

How to Complete the BARA Checklist

Extreme weather is becoming more and more common. We can expect to see more extreme weather events with the impacts of global climate change. In its 2021 Disaster Risk Assessment, the Calgary Emergency Management Agency (CEMA) ranked tornadoes as one of the top risks in Calgary.

Alberta averages eight tornadoes a year, but that number is likely low as many tornadoes occur in uninhabited areas where they are not observed or reported. While more powerful tornadoes have occurred in Alberta (the 1987 Edmonton tornado was an F4 and the 2000 Pine Lake tornado was an F3), smaller tornadoes or high winds can also cause damage, injury or even death.

Tornadoes typically occur between March and October, but high winds can occur any time of year. The warning period for tornadoes is usually 15 minutes or less, so it is important to be aware of current weather conditions and know when to seek shelter, and where to go.

CEMA has created a checklist to determine locations in buildings to designate as a Best Available Refuge Area (BARA). In a tornado or damaging wind event, employees and visitors should take shelter in these designated areas. It is important to note that seeking shelter in a BARA does not guarantee safety; however, there are better areas in which to shelter in almost all buildings.

The selection criteria for a BARA are widely accepted, but there is some judgement involved in the assessment. The selection process is explained in more detail below.

SECTION 1:

Ideally, a BARA will be large enough to house everyone in the building or area. The rule of thumb is to allow five square feet (or 0.465 square meters) per person. Persons with mobility aids (wheelchairs, crutches, etc.) will require more space, if possible.

It can be difficult to determine the number of members of the public in a building at any given time. Use your best guess or an average. If you have a range, use the higher number.

The area required is calculated by adding together the number of employees and the number of members of the public, then multiplying by the recommended area per person. This doesn't have to be exact, but it will give you an indication of how much space will be required for a BARA. You can't squish 300 people into a closet.

SECTION 2:

Section 2 of the assessment is where you will look at spaces and determine which have the most attributes to be a BARA.

As mentioned above, sheltering in a BARA is not a guarantee of safety. However, there are better areas in which to shelter, and these can usually be determined from a fairly simple visual inspection. The assessment process has been designed to be easy to understand – technical or in-depth knowledge of buildings or structures is not required. The assessment should be completed by someone who is familiar with and has access to the entire building – this could be a safety advisor, maintenance personnel or security personnel.

It is unlikely that an assessed area will “check every box” in determining the best location for a BARA. This is an assessment for the **Best Available** Refuge Area. You may have to assess several different areas in a building to determine better locations. You may have to designate several BARAs to accommodate the number of people in the building.

Let’s look at the individual criteria for assessing a space.

1. First, note the **square footage** of the room or area. You can determine this from room dimensions, but remember that unless the room is empty, the room dimension does not equal the amount of usable space for a BARA. Objects in the room also take up floor space. You can estimate the useable area or use a percentage of the room dimension – whichever will work better for your situation. Your BARA might not even be a room – often hallways are the locations that meet the most criteria.
2. **Below grade areas** are generally the safest place to be in a tornado or high wind event. Basements and underground parkades are examples of below grade areas. If the area under assessment is below grade, you can answer “yes” to this question.
3. It is important that areas designated as BARAs be **accessible to those with mobility challenges**. A basement may be an ideal place to shelter, but if access is limited to stairs, then it may not be accessible for everyone. That doesn’t mean you can’t designate it as a BARA; you should have an alternative accessible location designated as well. Stairwells are often constructed with reinforced concrete and can be suitable BARAs, but the “landing area” on each floor should be able to accommodate persons with mobility challenges while able-bodied individuals can use the stairs on which to shelter. If a space is accessible, answer “yes” to this question.
4. If an area is **accessible only to authorized individuals** by way of a key or access card, it may be of limited use as a BARA if there are large numbers of members of the public in the building or employees are “compartmentalized” in the building (i.e., they do not have access to all areas). Ideally, a BARA should be accessible without requiring a key or access card. If your selected space can only be securely accessed, consider having another BARA identified for the public or those without security access. If a space can be accessed without the need for a key or access card, answer “yes” to this question.

5. **Short roof spans** (like those in a hallway) are generally considered safer in high winds or tornado events than longer roof spans (gyms, malls, etc.). Open areas are more prone to collapse or have the roof blown off in high winds or tornadoes. As well, open spaces may have skylights or glass, which is a hazard. If a space has a short roof span (less than 25 feet or 7.6 meters) answer “yes” to this question.
6. **Interior rooms** are safer than exterior rooms. The leading cause of injuries or death during high winds or tornadoes is wind-borne debris that can penetrate exterior walls, doors or windows in a building. As debris is propelled into a building, it loses momentum and energy as it passes through walls and doors. In general, try to put as many walls between the exterior and the shelter space as possible. If a space is an interior room with no exterior walls, answer “yes” to this question.
7. Unsecured items like shelving can fall over and injure someone. It’s good practice to secure tall items to walls anyway, but even more important in a high wind or tornado situation. Anything that could fall or tip over on someone is considered a **drop hazard**. If a room is free of drop hazards (or has minimal drop hazards), answer “yes” to this question.
8. During a high wind or tornado event, unreinforced glass will break and could blow in and injure someone. Your BARA should have **minimal glass** in the form of windows, skylights, or doors. Even tempered glass (which breaks into small pieces upon impact) is not considered safe because it can still cause injuries if propelled by winds, and breakage allows other wind-borne debris to enter the room. Minimal glass is defined as less than 10% of total wall area. To determine if your space meets this requirement, determine the total area of wall and/or ceiling/roof space (include the ceiling or roof if there are windows or skylights in it). Then determine the total area of glass (windows, skylights, etc.). If the glass area is less than 10% of the total wall/ceiling area, answer “yes” to this question.
9. Doors can be hollow core or **solid core**. Hollow core doors are generally much lighter than solid core doors. Hollow doors are also more easily breached by wind-borne debris. Generally, exterior doors are solid core or metal, which makes them harder to breach (even in a break-in situation). They also have more insulating value. Interior doors – especially in residential applications – are often hollow core. Some commercial buildings may have solid core interior doors – these are most likely to be in areas where doors must be fire-rated to slow the spread of fire from one area to another. If you know the door(s) to your BARA are solid core, answer “yes” to this question. If you are unsure, answer “no”.
10. Some buildings are constructed using wood or metal studs as framing, while others are constructed of **masonry materials** (like cement blocks or concrete). In a house, for example, a basement foundation is usually poured concrete, which is considered a masonry material. The above-grade part of a house is usually constructed with wood or metal framing, clad in plywood (and exterior materials like siding) on the outside and drywall on the inside (with insulation between). Masonry materials like concrete are much more impervious to wind-borne debris. However, masonry materials are heavier and a more expensive form of construction (so they are less common in interior spaces) but may be used in places as a fire barrier. If your BARA has masonry walls, answer “yes” to this question. If you are unsure, answer “no”.

SECTION 3:

Section 3 of the BARA assessment is where you will look at elements of the exterior site.

Any exterior hazards like trees, lampposts, and flagpoles can become uprooted during a high wind or tornado event and fall on the building. However, even hazards that are further away can become projectiles that can impact the integrity of the building. The selection criteria in Section 2 will help you identify safer places within the building.

While it is not always possible to have an exterior area free of hazards, it is important to monitor them. Trees have a lifespan and can become weakened with age or disease and may need to be removed. Structures like flagpoles and lampposts are generally anchored well into the ground, but things like drought and nearby tree roots can cause instability. A maintenance program where these external elements are monitored will help ensure they maintain their structural stability.

Using the height of the hazard, estimate where in the building the hazard could reach and what areas could be affected. If possible, select an area that is not impacted by a falling hazard.

You've now completed all the steps of a BARA assessment. You can select the location or locations of your BARA.

Areas that are large enough to accommodate everyone in the building (Section 1), have more "yes" answers (Section 2) and are unlikely to be impacted by falling hazards (Section 3) are the top choices for a BARA.

Note that not all locations will have an appropriate BARA. Relocatable structures like school portables or ATCO trailers that do not have a foundation are not safe. Individuals in these types of structures should evacuate to the nearest suitable structure.

As mentioned previously, it is likely that your chosen location will not meet every criterion. That's okay – this process is not about finding the *perfect* BARA but rather the best one *available*. There may have to be multiple BARAs depending on your situation.

Once you've determined the location of your BARA, there are some things left to do.

- Update your building or organization's Emergency Response Plan (ERP) to include the BARA location(s).
- Ensure all personnel know where the BARA is located. This can be accomplished in numerous ways – for example, an updated ERP, safety meetings and signage (you can download signage as a PDF from the City's website or intranet). In much the same way as fire drills, have frequent BARA drills where everyone is directed to shelter in their designated BARA. Encourage your employees to have a buddy, especially in cases of mobility challenges. A buddy or buddies can assist those with mobility issues get a to a safer place.

- Know when to take shelter in a BARA. Tornadoes don't provide a lot of warning, so it is important to stay informed about weather conditions. Download the Alberta Emergency Alert app and the Environment and the WeatherCAN app from Environment and Climate Change Canada. Know and watch for the weather conditions that can lead to tornado formation: severe thunderstorms with lightning and thunder, an extremely dark sky (sometimes with green or yellow clouds), loud roars or rumbling sounds, funnel clouds, or wind-borne debris. If winds are strong enough to pick up items that are usually not moveable, watch carefully and take shelter in your BARA if winds seem to be increasing, or there is more wind-borne debris. Share this information with all the staff in your building.
- If there is any risk of flooding during a tornado event, be cautious about directing people to shelter in BARAs that are below grade, especially on flood plains or flood fringe areas.

For more information on hazards in Calgary and how to stay safe, please visit calgary.ca/getready