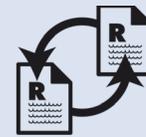


8 Human Factors Criteria

Human factors criteria for the community safe rooms are based on the design criteria set forth in Chapter 3 and the guidance expanding on those criteria presented in Chapter 6. When the first edition of this manual was published, existing documents did not address all the human factors involved in the design of extreme-wind safe rooms, but they did provide the basis for the criteria summarized in this chapter. Many documents now provide improved guidance with respect to human factors criteria that should be included in safe room design and construction. Unless otherwise noted, the criteria in this section are the same as those provided in the ICC-500, which standardized and correlated much of the existing FEMA guidance in this area with the current 2006 IBC and IRC requirements. These criteria were addressed without explanation in Chapter 3 and are discussed here in more detail to provide clarification of their use. If safe rooms are designed to provide protection from both tornadoes and hurricanes, the design should incorporate the human factor criteria for the most conservative criteria (i.e., the criteria that are appropriate for the larger population, the longer time, etc.).

Human factors design criteria are necessary in safe room design criteria to ensure a safe and comfortable environment for the safe room. Minimum criteria for the items in this chapter were presented in Chapter 3 for the tornado and hurricane community safe rooms as well as for the residential safe rooms. However, this chapter provides additional detail on the criteria or discussions to clarify their use. If criteria are not addressed in Chapter 3 or herein, the design requirements of the ICC-500 should be used. Should the ICC-500 also not address the criteria in question, consult the latest edition of the IBC or IRC.



ICC-500 CROSS-REFERENCE

The community and residential safe room design criteria presented in this chapter were addressed in Chapter 3 of this publication, but were not expanded upon in detail. This chapter provides additional information on these topics that governs aspects related to the use of the safe room beyond structural wind design criteria or debris impact criteria. The criteria in this chapter are the same as the community tornado shelter design criteria presented in the ICC-500 Storm Shelter Standard unless otherwise noted.

8.1 Protection of Critical Support Systems

A safe room may depend upon equipment or support systems to provide habitable safe room space. If this is the case, any equipment or critical support systems should remain functional

for the design wind event and the period of occupancy for the safe room (typically 2 hours for tornado safe rooms and 24 hours for hurricane safe rooms). Critical support systems located outside of the protected area of the safe room should be protected by a means that meets the wind pressure and missile impact criteria and, as applicable, the flood-resistance criteria presented in Chapter 3.

8.2 Occupancy Duration

The duration of occupancy of a safe room will vary, depending on the intended event or hazard for which the safe room has been designed. Occupancy duration is an important factor that influences many aspects of the design process. Safe rooms designed to the criteria in this manual are intended to provide life-safety protection to a specific population facing the immediate threat of impact from a landfalling hurricane or from a tornado.

In the interest of developing cost-effective designs, some items that would have increased occupant comfort were not included in the recommended design criteria. However, examples of items that might help to make safe rooms more comfortable and functional during an event are discussed in this chapter and are also listed in the sample operations plans described in Chapter 9 and presented in Appendices C and D.

8.2.1 Tornado Safe Rooms

Historical data indicate that tornado safe rooms will typically have a maximum occupancy time of 2 hours. Because the occupancy time is so short, many items that are needed for the comfort of occupants for longer durations (in hurricane safe rooms) are not recommended for a tornado safe room.

8.2.2 Hurricane Safe Rooms

Historical data indicate that hurricane safe rooms will typically have a maximum occupancy time of 24 hours (when the safe room is exposed to extreme winds). For this reason, the occupants of a hurricane safe room need more space and comforts than the occupants of a tornado safe room.

8.3 Ventilation

Ventilation for a safe room should comply with the building codes or ordinances adopted by the local jurisdiction; the designer should use the 2006 IBC and IRC if the AHJ has not adopted a building code. Ventilation should be provided either through the floor or the ceiling. Although horizontal ventilation openings may be easier to design and construct, vertical ventilation openings have a smaller probability of being damaged by a missile. Nevertheless, a protective shroud or cowling that meets the missile impact criteria of Chapters 3 and 6 should be provided to protect any ventilation openings in the safe room that are exposed to possible missile impacts,

such as the point where ductwork for a normal-use ventilation system penetrates the wall or roof of the safe room. Occupied space in safe rooms should be ventilated by natural or mechanical means as discussed in Sections 8.3.1 and 8.3.2.

Air exhaust or intake openings that terminate outside of safe room and support system areas should comply with the provisions of Sections 3.3, 3.4, or 3.5 for exterior wall and roof opening protective devices for the appropriate hazard and safe room use. Configuration of natural ventilation openings recommended for the safe rooms should be such that a minimum of 25 percent of the recommended area is located within 46 inches of the floor, or in the lower half of the height of the safe room, whichever is less, with the balance, but not less than 50 percent of the recommended area, located a minimum of 72 inches above the floor, or in the upper quarter of the height of the safe room, whichever is greater. Additionally, outside air intake openings located in the same wall should be located a minimum of 10 feet horizontally. The intake should be separated from any hazardous or noxious contaminant, such as emergency or backup generator vents or exhausts, fuel storage tank vents and containers, and maintenance or custodial storage facilities.

Although a mechanical ventilation system may be overwhelmed in a rare event when the area is used as a safe room, air exchange will still take place. The designer should confirm with the local building official that the ventilation system may be designed for the normal-use occupancy. In the event the community where the safe room is to be located has not adopted a model building and/or mechanical code, the requirements of the most recent edition of the IBC are recommended.

Mechanical systems that provide ventilation are typically part of larger systems that also provide air conditioning and heating. For safe rooms, ventilation and fresh air criteria are driven by the code requirements of the IBC and IRC. Air conditioning and heating systems are not considered part of the design criteria for safe rooms and, therefore, are not addressed by this publication (or the ICC-500). Although air conditioning and heating may increase occupant comfort, they are not necessary for life-safety protection from wind and windborne debris.

However, any buildings that support hospitals or other life-critical operations should consider appropriate design, maintenance, and operations plans that ensure continuous operation of all mechanical equipment during and after a tornado or hurricane. In these instances, a failure of the air-handling system may have a severe effect on life safety. For these types of facilities, protecting the backup power supply to the ventilation system of the safe room is recommended.

8.3.1 Ventilation for Tornado Community Safe Rooms

Tornado community and residential safe rooms should be ventilated by natural means or by mechanical ventilation in accordance with this section. Further, either type of ventilation openings used for atmospheric pressure change (APC) is permitted to be counted as ventilation for the purposes of this section.

If mechanical ventilation is provided, the ventilation system for both single- and multi-use tornado safe rooms (community and residential) should be capable of providing the minimum mechanical ventilation rate of required outdoor air in accordance with the applicable building code provisions for the normal use of the space for the safe room's occupancy classification. The mechanical ventilation system should also be connected to a standby power system. For single-use safe rooms, 15 cubic feet (ft³) per person per minute is the minimum air exchange recommended; this recommendation is based on guidance outlined in the International Mechanical Code (IMC). For multi-use safe rooms, the design of mechanical ventilation systems is recommended to accommodate the air exchange requirements of the IMC for the occupancy classification of the normal use of the safe room.

Tornado safe rooms (community and residential) that rely on natural ventilation should provide the minimum ventilation area in accordance with Table 8-1.

Table 8-1. Venting Area Requirements for Tornado Safe Rooms (from ICC-500, Table 702.1.1)

Tornado Safe Room Type	Venting Area (per Occupant)
Residential	2 square inches*
Community (≤ 50 persons)	5 square inches
Community (> 50 persons)	6 square inches

* However, air intake openings for residential tornado safe rooms should be permitted to be located entirely in the upper half of the safe room if the venting area provided is increased to 4 square inches per safe room occupant.

8.3.2 Ventilation for Hurricane Community Safe Rooms

Hurricane community and residential safe rooms should be ventilated by natural means or by mechanical ventilation in accordance with this section. For hurricane safe rooms with an occupant load greater than 50, every occupied space in a hurricane community safe room should be ventilated by mechanical means. The minimum mechanical ventilation rate of required outdoor air should be determined in accordance with the applicable building code provisions for the normal use of the space. If less than 50 persons occupy the safe room, mechanical ventilation may be used but is not required.

All hurricane safe rooms should be provided with openings to facilitate minimum natural ventilation. The area of ventilation openings should comply with Table 8-2 and the location of openings should be in accordance with the provisions presented earlier in this section. When hurricane safe rooms are also designed as tornado safe rooms, openings provided to relieve internal pressure for APC per Sections 3.3.1 or 3.5.1 should be permitted to be counted as natural ventilation openings.

Table 8-2. Venting Area Requirements for Hurricane Safe Rooms (from ICC-500, Table 703.1)

Hurricane Safe Room Type	Venting Area (per Occupant)
Residential	4 square inches
Community (≤ 50 persons)	8 square inches
Community (> 50 persons)	12 square inches

8.4 Square Footage, Occupancy, and Egress Recommendations

The criteria for occupancy and egress were presented in Chapter 3 for all safe rooms and were intended to mirror those requirements set out in the applicable building code (IBC being the default if no code is available), where for multi-use safe rooms, the normal occupancy of the safe room is used and for single-use safe rooms occupancy Assembly 3 (A-3) is used. Additional criteria, based on the specific type of safe room, are added to the conditions associated with the normal occupancy of the space. The minimum area criteria for safe rooms presented in this section are based on the use of the space during a storm event and are not intended to address the space recommended for a safe room that might be used for recovery purposes.

Further, a fundamental concept in life safety is that a means of egress, of adequate size to accommodate all occupants, should be available at all times. Since most community safe rooms will be located in spaces normally used for other purposes, such as a gymnasium or cafeteria, the number of egress elements present will often be adequate for those who occupy the space as a safe room.

8.4.1 Tornado and Hurricane Community Safe Room Square Footage Criteria

Occupancy recommendations for tornado and hurricane community safe room design are provided in this section. Additional criteria for seated, bedridden, and disabled occupants were provided in Sections 3.3.1 and 3.4.1.

Section 3.3.1 recommended a minimum of 5 square feet per person for tornado community safe rooms. These recommendations are the same as those provided in the FEMA 1999 *National Performance Criteria for Tornado Shelters* and the first edition of FEMA 361, and are considered to be an appropriate minimum for the tornado community safe room.

The designer, however, should be aware of the occupancy requirements of the building code governing the construction of the safe room. The occupancy loads in the building codes have historically been developed for life-safety considerations. Most building codes will require the maximum occupancy of the safe room to be clearly posted. Multi-use occupancy classifications are provided in the IBC and state and local building codes. Conflicts may arise between the code-specified occupancy classifications for normal use and the occupancy needed for sheltering. The following is an example for a tornado community safe room:

According to the IBC, the occupancy classification for educational use is 20 ft² per person; however, the recommendation for a tornado safe room is 5 ft² per person (per FEMA 361 and ICC-500). Without proper signage and posted occupancy requirements, using an area in a school as a safe room can create a potential conflict regarding the allowed numbers of persons in the safe room. If both the normal and safe room maximum occupancies are posted, and the safe room occupancy is not based on a minimum less than the recommended 5 ft² per person, the safe room design should be acceptable to the building official. The IBC and the model building codes all have provisions that allow occupancies as concentrated as 5 ft² per person and, in some cases, 3 ft² per person.

Section 3.4.1 recommended a minimum of 20 square feet per person for hurricane community safe rooms. This square footage requirement is an increase over the original FEMA 361 hurricane community safe room criteria as a result of discussions among the Project Team, the Review Committee, the ICC-500 Standard Committee, and data from the use of shelters after hurricanes in 2004 and 2005. This increase brings the minimum requirements in line with the recommendations of American Red Cross Publication No. 4496. The ARC publication recommends the following minimum floor areas (Note: the ARC square footage criteria are based on long-term use of the safe room [i.e., use of the safe room both as a refuge area during the event and as a recovery center after the event] and are presented here for informational purposes only):

- 20 ft² per person for a short-term stay (i.e., a few hours to a few days)
- 40 ft² per person for a long-term stay (i.e., a day to weeks)

As with the tornado community safe room, conflicts may arise between the code-specified occupancy classifications for normal use and the occupancy needed for sheltering for hurricane community safe rooms. Below is an example for a hurricane community safe room; in this example, the occupancy conflict can directly affect egress requirements for the safe room set forth in the building code:

According to the IBC, for a 5,000-ft² proposed safe room, the normal occupancy load is $5,100/20 = 255$ people, while the safe room occupancy load is $5,100/10 = 510$ people. For both educational and safe room uses, the IBC requires 0.20 inch of egress per person for buildings not equipped with a sprinkler system. For normal (educational) use, this calculates to 51 inches of required egress and, because of code, a minimum of two doors (exits). Therefore, two 32-inch doors (64-inch total net egress) should be provided. For safe room use, the requirement is for 102 inches and a minimum of three doors (exits). Therefore, three 36-inch doors (108-inch total net egress) should be provided. Although guidance concerning code compliance is provided in Chapter 3 of this publication, the conflicts between these two occupancy requirements for egress must be resolved with state and/or local officials. Future code requirements concerning occupancies and egress may address extreme events and temporary circumstances.

8.4.2 Tornado and Hurricane Residential Safe Room Square Footage Criteria

Occupancy recommendations for tornado and hurricane residential safe room design are provided in this section. Section 3.5.1 recommended a minimum of 3 square feet per person and 7 square feet per person for tornado and hurricane residential safe rooms servicing one- and two-family dwellings, respectively. Similarly, for residential safe rooms servicing more than one- and two-family dwellings, a minimum of 5 square feet per person and 10 square feet per person for tornado and hurricane safe rooms, respectively, is recommended.

These recommendations provide for a more dense residential safe room population than previously recommended in the first edition of FEMA 361. However, these more dense occupancies have been determined to be appropriate for the smaller population residential safe rooms where the maximum occupancy is 16 persons.

8.5 Distance and Travel Time

The safe room designer should consider the time needed for all occupants of a building or facility to reach the safe room. The National Weather Service has made great strides in predicting tornadoes and hurricanes and providing warnings that allow time to seek shelter. For tornadoes, the time span is often short between the NWS warning and the onset of the tornado. Refer to FEMA Hazard Mitigation Assistance (HMA) safe room policy for guidance on how to address the issues of travel time and distance of the at risk population to the safe rooms for tornado hazards. For hurricane safe rooms, a different set of criteria apply. Other hazard-specific constraints that may be governed by local emergency management or law enforcement requirements, mandatory evacuations, and other plans that affect the movement of at risk populations out the way of landfalling hurricanes should be considered for hurricane community safe rooms. To obtain the current FEMA policy on safe rooms, contact your FEMA regional office.

Travel time may be especially important when safe room users have disabilities that impair their mobility and may need assistance from others to reach the safe room. In addition, wheelchair users may need a particular route that accommodates wheelchairs. The designer should consider these factors in order to provide the shortest possible access time and most accessible route for all potential safe room occupants.

Access is an important element of safe room design. If obstructions exist along the travel route, or if the safe room is cluttered with non-essential equipment and storage items, access



ICC-500 CROSS-REFERENCE

Design criteria and code compliance requirements for the number of doors (exits), door orientation and swing, and door hardware are addressed in detail in Chapter 5 of the ICC-500 and are correlated with the egress and life-safety requirements of the IBC, IRC, and National Fire Protection Association (NFPA) 101. Further, guidance for constraints that apply to vertical egress into and out of safe rooms that require the use of stairs and ladders has also been provided and should be enforced as appropriate.

to the safe room will be impeded. It is essential that the path remain unencumbered to allow orderly access to the safe room. Hindering access in any way can lead to chaos and panic. In addition, siting factors that affect access should be considered (see Chapter 5). For example, at a community safe room built to serve a residential neighborhood, parking at the site may complicate access to the safe room; at a non-residential safe room, such as a facility at a manufacturing plant, mechanical equipment could impede access.

Unstable or poorly secured structural or exterior envelope elements could potentially block access if a collapse occurs that creates debris piles along the access route or at entrances. A likely scenario is an overhead canopy or large overhang that lacks the capacity to withstand extreme-wind forces and collapses over the entranceway. Prior to collapse, these entranceways and canopies may reduce wind pressures and protect openings from windborne debris impacts. However, if they are not designed to withstand the design wind forces acting on the building, they may be damaged during a wind event and may prevent access to and egress from the safe room. If canopies and overhangs are not designed for the design wind speed, they should either be retrofitted and reinforced or be removed.

8.6 Americans with Disabilities Act (ADA)

The needs of persons with disabilities requiring safe room space should be considered. The appropriate access for persons with disabilities should be provided in accordance with all federal, state, and local ADA requirements and ordinances. If the minimum requirements dictate only one ADA-compliant access point for the safe room, the design professional should consider providing a second ADA-compliant access point for use in the event that the primary access point is blocked or inoperable. Additional guidance for compliance with the ADA can be found in many privately produced publications.

The design professional can help safe room operators understand ADA requirements and assist the owner/operator of the safe room in the development of the plan. All safe rooms should be managed with an operations and maintenance plan. Guidelines for the development of safe room operations plans are provided in Chapter 9 for community safe rooms intended to serve residential areas and for non-residential community safe rooms. Developing a sound operations plan is extremely important if compliance with ADA at the safe room site requires the use of lifts, elevators, ramps, or other considerations for safe rooms that are not directly accessible to non-ambulatory persons.



NOTE

For more information about providing for the needs of disabled persons during emergencies, refer to FEMA's United States Fire Administration publication *Emergency Procedures for Employees with Disabilities in Office Occupancies*.

8.7 Special Needs

The use of the safe room also needs to be considered in the design of special needs facilities. The design of special needs safe rooms is beyond the scope of this publication; however, it is important for the design professional to be aware of the need of specific users for whom a safe room is or may be constructed. Occupancy classifications, life-safety codes, and ADA requirements may dictate the design of such elements as door opening sizes and number of doors, but use of the safe room by hospitals, nursing homes, assisted living facilities, and other special needs groups may affect access requirements to the safe room. For example, strict requirements are outlined in the IBC and the model codes regarding the provision of uninterruptible power supplies for life support equipment (e.g., oxygen) for patients in hospitals and other health care facilities.

In addition, strict requirements concerning issues such as egress, emergency lighting, and detection-alarm-communication systems are presented in Chapter 10 of the IBC and in the NFPA Life Safety Code (NFPA 101, 1997 Edition, Chapter 12) for health care occupancies. The egress requirements for egress distances, door widths, and locking devices on doors for health care occupancies are more restrictive than those for an assembly occupancy classification in non-health care facilities based on one of the model building codes for non-health care facilities. Additional requirements also exist for health care facilities that address automatic fire doors, maximum allowable room sizes, and maximum allowable distances to egress points. The combination of all these requirements could lead to the construction of multiple small safe rooms in a health care facility rather than one large safe room.

8.8 Lighting

A standby power source for lighting is essential during a disaster because the main power source is often disrupted. For the regular (i.e., non-safe room) use of multi-use safe rooms, lighting, including emergency lighting for assembly occupancies, is required by all model building codes. Emergency lighting is recommended for community safe rooms. Natural lighting provided by windows and doors is often a local design requirement but is not required by the IBC for assembly occupancies. At this time, very few glazing systems proposed to provide natural lighting for safe rooms meet the missile impact requirements presented in Chapters 3 and 7.

When a standby light system is required, the lighting system should provide an average of 1 foot-candle of illumination in occupied safe room areas, occupant support areas, required corridors, passageways, and means of egress. Standby lighting systems are recommended as follows:

- Tornado community safe rooms should be provided with an emergency lighting system.
- Hurricane community safe rooms with a safe room occupant load greater than 50 should be provided with a standby lighting system.
- Personal-use flashlights should be permitted as satisfying the emergency lighting system criteria for tornado community safe rooms with an occupant load of less than or equal to

50, when provided at a quantity not less than one flashlight per 10 occupants. Personal-use flashlights should be a minimum of two “D” cell batteries size or equivalent light output, and readily accessible from within the occupied safe room areas or immediately adjacent occupant support areas.

In addition to the above criteria, a battery-powered system is recommended as the standby power source because it can be located, and fully protected, within the safe room, although for hurricane safe rooms, a more significant standby power supply may be necessary. Flashlights stored in cabinets are useful as secondary lighting provisions, but should not be used as the primary backup lighting system with the exception of tornado residential safe rooms and community safe rooms with less than 50 occupants (see ICC-500, Chapter 7). A reliable lighting system will help calm safe room occupants during a disaster. Failing to provide proper illumination in a safe room may make it difficult for the owners/operators to minimize the agitation and stress of the safe room occupants during the event. If the backup power supply for the lighting system is not contained within the safe room, it should be protected with a structure designed to the same criteria as the safe room itself.

8.9 Emergency Provisions

Emergency provisions will also vary for different wind events. In general, emergency provisions will include food and water, sanitation management, emergency supplies, and communications equipment. A summary of these issues is presented in the following sections.

8.9.1 Food and Water

For tornado safe rooms, because of the short duration of occupancy, stored food is not a primary concern; however, water should be provided. For hurricane safe rooms, providing and storing food and water are an important concern. As noted previously, the duration of occupancy in a hurricane safe room could be as long as 24 hours or more. Food and water will be needed, and storage areas for them should be included in the design of the safe room. These issues should be addressed in the operations plan for the safe room. FEMA and ARC publications concerning food and water storage in safe rooms may be found at <http://www.fema.gov> and <http://www.redcross.org>.

8.9.2 Sanitation Management

A minimum of two toilets are recommended for both tornado and hurricane community safe rooms. Although the short duration of a tornado might suggest that toilets are not essential for a tornado safe room, the safe room owner/operator is advised to provide two toilets or at least two self-contained, chemical-type receptacles/toilets (and a room or private area where they may be used) for safe room occupants. Meeting this criterion will provide separate facilities for men and women, but is in excess of the ICC-500 requirements, which only specify one toilet when occupancy is less than 50 persons.

ICC-500 also requires a minimum of two toilets for community safe rooms that serve more than 50 occupants, but allows a single toilet for smaller facilities. Larger tornado safe rooms would need to add only one additional toilet per 500 occupants, while the hurricane safe rooms would need one additional toilet per 50 occupants.

Additional toilets will be needed by the occupants of hurricane safe rooms because of the long duration of hurricanes. The toilets will need to function without power, water supply, and possibly waste disposal. Sanitation facilities may be damaged during a hurricane; therefore, designers should consider siting the safe room above a pump station (if appropriate at a safe room site), which would allow the system to have some capacity during the event.

8.9.3 Emergency Supplies

Community safe rooms should contain, at a minimum, the following safety equipment:

- Flashlights with continuously charging batteries (one flashlight per 10 safe room occupants)
- Fire extinguishers (number based on occupancy type) appropriate for use in a closed environment with human occupancy, surface mounted on the safe room wall
- First aid kits rated for the safe room occupancy
- NOAA weather radio with continuously charging batteries
- Radios with continuously charging batteries for receiving commercial radio broadcasts
- A supply of extra batteries to operate radios and flashlights
- An audible sounding device that continuously charges or operates without a power source (e.g., canned air horn) to signal rescue workers if safe room egress is blocked

The above list shows a number of important items to keep in a safe room for the safety and well-being of the occupants. The list should, however, also be cross-checked with the list of items shown in Case Study I, Attachment 11 (Community Safe Room Manager's Kit) contained in the Community Safe Room Sample Standard Operating Procedures, in Appendix C of this publication, which also includes key supplies to have ready for use, such as detailed first-aid equipment, toiletries, and other basic supplies.

8.9.4 Communications Equipment

A means of communication other than a landline telephone is recommended for all safe rooms. Both tornadoes and hurricanes are likely to cause a disruption in telephone service. At least one means of backup communication should be stored in or brought to the safe room. This could be a handheld amateur (HAM) radio, cellular telephone, citizens' band radio, or emergency radios capable of reaching police, fire, or other emergency services. If cellular telephones are relied upon for communications, the owners/operators of the safe room should install a signal amplifier

to send/receive cellular signals from within the safe room. It should be noted that cellular systems may be completely saturated in the hours immediately after an event if regular telephone service has been interrupted.

Finally, the safe room should contain either a battery-powered radio transmitter or a signal-emitting device that can be used to signal the location of the safe room to local emergency personnel should occupants in the safe room become trapped by debris blocking the access door. The safe room owner/operator is also encouraged to inform police, fire, and rescue organizations of the safe room location before an event occurs. These recommendations apply to both above-ground and in-ground safe rooms.

8.10 Standby Power

Safe rooms designed for tornadoes and hurricanes will have different standby (emergency) power needs. These needs are based upon the length of time that people will stay in the safe rooms (i.e., shorter duration for tornadoes and longer duration for hurricanes). In addition to the essential requirements that should be provided in the design of the safe room, comfort and convenience should be addressed.

For tornado safe rooms, the most critical use of standby power is for lighting. Emergency power may also be required in order to meet the ventilation recommendations described in Section 8.3. The user of the safe room should set this requirement for special needs facilities, but most tornado community safe rooms would not require additional emergency power. The ICC-500 standard requires standby power systems to be designed to provide the required output capacity for a minimum of 2 hours and to support the mechanical ventilation system, when applicable.

For hurricane community safe rooms, standby or emergency power may be required for both lighting and ventilation by the local building code. This is particularly important for safe rooms in hospitals and other special needs facilities. Therefore, a backup generator is recommended. Any generator relied on for standby or emergency power should be protected with an enclosure designed to the same criteria as the safe room. The ICC-500 requires the standby backup electrical system to have sufficient capacity to power all the required (critical support) systems and circuits at the same time continuously for a minimum period of 24 hours.