), the public cyclone shelter must have a sewerage overflow abatement plan that complies with the Plumbing Code of Australia and AS/NZS 350.2.

## Schedule 1 – Simulated windborne debris impact testing

A2.0.1 and A2.0.2

### 1. Test equipment and accuracy

- 1) The impact speed of a test debris missile must be measured to an accuracy of plus or minus 0.5m/s.
- 2) The maximum displacement of the test specimen at any stage of the test must be measured to an accuracy of  $\pm 2$ mm.
- 3) The test specimen must be supported by the test frame in a manner that replicates the intended method of support provided by the building, including through the use of restraint fixings.
- 4) The maximum displacement of the frame for the test specimen at the point where it connects to the test specimen must be 5mm at any stage of the test.
- 5) The frame for the test specimen must be assessed by impacting the test frame, at the point where it connects to the test specimen, with the debris impact load A.
- 6) If the test specimen includes a garage door (eg a roller door), testing must be conducted in accordance with schedule 4 of AS/NZS 4505 and this schedule.

### 2. Test specifications - simulated windborne debris test impacts

*Debris impact load A:*

- 1) *Debris impact load A*, for a *public cyclone shelter*, is the load simulated using a *timber test member* that is 4kg in mass and at least 600kg/m<sup>3</sup> in density, with a nominal cross-section of 100mm x 50mm, impacting end on at-
  - a) 0.4VR normal to wall surfaces; and
  - b) 0.4 VR x sine of the roof slope, normal to roof surfaces greater than 15° pitch; and
  - c) 0.1VR normal to roof surfaces less than, or equal to, 15° pitch;

where *VR* is the regional wind speed, for the region where the shelter is located, determined in accordance with clause 3.2 of AS/NZS 1170.2, table 3.1(A), for V10000.

- 2) For section 2(1) of this schedule-

***timber test member*** see section 4.3 of James Cook University's Cyclone Testing Station Technical Note No. 4 entitled *Simulated Windborne Debris Impact Testing of Building Envelope Components*.

### Test sequence

- 1) A test specimen comprised of cladding or a *debris screen* must be subject to successive impact loads applied in the following order-
  - a) *debris impact load A*;
  - b) *debris impact load B*.
- 2) *Debris impact load A* must impact the most critical locations of the test specimen, as determined by the testing authority.
- 3) *Debris impact load B* must successively impact at various random locations of the test specimen.
- 4) A test specimen is exempt from the requirement for testing against debris impact load B if the specimen is-
  - a) a uniform sheet of cladding without perforations or additional layers; or
  - b) a debris screen to be used for protecting elements that are capable of resisting debris impact load B.

### 4. Acceptance criteria

- 1) A test specimen must-
  - a) prevent the following loads from penetrating through the test specimen-
    - I) debris impact load A; and
    - II) if section 3(4)(b) does not apply-debris impact load B; and
  - b) if it is a debris screen protecting glazing-when hit by debris impact load A, not deflect more than 0.8 times the clear distance between the screen and the glazing at any stage of the test; and
  - c) if it is a debris screen protecting an element other than glazing- when hit by debris impact load A, not deflect more than the clear distance between the screen and the element at any stage of the test; and
  - d) if it is laminated glass-when hit by debris impact load A and debris impact load B, have no spalling of glass from the internal lamination; and
  - e) if it is a door that is a required exit-when hit by debris impact load A and debris impact load B, remain operable.

## 5. Test Report

- 1) A test report for one or more test specimens must state-
  - a) the name of the accredited testing laboratory and details of its accreditation for the testing; and
  - b) the date and location of the test; and
  - c) name of the testing officer; and
  - d) the test specifications and test sequence; and
  - e) the acceptance criteria; and
  - f) a description of the following-
    - I) each test specimen, including any fixings and support;
    - II) the test apparatus, including the test frame displacement, speed measurement accuracy and displacement measurement accuracy of the apparatus;
    - III) the test procedure;
    - IV) the test results, including the following-
      - (i) for each test-the location of impact, impact velocity, maximum displacement at any stage of the test, magnitude of permanent displacement, and observations of the specimen and its fixings;
      - (ii) for each test specimen-a pass or fail statement; and
  - g) any other relevant information.

## Schedule 2 – Simulated wind pressure testing

A2.0.1 and A2.0.2

### 1. Test equipment and set-up

- 1) This section states the testing requirements for simulating the combined effect of-
  - a) suction pressure on the external surface of cladding or other elements of the external envelope of a public cyclone shelter; and
  - b) positive pressure on the internal surface of cladding or other elements of the external envelope applied as a combined pressure on the inside surface.
- 2) The cladding or other elements must be tested in an open top pressure chamber known as an airbox test rig of a type mentioned in AS 4040.3-2018.

### 2. Test specification

- 1) The test for cladding systems is as set out in AS 4040.0 and AS 4040.3.
- 2) Windows and doors of the external envelope of a public cyclone shelter must be tested for outward and inward loading as mentioned in AS 4420.1-2016 with the loads and cycles of load as set out in AS 4040.3.
- 3) Other elements of the external envelope must be tested for outward and inward loading with the loads and cycles of load as set out in AS 4040.3.

### 3. Acceptance criteria

- 1) A cladding test specimen must sustain the test load without-
  - a) any rupture; or
  - b) failure of the connections between the cladding and the part of the supporting structure that supports the cladding.
- 2) An external door for a public cyclone shelter must sustain the test load without-
  - a) rupture of the door; or
  - b) failure of the connection between the door frame and the part of the supporting structure that supports the door; or
  - c) failure of the door hinges, and any lock, latch or exit device attached to the door.
- 3) The door must not open under the test load.
- 4) If the door is a door to a required exit for a public cyclone shelter-the door must be operable on completion of the test.
- 5) A window that includes a frame, hinges and latches must sustain the test load without-
  - a) spalling of glass from glass rupture; or
  - b) failure of the connection of between the window frame and-
    - I) the part of the supporting structure that supports the window; or
    - II) the hinges; or
    - III) the latches.
- 6) Each other element of the external envelope of a public cyclone shelter must sustain the test load without-
  - a) rupture; or
  - b) failure of connection between the element and the part of the supporting structure that supports the element.

#### 4. Test Report

- 7) A test report for one or more test specimens must state-
- a) the date and location of test; and
  - b) the name of the accredited testing laboratory and details of its accreditation for the testing; and
  - c) the name of the testing officer; and
  - d) a description of the following-
    - I) the test set-up;
    - II) the test specimen, including cladding, fixings and the structure supporting the cladding;
    - III) the loading sequence;
    - IV) the behaviour of the specimen, including fastenings, during testing;
    - V) for each test specimen-a pass or fail statement; and
  - e) any other relevant information.

## Schedule 3 – Standardised site and building signage

A3.0.0 and A5.2.2

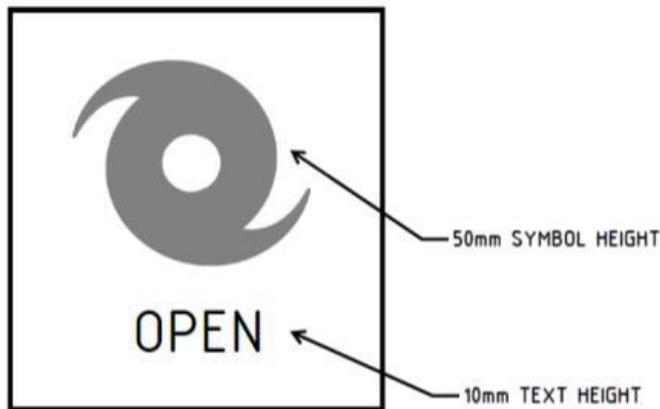
### 1. Directional signage

Directional signage for a public cyclone shelter must comply with the specifications for standardised cyclone shelter signs set out by the Department of Transport and Main Roads in its technical publications, TC series - service signs, drawings TC1974\_1 to TC1974\_6 available at: <https://www.tmr.qld.gov.au>



Note-  
Images of standardised cyclone shelter signs are as follows-

### 2. Signage for manual control for each natural ventilation device



## Schedule 4 – Specifications for ventilation provided by venturi suction systems

A5.2.6, A5.2.7 and A5.2.8

### 1. Venturi suction system

- 1) A venturi suction system, for a public cyclone shelter-
  - a) must incorporate-
    - I) one or more vertical circular exhaust stacks, which-
      - (i) are open at the top; and
      - (ii) are located outside the shelter's external walls; and
      - (iii) drain at the base; and
    - II) main and branch ductwork and ceiling grilles; and
  - b) may share components of the shelter's mechanical exhaust system.
- 2) The size of the system must be determined based on a friction loss of no greater than 0.6 Pa/m utilising the air flow rates that would otherwise be applicable for a mechanical exhaust system provided in accordance with AS 1668.2.
- 3) The external exhaust pressure of the system must be determined in accordance with AS/NZS1170.2, excluding local pressure factors for the mean 10-minute wind speeds defined in schedule 7, clause 5(3) of this QDC part.
- 4) One or more backdraft dampers must be incorporated within the ductwork to prevent the migration of odours from one part of the shelter area to other parts of the shelter area as a result of internal building pressure.
- 5) Ductwork and associated fixings located outside the shelter must be capable of resisting the magnitude of wind actions for the shelter mentioned in A2.0.0(1)(a) and (c), including local pressure factors mentioned in AS/NZS1170.2.
- 6) The top of the ductwork must be located in a region of the roof that is subject to negative pressure from all wind directions.
- 7) The projection of ductwork above the roof level must be minimised to reduce the magnitude of wind pressures mentioned in A2.0.0(1)(a) and (c), including local pressure factors mentioned in AS/NZS1170.2, on the ductwork and fixings, and the potential for impact by wind borne debris.
- 8) The ductwork must be rated to an internal pressure of at least -2,500 Pa.
- 9) The ductwork and fixings must be capable of resisting the magnitude of wind actions mentioned in A2.0.0(1)(a) and (c).

## Schedule 5 – Specifications for diesel generators

### A7.2.0 and A8.0.1

- 1) The generator for a public cyclone shelter must be capable of providing power for the following aspects of the shelter for a continuous period of 24 hours-
  - a) the internal lighting required to achieve the minimum lux levels mentioned in A6.0.1(a) and (b);
  - b) all emergency lighting, including exit lighting;
  - c) all external lighting;
  - d) the UPS mentioned in A7.2.0;
  - e) the emergency lighting central battery system;
  - f) all ceiling and wall fans;
  - g) all supply air and exhaust air systems;
  - h) all circulation fans;
  - i) all water supply pumps;
  - j) all fire and life safety systems (including fire indicator panel and emergency evacuation panel);
  - k) all kitchen equipment (including any fridges, stoves, ranges and hot water boilers);
  - l) all roller shutter motors;
  - m) all of the general-purpose electrical socket outlets in the shelter's-
    - I) first aid area; and
    - II) office area; and
    - III) kitchen; and
    - IV) accommodation area.
- 2) The generator must have adequate fuel storage for 24-hour continuous operation at full load.
- 3) Fuel for the generator must be stored in one or more steel tanks and have integral secondary containment and fuel shut off systems.
- 4) The generator must have a fuel polishing system for maintaining the fuel life of fuel stored for long periods.
- 5) The generator must be-
  - a) designed to start upon sensing a power failure; and
  - b) provided with an automatic transfer switch that automatically-
    - I) transfers power produced by the generator to the services mentioned in subsection (2) of this schedule, in the event of mains power failure, within 30 seconds after the power failure occurs; and
    - II) switches the power produced by the generator off as soon as mains power has been restored.
- 6) A sign must be fixed in the generator area identifying the generator's automatic transfer switch.
- 7) Exhaust from the diesel engine in the generator must be-
  - a) piped to the external environment; and
  - b) discharged at roof level without projecting above the roof level; and
  - c) discharged at least 6m from any-
    - I) natural ventilation device for the shelter; or
    - II) outside air intake vent for the shelter.
- 8) The generator must be located in a generator area in the shelter.
- 9) The generator must have the following controls and gauges-
  - a) a key-operated local engine start/stop control;

- b) controls for auto/off/manual/load testing;
- c) an emergency manual shutdown control;
- d) a speed indicator;
- e) a kW meter;
- f) a frequency meter;
- g) an ammeter;
- h) a kVAR meter;
- i) a power factor meter;
- j) an hours-run meter;
- k) an oil pressure indicator;
- l) a coolant temperature indicator.

Notes-

1. A generator for the building should be switched off except when the building is used as a public cyclone shelter.
2. The shelter is required to have an operational management procedures plan that includes procedures for ensuring the diesel generator fuel tank is full and is switched on to automatic mode shortly before the commencement of the occupancy period for a cyclone.
3. Fuel must be stored in compliance with AS 1940 and AS 1692 under applicable work health and safety legislation and guidelines.

## Schedule 6 – Battery systems for emergency lighting and UPS

A6.1.0 and A7.2.0

### 1. Battery system for emergency lighting

- 1) A central, 24-hour battery operated system for a public cyclone shelter must, in the event of failure of the diesel generator mentioned in A7.2.0, be capable of providing power for the emergency lighting for the shelter for a period of up to 24 hours.

### 2. Uninterrupted power supply (UPS)

- 1) A UPS for a public cyclone shelter must, in the event of a failure of the diesel generator mentioned in A7.2.0, be capable of providing power, for a period of up to 24 hours, to electrical socket outlets located in spaces in the shelter to be used for the following-
  - a) the provision of first aid;
  - b) using a UHF radio;
  - c) charging the following-
    - I) a mobile phone;
    - II) a satellite phone;
    - III) a UHF hand held radio;
    - IV) a laptop computer.

Note-

The devices connected to the electrical socket outlets should be low wattage to conserve the UPS.

(2) The UPS must incorporate batteries that are designed with the following features-

- (a) ageing factor is 1.25;
- (b) design margin is 1.1.

### 3 Battery systems

(1) The emergency lighting and UPS must be powered by separate battery systems.

(2) The battery systems must have a working life sufficient to maintain 80% of its rated capacity for up to 10 years.

Note-

Although a central 24-hour battery operated backup system for emergency lighting is separate from a UPS, the 2 systems may be co-located in the same fire-isolated room.

## Schedule 7 – Dynamic thermal simulation and CFD simulation assessment

### A5.1.0

#### 1. Dynamic thermal simulation

- 1) The carbon dioxide concentration and indoor air temperature of a public cyclone shelter must be assessed using-
  - a) Integrated Environmental Solutions Virtual Environment (IES VE); or
  - b) Thermal Analysis Software (TAS).
- 2) The shelter must be modelled to full scale for the purposes of the assessment.

#### 2. Computational fluid dynamic simulation

- 1) Computational fluid dynamic (CFD) simulation must be carried out for a public cyclone shelter to ascertain the internal air velocities of the shelter for the purpose of informing the calculation of the Predicted Mean Vote for determining the thermal comfort of the shelter.
- 2) The CFD simulation must be carried out using PHOENICS or a similar type of software that simulates processes involving fluid flow, heat or mass transfer, chemical reaction and combustion in engineering equipment and the environment.

#### 3. Dynamic thermal simulation zone size

- 1) Vertical zoning up to 2.1m above the finished floor level for a public cyclone shelter must be set to-
  - a) 0–0.75m above the finished floor level; and
  - b) 0.75–2.1m above the finished floor level.
- 2) Vertical zoning higher than 2.1m above the finished floor level must be set to zone heights not greater than 2m.
- 3) Horizontal zoning for the shelter must not be greater than 10m<sup>2</sup>.
- 4) Ancillary areas of the shelter (e.g. first aid area, chair storeroom) with a floor area of less than 15m<sup>2</sup> may be treated as one horizontal zone.

#### 4. Dynamic thermal simulation inputs

- 1) The building form of a public cyclone shelter must be as shown on the approved architectural documentation for the shelter.
- 2) A reference in this schedule to an occupant is a reference to one of the maximum number of occupants for the shelter.
- 3) The occupant heat load for the shelter must be calculated based on-
  - a) 50 watts sensible heat per occupant; and
  - b) 80 watts latent heat per occupant.
- 4) Each occupant must be represented as a cylindrical or cube shape that has a maximum height of 1.5m, within each horizontal zone.
- 5) A maximum of 10 occupants may be grouped together, for each horizontal zone, for simulation simplicity.
- 6) Occupant CO<sub>2</sub> output for the shelter is taken to be 0.525 g CO<sub>2</sub>/minute per occupant.
- 7) The lighting load for the shelter must be calculated based on the electrical services documentation assuming mains electricity, or electricity produced by a diesel generator, is available.
- 8) The simulation period, for a cyclone, must be a total of 30 hours, including-

- a) a period of 12 hours ending immediately before the strong winds period starts; and
  - b) a simulation strong winds period of 18 hours.
- 9) Occupancy is taken to increase linearly for the first 8 hours of the simulation period and then be maintained at the maximum number of occupants for the shelter for the duration of the strong winds period.
- 10) External wind pressures must be determined in accordance with AS/NZS 1170.2, excluding local pressure factors for the mean 10-minute wind speed.
- 11) The ambient temperature and wind during the simulation period must be as defined in section 5 for the ventilation design cyclone climate.
- 12) The simulation must be based on-
- a) all natural ventilation devices being 100% open for the simulation period; and
  - b) all doors being closed for the simulation period, except the primary entry point for the shelter which is open for the first 12 hours of the simulation period; and
  - c) all windows being fully open until 6 hours before the strong winds period starts; and
  - d) all windows being closed for 6 hours before the strong winds period starts and during the strong winds period; and
  - e) only natural ventilation being provided during the strong winds period.

#### **5. Ventilation design cyclone climate**

- 1) This section defines the ventilation design cyclone climate for a public cyclone shelter.
- 2) The design ambient temperature for the pre-lockdown period and the strong winds period must be in accordance with the Australian Institute of Refrigeration, Air-conditioning and Heating's (AIRAH) DA09 – Air-conditioning Load Estimation for the comfort conditions in degrees Celsius for the location geographically closest to the public cyclone shelter site, less 3 degrees Celsius.
- 3) The mean 10-minute wind speed must-
  - a) at the start of the simulation pre-lockdown period (which is taken to end 12 hours after it starts) -be 10 km/hr; and
  - b) increase linearly to a mean speed of 70 km/hr and be maintained at this speed during the simulation of the strong winds period (which is taken to end 18 hours after it starts).

## Schedule 8 – Ductwork for ventilation

A5.2.1 and A5.2.2

### Part 1 Connectivity

#### 1. Connectivity of ductwork for natural ventilation devices

- 1) Ductwork forming part of a natural ventilation device that connects external openings for the device to internal openings for the device, in a public cyclone shelter (the relevant ductwork), must have an internal cross-sectional area that is at least the size determined by the use of the following formula-

$$AD \geq 0.25 ANVD \sqrt{KT}$$

Where-

AD = area of ductwork connecting the external openings for the device to the internal openings for the device (m<sup>2</sup>)

ANVD = area of device (m<sup>2</sup>)

KT = the aggregate loss co-efficient of proposed ductwork fittings (bends, transitions, offsets, plenums, expansions, contraction) connecting the external openings for the device to the internal openings for the device, determined by using the Reynolds number correction value of 1.0.

- 2) The minimum internal cross-sectional area of the relevant ductwork must be at least 20% of the size of the device.
- 3) The length of the relevant ductwork must not be more than 20m.
- 4) The use of turning vanes in the relevant ductwork is not permitted.
- 5) Each of the internal openings forming part of the device must have a face area determined by-

$$AIO \geq 0.5 ANVD \sqrt{P20}$$

Where-

AIO = area of internal opening (m<sup>2</sup>)

ANVD = area of device (m<sup>2</sup>)

P = pressure drop (Pa) of a 1 m<sup>2</sup> reference sample of the internal opening with a face velocity of 3.5 m/s.

- 6) The face area of each of the internal openings forming part of the device must be at least 30% of the area of the external openings for the natural ventilation device.

### Part 2 Weatherproofing

#### 2) Weatherproofing requirements

- 1) During a strong winds period, natural ventilation of the shelter must not be provided by means of open windows or louvres.
- 2) The minimum resistance to water penetration of a natural ventilation device must be comprised of the following-
  - a) either-
    - l) a fixed two-stage louvre that has-
      - (i) alternating horizontal and vertical louvre stages each of which is at least 100 mm deep;
    - and

- (ii) water control extrusions; and
    - (iii) a sill externally draining; or
  - II) a one-stage louvre that has a horizontal louvre with a depth of at least 100 mm and water control extrusions if-
    - (i) an internal baffle is located within a plenum; and
    - (ii) there is a vertical and horizontal directional change of air flow; and
    - (iii) the internal baffle extends to the top of the louvre; and
    - (iv) the top of the internal opening connection is below the top of the baffle;
  - b) a plenum that includes-
    - I) a drained base; and
    - II) an internal opening connection in the upper portion of the plenum;
  - c) a damper control to permit adjustment as the wind speed and other conditions vary;
  - d) a minimum 90-degree change of direction within the plenum or an internal duct.
- 3) Where a duct in the device connects directly with the plenum, it must drain by sloping toward the plenum.
  - 4) An internal opening or grill in the device must be located above the base of a duct in the device.
  - 5) A duct in the device that is secondary to a primary duct in the device must-
    - a) drain to the primary duct; and
    - b) connect above the base of the primary duct.

## Part 3 Ventilation specifications

### 3) Ductwork and accessories

- 1) Ductwork used for a mechanical ventilation system during a pre-lockdown period or a post-lockdown period must have a minimum pressure classification of 500 Pa to AS 4254.2.
- 2) Ductwork and each plenum used for a natural ventilation device, or ductwork subject to wind pressures during a strong winds period, must comply with the requirements in AS 4254.2 for a duct static operating pressure classification that is equal to or greater than the duct design pressure.
- 3) For section 3(2)-
  - a) the duct design pressure is based on the magnitude of wind actions mentioned in A2.0.0(1)(a) and (c), including-
    - I) pressure drops within the device; and
    - II) internal pressures within the building mentioned in A2.0.0(1)(d); and
  - b) the duct static operating pressure classification mentioned in AS 4254.2 is determined by dividing the wind actions mentioned in section 3(3)(a) by 1.5; and
  - c) the minimum duct static operating pressure range mentioned in AS 4254.2 is  $\pm 2,500$  Pa, unless another duct static operating pressure range is demonstrated to comply with section 3(3)(a) and (b) in a compliance report-
    - I) certified by a person who is-
      - (i) a registered professional engineer under the Professional Engineers Act 2002; and
      - (ii) a member of the Australian Wind Engineering Society (AWES); and
    - II) approved by the LDMG.
- 4) If the duct or a portion of the duct is part of the external fabric, the duct or portion must be capable of resisting the wind actions mentioned in A2.0.0(1)(a), (c), (d) and (e).
- 5) Each duct in the device must be provided with bracing that-

- a) is designed to resist differential wind actions; and
- b) consists of at least the following-
  - I) masonry wall anchors;
  - II) guy wires;
  - III) thimbles;
  - IV) wire rope clips;
  - V) anchor shackles;
  - VI) dead end sleeves and support fixing mechanisms.
- 6) Horizontal bracing for a duct in the device must be provided at not less than 2m intervals and at each change of direction to limit horizontal movement due to differential wind actions.

Note-

The horizontal bracing required under subsection (5) may exceed the requirements of AS4254.2 and AS2107.

- 7) Ductwork connecting the device to internal openings used during a strong winds period must incorporate, on the inside of the damper-
  - a) an open mesh screen; or
  - b) another type of grill barrier.
- 8) A ductwork plenum connecting the device to ductwork used during a strong winds period must have a depth of at least the larger of the following-
  - a) a quarter of the largest dimension of the device; or
  - b) 300 mm.
- 9) Motorised, manually activated or backdraft dampers for the device must have a manufactured pressure rating equal to or greater than the duct static operating pressure range mentioned section 3(3)(c).
- 10) Drive shafts for dampers must be hexagonal.
- 11) Flexible ductwork must not be used for a natural ventilation device during a strong winds period.
- 12) Joint types TJ-1 to TJ-5 must not be used for ducts in the device during a strong winds period.
- 13) A filter, insect screen or other screen must not be fitted to a supply air intake for the device during a strong winds period.
- 14) Air moving through the device during a strong winds period must not pass fan equipment.
- 15) Dedicated ductwork, motorised dampers or fan bypass ductwork must be provided for the device, as required.
- 16) Damper actuators, for the device, must-
  - a) have a torque rating to suit the operation of the damper at a pressure differential of 2,500 Pa; and
  - b) be backed up by generator power and control system UPS; and
  - c) be fail safe to the position required to provide ventilation during an strong winds period.
- 17) Ventilation modulation, for the device, must be provided via-
  - a) proprietary window winder mechanisms that are adapted for damper modulation; or
  - b) gear operated valve mechanisms that are adapted for damper modulation.
- 18) Each window winder mechanism mentioned in section 3(17)(a) must be rated to provide at least 500 N force to a custom-made lever securely fastened to the hexagonal damper drive shaft.
- 19) Each gear-operated valve mechanism mentioned in section 3(17)(b) must provide-
  - a) a torque rating of at least 600 Nm; and
  - b) a 300 mm hand wheel.
- 20) If a plenum in the device is restrained by a connecting duct to resist the magnitude of wind actions mentioned in section 3(3)(a), the duct and bracing for the duct must be designed to transfer the wind load to the building structure.

#### 4) Control panel

- 1) A ventilation control panel for a public cyclone shelter must include-
  - a) a manual control for switching the following on or off-
    - I) each ceiling and wall-mounted circulation fan;
    - II) each exhaust air fan;
    - III) each supply-air fan; and
    - IV) the mechanical ventilation system to natural ventilation mode during a strong winds period; and
  - b) a status light that displays green for on/run for-
    - I) each ceiling and wall-mounted circulation fan; and
    - II) each exhaust fan; and
    - III) each supply-air fan; and
  - c) a status light that displays red for fault for-
    - I) each ceiling and wall-mounted circulation fan; and
    - II) each exhaust fan; and
    - III) each supply-air fan; and
  - d) a status light that displays amber when CO<sub>2</sub> levels reach 800 PPM in the shelter space; and
  - e) a status light that displays red when CO<sub>2</sub> levels reach 1000 PPM in the shelter space; and
  - f) a status light that displays red for a mains power failure; and
  - g) a status light that displays green for on/run for the generator; and
  - h) a status light that displays red for a generator failure.
- 2) All manual controls and status lights on the ventilation control panel must have signage indicating their purpose.
- 3) The control panel must be connected to a 24-hour UPS mentioned in A7.2.0.

## Schedule 9 – Elements of operational management procedures plan (including fire and evacuation plan)

A1.2.0, A3.2.1, A3.3.0, A4.0.3, A4.4.0, A5.2.3, and A5.2.7

- 1) The operational management procedures plan, for a public cyclone shelter, must-
  - a) state-
    - I) the name and address of the shelter; and
    - II) the maximum number of occupants, other than staff nominated by the LDMG, that may be accommodated in the accommodation area, during an occupancy period; and
    - III) the maximum number of occupants, including staff nominated by the LDMG, that may be present in the shelter during an occupancy period; and
    - IV) that a copy of the shelter's operational management procedures plan must be available for inspection during an occupancy period; and
  - b) include the fire and evacuation plan for the shelter, being a plan of the action to be taken by a person, or persons nominated by the LDMG in the event of a fire, or activation of the shelter's fire alarm, that is adequate to ensure the safety of occupants of the shelter during an occupancy period, even if it is not safe for the occupants to evacuate

Note -

The fire and evacuation plan for the shelter may be separate from the fire and evacuation plan required for the building's normal use.

- c) contain a floor plan showing all areas of the shelter; and
- d) describe any area mentioned in A4.0.3(4); and
- e) state the procedures a person, or persons nominated by the local government must follow for the following-
  - I) to ensure shuttle transport to and from the shelter is provided if the car parking is located more than 1 km away from the shelter;
  - II) to ensure the fuel tank of the shelter's diesel generator is full at the commencement of an occupancy period;
  - III) to ensure the generator-
    - (i) is switched on to automatic mode for the duration of an occupancy period; and
    - (ii) is switched off as soon as practicable after the end of that period, or before the end of that period in an emergency if necessary; and
  - IV) to ensure other alternative sources of power, including a battery system and UPS in the shelter are operational during an occupancy period;
  - V) for filling water tanks for use during an occupancy period;
  - VI) for closing doors that provide for access to and egress from the shelter for a lockdown period;
  - VII) for opening doors that provide for access to and egress from the shelter after the end of a lockdown period;
  - VIII) for locking any showers that are in the shelter, for an occupancy period, except for the shower in the accessible unisex sanitary compartment mentioned in table 7, restricting the use of the drinking water stored in the tanks for showers so it can only be used via the facilities mentioned in table 6;
  - IX) for ensuring water tanks are filled with fresh water that is ready to be used during an occupancy period;
  - X) for unlocking cabinets housing fire hose reels so they can be used during a lockdown period, if required;

- XI) for modulating natural ventilation devices manually, as required;
- XII) for modulating mechanical exhaust systems, as required;
- XIII) for maintaining an environment that is as free from sources of ignition and fire loads as practicable, considering the reasonable needs of the occupants during an occupancy period, including procedures for the following-
  - (i) removing any sources of ignition and any fire loads from the accommodation area before an occupancy period;
  - (ii) if gas is connected-isolating gas supply to the shelter;
  - (iii) preventing members of the public from bringing ignition sources into the shelter;
  - (iv) minimising the fire loads that are brought into the shelter, including by preventing members of the public from bringing mattresses into the shelter and restricting the personal property that members of the public are allowed to take into the shelter;

Example of personal property allowed

1 small bag that contains 1 change of clothes and essential toiletries other than flammable toiletries

- (v) restricting the use of electrical socket outlets following loss of mains power to the uses listed in schedule 6, section 2;
- (vi) monitoring the shelter, during an occupancy period, to detect any potential ignition sources or fire hazards in the shelter and to minimise fire loads in the shelter;
- (vii) clearly communicating to occupants of the shelter their responsibilities in preventing fire and the actions to be taken by them in the event of a fire or activation of the shelter's fire alarm;
- (viii) ensuring mobile phones can be charged in a safe manner during an occupancy period; and
- XIV) for ensuring members of the public with disabilities and special needs are adequately catered for;
- XV) for ensuring signage will be displayed during an occupancy period, clearly identifying the roles and responsibilities of all members of the shelter management team for the following tasks-
  - (i) supervision of doors to avoid accidental opening of the doors during a strong winds period;
  - (ii) restricting the spread of fire, reducing or minimising fire loads, and conducting a continual fire watch throughout the shelter for fire hazards during an occupancy period;
  - (iii) providing rapid first response and firefighting actions to contain or control a fire within the shelter.

Note-

Under section 104E of the Fire and Emergency Services Act 1990, the occupier of a building must-

- a) maintain at all times a plan of the action to be taken by persons within the building in the event of a fire threatening the building adequate to ensure their own and other persons safety (a fire and evacuation plan); and
  - b) provide adequate instructions to prescribed persons in the building concerning the action to be taken by them in the event of fire threatening the building in order to ensure their own and other persons safety.
- 2) The fire and evacuation plan for a public cyclone shelter must be included in the operational management procedures plan for the shelter.

## **Schedule 10 – Elements of shelter requiring maintenance work**

Section 6, definition maintenance management procedures plan

- 1) Building structure - walls and roof (including roof sheeting, flashing and fixings)
- 2) Debris screens
- 3) Windows and grills
- 4) External doors and shutters
- 5) External door locks, latches and exit devices
- 6) Lockdown systems
- 7) Fire protection systems
- 8) Fire extinguishers
- 9) Gas isolation valves
- 10) Switchboards necessary for use of the building as a public cyclone shelter
- 11) Emergency generator set, fuel tank and fuel polishing system
- 12) Emergency lighting and batteries
- 13) Communication devices and systems
- 14) Mechanical ventilation systems– fans, ducts, dampers
- 15) Natural ventilation devices – ducts, dampers, winders
- 16) CO2 sensors
- 17) Water tanks
- 18) Amenities area (including toilets, showers and drinking fountains)
- 19) Store items (including chairs, damper winders, and when required, door mullions and bolts)