



Places of Refuge: Cyclones

Guidance on the site selection of buildings

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Limitations

The Queensland Government and the Cyclone Testing Station (CTS) have taken reasonable steps and due care to ensure that the information contained herein is correct at the time of publication.

The Queensland Government and CTS expressly exclude all liability for loss, damage or other consequences that may result from the application of this Guidance on site selection document.

This Guidance Document may not be published except in full unless publication of an abstract includes a statement directing the reader to the full document.

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Guidance document prepared by:

G. Boughton, D. Falck, and D. Henderson

Cyclone Testing Station

College of Science, Technology and Engineering

James Cook University

Townsville Qld 4811 Australia

Email: jcu.cts@jcu.edu.au

www.jcu.edu.au/cts

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1. Introduction

The consideration of evacuation and sheltering arrangements are a critical component of a Local Government's disaster planning responsibilities. Evacuation facilities and safer locations describe a variety of sites and buildings which may need to be established to accommodate people during an evacuation. This document provides guidance for local governments in the identification of buildings, or parts of a building, that may be designated and used as Places of Refuge during a cyclone event.

The identification of safer locations for other events and hazards, such as floods and bushfires, will require different assessment requirements to ensure they consider the hazard specific risks.

2. Definition

A Place of Refuge is a building used to provide an enhanced level of protection from the effects of a cyclone as it passes through a location. It is not specifically [designed or constructed as a public cyclone shelter](#).

3. Building's normal use

Unlike public cyclone shelters, Places of Refuge will not have been designed to withstand wind pressures and wind-borne debris experienced in the most severe cyclones. When choosing a building to be used as a Place of Refuge local governments will consider several components and evaluate the scope of work to undertake just in time strengthening options to increase the level of protection available.

Strong and well-maintained buildings with large empty open spaces, or areas with fixed seating, and minimal glass windows are most suited for use as Places of Refuge. Multi-purpose sports and performing arts buildings could also be suitable, depending on construction and location and access to and from the building.

It may be a case where a theatre is available which would be great as a place of refuge, but the toilet are outside in the foyer which is surrounded by glass. The time and cost to cover the glass prior to the event may deem the building not suitable to use as a place of refuge. However, if a similar building had access to the toilets without going through the foyer, this may make the building more suitable to use.

There is no one size fits all, each element must be considered and risks assessed for the element and overall when compared to other buildings.

4. Building's use during a cyclone

Places of Refuge are available for use by remaining members of the community without suitable shelter-in-place arrangements or access to purpose designed public cyclone shelter accommodation. Places of Refuge will offer less protection in extreme cyclone events than a Designated Public Cyclone Shelter but offer more protection than other similar structures.

5. Location

Places of Refuge are to be located in areas of reduced risk. The criteria are not as stringent as those required for the placement of a new public cyclone shelter but still require consideration to ensure a decreased exposure to the concurrent elements of a cyclone. Places of Refuge shall be located:

- a) on high ground above a
 - I. 1:500 ARI ocean storm tide evacuation zone
 - II. 1:200 ARI ocean storm tide evacuation zone in combination with a Q200 riverine flood level plus 0.5 metre height buffer

- b) near to the impacted community and directly accessible from a public road
- c) away from other potential hazards, such as tall structures, including trees, or fuel stores

6. Structure and building envelope

Queensland's cyclonic region is known as wind region C and is located from Bundaberg north, 50km in from the coast. Typically, residential buildings in this region are designed under the building code for wind pressures consistent with a mid-strength Category 4 cyclone (wind gusts of approximately 250km/hr and larger buildings for approximately 265km/hr gusts).

Outside the cyclonic region, buildings in Queensland are not designed to resist the change in pressure when windborne debris penetrates the building. As such, mitigation measures required in these areas may require additional strengthening and focus on the building envelope.

Buildings selected as Places of Refuge shall be larger buildings typically constructed after 1989. By considering buildings constructed after this date there is a greater probability that they have been designed and constructed to comply with the Building Code of Australia. Additionally, buildings considered as a place of refuge should be well maintained, with any renovations or upgrades done in line with the appropriate building approvals.

To be more resistant to windborne debris, all Places of Refuge should be investigated to identify solutions for the temporary protection of windows, doors and other openings. To allow the quick attachment of temporary protection, the size of a glass window or door (glazed opening) should not exceed 2.2m.

Rather than just in time strengthening actions, consideration of the permanent protection of openings such as permanent screens, shutters, roller door upgrades could be implemented prior to cyclone season.

External cladding should have at least a moderate degree of debris resistance equivalent to 110mm double brick, core filled 200 series block or 19mm hardwood plywood cladding. Single skin wall from cladding such as fibre cement sheeting or thin metal cladding would not be acceptable as it is more likely to be penetrated or damaged by wind borne debris.

Roller doors and other large access doors are not acceptable unless the doors and tracks comply with AS/NZS 4505. Additionally, framing and supports to strengthen these doors should be certified by a Registered Professional Engineer of Queensland (RPEQ).

To decrease the risk of roof cladding being lifted off the top of the identified Place of Refuge continuous metal sheeting is to be screw fixed. Buildings with terracotta/concrete tiled roofs or secret fixed (clipped) metal cladding are not acceptable as Places of Refuge, unless the roof is over a plywood sheathing or concrete slab. Buildings with clear/translucent sheet roofs are also not acceptable.

It should be noted that suspended ceilings, such as ceiling tiles and plasterboard ceilings could become dislodged due to pressure difference across the ceiling. Similarly, plasterboard ceilings can collapse due to wind driven rain entering into the ceiling space.

6.1 Structure and building envelope technical evaluation

The Queensland Government technical guidance document *Places of Refuge: Guidance on the technical assessment of buildings* (2023) sets out a methodology and ranking system for comparing and evaluating buildings.

7. Occupancy

The selection of Places of Refuge requires attention to behavioural and other non-engineering issues that affect the safety of large numbers of people in relatively confined spaces. Places of Refuge are not intended

to store personal property or provide bedding during use. Councils should consider options to accommodate pets whilst ensuring maximum space for evacuees.

Similar to cyclone shelters the occupancy level of Places of Refuge will be calculated on the basis that the majority of people are able to sit with occasional periods of standing. Additional space is allowed to enable some people to lie for a period of time. Provision is also made for some people who may be in wheelchairs or bedridden. The nominal area allowance per person is 1.2 sqm which recognises that not all occupants will be able to remain seated. It does allow for occupants to have their personal evacuation necessities. The occupancy level may exceed the normal use under the building code.

8. Duration of occupancy

Places of Refuge are intended to provide protection for people during a cyclone in the absence of public cyclone shelters. Normally, an event would require the building to be managed similar to a shelter for a period of 24 to 48 hours. This time period includes opening and setup, occupation, the lock down period as the cyclone passes, exit of occupants and shut down. Occupation will potentially commence 6-12 hours before the lock-down period. Typically the lock-down period, when windows and doors are closed to provide protection from wind gusts of 100km/hr and greater, may be 6-12 hours with a maximum of 36hrs.

9. Other basic selection considerations

9.1 Lighting

Lighting within the Places of Refuge is necessary to calm shelter occupants during the cyclone and to permit safe movement within the space. It is recommended that any emergency lighting is also supplemented by handheld torches. Some sites may be serviced by emergency power. Under no circumstances should candles, lanterns or gas lamps be allowed into the Place of Refuges.

9.2 Ventilation

Natural ventilation of Places of Refuge is necessary to provide a degree of comfort for occupants both in the lead up to and during the passage of a cyclone, when wind gusts are lower than 100 km/hr. In larger buildings, natural leakage may provide enough ventilation if the wind speed is greater than 100 km/hr.

9.3 Amenities

Toilets must be available in the building for use during the passage of the cyclone. The number of amenities may restrict the number of persons to be accommodated. Consideration of the number of people per toilet should inform the total number of people able to stay in the building as a Place of Refuge.

9.4 Water supply

Water supply to the building must be maintained during the cyclone. Where the normal water supply may be disrupted, tank water needs to be provided to supply the toilets for the duration of occupancy. Bottled water may be provided for drinking.

9.5 Ownership of buildings

Local Governments should ensure the appropriate agreements are in place prior to the activation of a location as a Place of Refuge.