

## Improving the Safety Offered by your Home in a Cyclone

(This document was written with the assistance of Engineers Australia, Northern Division AND  
The Northern Territory Emergency Services)

The Territory is a great place to live, but it is prone to tropical cyclones from November to May. Cyclones are dangerous because they can produce destructive winds, heavy rainfall and storm surges.

To reduce the risk posed by cyclones, the Northern Territory Government provides a general level of community safety by implementing a building code and providing an effective counter disaster organisation. However, the protection of your family, your home and your possessions is your responsibility. You need to decide your plan of action well ahead of any cyclonic threat so that you are prepared.

### Is your house built to code?

Generally speaking houses and units built since cyclone Tracy in cyclonic areas of the Northern Territory are designed to withstand a mid range category 4 cyclone. Category 4 cyclones have windspeeds between 225-280 km/hr. Buildings that comply with the Building Code of Australia are generally referred to as being “built to code”.

Excluding the impact of wind borne debris, a building designed and built to code, should be able to withstand the wind loads from a low level Category 4 cyclone with minimal structural damage. However, a mid range Category 4 cyclone would place loads on the building (or at least some elements of the building) at the expected design capacity of that building and it is possible structural damage and/or failure could occur.

### Maintenance

Over time buildings that were originally built to code may deteriorate unless they are appropriately maintained. General guidelines to assist in determining whether your house has

been maintained adequately are available at

<http://www.nt.gov.au/lands/building/regulations/factsheets/documents/cyclonemaintenance.pdf>.

## Choosing the most appropriate room to shelter

Once you have determined that your house is built to code and has been properly maintained, you should consider where in your home you will shelter by going through the following checklist:

- Consider choosing a small room such as a bathroom/ toilet or a laundry/ toilet. Smaller rooms are generally stronger but choose a room which is large enough to accommodate all the members of your family and any friends who plan to stay with you.
- Choose a room with concrete or reinforced/ core filled block work walls if you have one.
- If you have a choice between an upstairs room and a downstairs room, generally choose the downstairs room because it will be less affected by wind.
- Choose a room with a properly secured concrete slab roof if there is one in your house.
- Choose a room with small windows preferably not directly facing an exposed outlook.
- If possible, choose a room with a door which does not face the outside of the building but opens into another room. Preferably the door should open inwards into the proposed shelter.
- A room with a water tap is good, but an emergency store of water is strongly recommended in any case.
- A room with a toilet is good, otherwise emergency means of ablutions may need to be considered and a stock of water should be made to operate the toilet if the mains water supply fails.

## **Improving the Protection offered by your Home in a Cyclone**

If you decide to improve the protection offered by your own home there are a number of options available:

- Create a "strengthened area". This would usually be a bathroom/ toilet or laundry/ toilet area - these areas tend to be stronger because they are smaller rooms. They also provide access to toilet facilities.
- Construct a purpose-built cyclone shelter in your back yard, or as an extension to the existing house or enclose an area underneath an existing elevated house.

### **Creating a strengthened Area**

Once you have chosen the strongest and most appropriate room to use as a shelter there are several things you can do to strengthen the chosen area.

- **Windows.** Putting a shutter over a window will greatly reduce the possibility of debris damaging the window or penetrating the room. If the window is small (say, less than 900 x 600 mm) a sheet of 19 mm plywood firmly attached over a window with bolted concrete anchors may be sufficient. The sheet of material should have a good overlap outside the frame of the window. If necessary or in doubt, consult a Structural Engineer to ascertain that your proposed work is structurally adequate.
- **Doors.** You can strengthen your shelter's door by upgrading it to, as a minimum, a solid core door. It should be fitted with 3 strong hinges - top bottom and middle and open inwards into the strengthened area to provide a safe means of escape from the room. In addition to the normal latch the door should be fitted with two additional heavy pad-bolts (minimum M10 bolt size recommended) - one near the top of the door and one near the bottom of the door. The door can be additionally strengthened by fixing a sheet of 1.6 mm minimum thickness steel or 12 mm minimum thickness structural plywood to the

outside surface. This should be glued and screwed in place. If necessary or if in doubt, consult a Structural Engineer to ascertain if your proposed work is structurally adequate.

- Walls. If any of the walls of your selected room are constructed of 100 mm thick block-work or 200 mm thick block-work not reinforced and core filled with concrete, it may be prudent to consider strengthening these walls. This can be done by building a new wall outside and in contact with the old wall. Alternatively additional structural supports may be able to be added to the wall. Consultation with a Structural Engineer would be recommended before undertaking such work.
- Ceiling. If the room does not have a concrete ceiling, it may be possible to strengthen the ceiling structurally - for instance, with additional framing/ framing fixings and structural plywood sheeting. Consultation with a Structural Engineer is recommended together with appropriate approvals and paperwork before undertaking such work.
- Ad Hoc Measures. You may be able to improve your safety by planning to shelter under bed mattresses or strong tables.

### **Purpose-Built Cyclone Shelter**

The advantage of a new purpose-built Cyclone Shelter is that it can be built to suit your needs, being made as strong as you feel you need it to be. If you are considering a purpose built shelter, it is recommended that a structural engineer be consulted on the options available to suit your needs. Below are listed some of the types of material which could be considered:

- Core Filled Structure. This is a conventional reinforced core filled 200 mm concrete block work structure with a concrete slab floor and roof. This type of structure is a very conventional easy-to-build solution which can be customised to your available space and needs. A suitable inward-opening door and debris protection to windows would need to be specified. Building approval is required for such a structure.
- Pre-cast Concrete Panels or Modules. This is a structure constructed from pre-cast concrete panels or modules which is a very conventional easy-to-build solution that can be customised to your available space and needs. A suitable inward-opening door and debris protection to windows would need to be specified. Building approval is required for such a structure.

- Recycled Steel Shipping Container. This structure may be cheaper than other types requiring less on-site construction work. It needs to be properly anchored by attaching it to a foundation structure which may consist of a cast concrete slab, cast concrete columns or pre-cast concrete foundation blocks with hold-down attachments. Modification or replacement of the doors is likely to be required to ensure that doors open inwards and can be secured from the inside. This allows occupants to leave the container in the event there is debris against the outside of the doors. Planning approval (for the container) and building approval is required for such a structure.

Remember, irrespective of the material type you are considering, consultation with a Structural Engineer is recommended together with appropriate approvals and paperwork before undertaking such work.

**TIPS:**

1. For tips on how to equip and stock your shelter area consult the Emergency Services web site

<http://www.pfes.nt.gov.au/index.cfm?fuseaction=page&p=252&m=45&sm=144&ssm=41>

2. For an indication of which parts of Darwin are affected by storm surge consult the Emergency Services web site

<http://www.pfes.nt.gov.au/index.cfm?fuseaction=page&p=252&m=45&sm=144&ssm=41>

3. For information on building standards in cyclone areas and maintenance of houses consult the Building Advisory Services web site

<http://www.nt.gov.au/lands/building/index.shtml>.

4. Think about the inclusion of a bathroom/ toilet within the cyclone shelter.

5. If required or if in doubt, consult a Structural Engineer for details of structural upgrading works

<https://fwas.engineersaustralia.org.au/rpsearch/home.jsp>