

Article 13. Hawaii Residential Safe Room

Sections:

- 16-13.1 Performance-based design criteria.**
- 16-13.2 Intent and scope.**
- 16-13.3 Alternative standards.**
- 16-13.4 Site criteria.**
- 16-13.5 Maximum occupancy.**
- 16-13.6 Provisions for exiting.**
- 16-13.7 Design for dead, live, wind, rain, and impact loads.**
- 16-13.8 Ventilation.**
- 16-13.9 Communications.**
- 16-13.10 Construction documents.**
- 16-13.11 Notification.**
- 16-13.12 Special inspection.**

Sec. 16-13.1 Performance-based design criteria.

The Residential Safe Room shall meet the minimum performance specifications of this article. (Added by Ord. 12-34)

Sec. 16-13.2 Intent and scope.

The intent of the Residential Safe Room is to temporarily provide an enhanced protection area, fully enclosed within a dwelling or within an accessory structure to a residence, which is designed and constructed to withstand the wind pressures, windborne debris impacts, and other requirements of this section. (Added by Ord. 12-34)

Sec. 16-13.3 Alternative standards.

- (a) **Manufactured Safe Room Designs Subject to Approval:** A manufactured safe room or safe room kit may be substituted if documentation is submitted and approved by the building official. The safe room shall be engineered, tested, and manufactured to meet or exceed the criteria of this section.
- (b) **FEMA In-Residence Shelter Designs Permitted:** It shall be permissible to build FEMA In-Residence Shelters of up to 64 square feet of floor area with walls up to 8 feet long that are built in accordance with construction details of FEMA 320.

(Added by Ord. 12-34)

Sec. 16-13.4 Site criteria.

Residential Safe Rooms shall not be constructed within areas subject to stream flooding, coastal flooding, or dam failure inundation within any of the following areas:

- (1) FEMA Special Flood Hazard Areas (SFHA) subject to rainfall runoff flooding or stream or flash flooding;
- (2) Coastal zones "V" or "A" identified in the Flood Insurance Rate Map (FIRM) issued by FEMA for floodplain management purposes, in which the flood hazard are tides, storm surge, waves, tsunamis, or a combination of these hazards;

- (3) Areas subject to dam failure inundation as determined by the Department of Land and Natural Resources.

(Added by Ord. 12-34)

Sec. 16-13.5 Maximum occupancy.

The safe room is permitted to be used for a maximum occupancy based on at least 15 square feet per person with a maximum of 8 persons in a room of up to 128 square feet of floor area. (Added by Ord. 12-34)

Sec. 16-13.6 Provisions for exiting.

The room shall be equipped with an inward-swinging door and an impact-protected operable window suitable for a means of alternative exiting in an emergency. (Added by Ord. 12-34)

Sec. 16-13.7 Design for dead, live, wind, rain, and impact loads.

(a) Structural Integrity Criteria.

- (1) The safe room shall be built with a complete structural system and a complete load path for vertical and lateral loads caused by gravity and wind.
- (2) The building that the safe room is built within shall be assumed to be destroyed by the storm and shall not be taken as offering any protective shielding to the safe room enclosure.
- (3) The ceiling structure and wall shall be capable of supporting a superimposed debris load of the full weight of any building floors and roof above, but not less than 125 psf.
- (4) The safe room enclosure shall be capable of simultaneously resisting lateral and uplift wind pressures corresponding to a 160 mph 3-second peak gust, determined in accordance with ASCE Standard 7, Minimum Design Loads for Buildings and Other Structures, calculated using load and importance factors of 1.0. The site exposure factor shall be based on exposure C. The gust factor and the directionality factor shall be taken as 0.85. Topographic wind amplification caused by mountainous terrain shall be considered in accordance with the building code. Internal pressure shall be determined in accordance with ASCE-7.
- (5) The safe room shall be anchored to a foundation system capable of resisting the above loading conditions.

(b) Windborne debris impact protection of building enclosure elements.

The entire enclosure of the safe room, including all walls, ceilings, and openings, fixed or operable windows, and all entry doors into the safe room, shall meet or exceed Level D requirements of ASTM E 1996 (Table 16.5-1). Any wall or ceiling penetration greater than 4 square inches shall be considered an opening.

Exception: Electrical outlet boxes and interior lighting switches not penetrating more than 2.5 inches into the interior wall surface and a plumbing piping or conduit not greater than 1.5-inch in diameter shall be exempted from this requirement.

Approved Debris Impact Resistant Wall Assemblies. Wall assemblies constructed in accordance with Table 16-13.7(b) shall be deemed to comply with the Level D windborne debris impact protection of building-enclosure elements.

Table 16-13.7(b) Wall Assemblies Complying with Level D Windborne Debris Requirements

Wall Assemblage
3/4-inch plywood on wood studs at 16-inches on-center with #8 X 3-inch wood screws at 6-inches o.c.
3/4-inch plywood attached to double studs at 16-inches o.c. with #8 X 3-inch wood screws at 6-inches o.c.
8-1/4" cementitious lap siding over 22ga sheet metal attached to 350S162-33 studs at 24" or 16" o.c.
8-1/4" cementitious lap siding attached to 350S162-33 studs at 24" o.c. studs with interior 3/4" ply interior sheathing
8-1/4" cementitious lap siding attached to 35US1b2-33 studs at 24" o.c. with 1/2" interior 22-gage sheet metal composite gypsum wallboard
8-1/4" cementitious lap siding attached to 2 x4 wood studs at 16" o.c. with 1/2" interior 22-gage sheet metal composite gypsum wallboard
8-1/4" cementitious lap siding attached to 2 x4 wood studs at 16" o.c. with 22-gage sheet metal and 1/2" interior gypsum wallboard
Cementitious lap siding attached to 5/8 inch structural plywood on 2 X 4 wood studs @ 16 inches a/c.
Cementitious-panel siding attached to 5/8 inch structural plywood on 2 X 4 or 362S-137-43 steel studs @ 16 inches o.c.
EFS with 1/2-inch dens-glass gold exterior sheathing on 362S-137-43 steel studs @ 16 inches and 1/2-inch interior gypboard
Interior or Exterior wall with laterally braced (sheathed) 2 x 4 wood studs at 16" o.c. with 22-gage sheet metal on either side attached directly to the studs
Interior or Exterior wall with laterally braced (sheathed) 2 x 4 wood studs at 16" o.c. with 1/2" interior 22-gage sheet metal composite gypsum wallboard on either side attached directly to the studs
24 gage steel sheet (50 ksi) on girts
4-inch-thick concrete with reinforcing
6-inch CMU with partial grouting at reinforcing spaced at 24 inches o.c.
8-inch CMU with partial grouting at reinforcing spaced at 24 inches o.c.

Notes: Sheathing shall be attached to studs at 6-inches on center edge and field fastening.
 22 gage sheet metal shall be galvanized and attached to studs with screws
 (c) Cyclic pressure loading of glazing and protective systems.

Impact protective systems shall meet the ASTM E 1996 cyclic pressure requirement for the loading given in Table 16.13-1.

Table 16.13-1: Windborne Debris Protection and Cyclic Pressure Criteria for Residential Safe Rooms

ASTM E 1996 Missile Level Rating	Debris Missile Size	Debris Impact Speed	Enclosure Wall Ceiling, and Floor Cyclic Air Pressure Testing - maximum inward and maximum outward pressures
D	2 x 4 weighing 9.0 lb. +- 0.25 lb., and with min. length 8 ft. +- 4-inch	50 ft./sec. or at least 34 mph	35 psf inward 45 psf outward

(Added by Ord. 12-34)

Sec. 16-13.8 Ventilation.

The room shall be naturally ventilated to allow the enclosure to have approximately one air change every 2 hours. This requirement may be satisfied by 12 square inches of venting per occupant. There shall be at least two operable vents. The vents shall be protected by a cowling or other device that shall be impact tested to comply with ASTM E 1996 Level D. Alternatively, the room shall be evaluated to determine if the openings are of sufficient area to constitute an open or partially enclosed condition as defined in ASCE 7.

(Added by Ord. 12-34)

Sec. 16-13.9 Communications.

The safe room shall be equipped with a phone line and telephone that does not rely on a separate electrical power outlet. Alternatively, a wireless telephone shall be permitted to rely on an Uninterruptible Power Supply (UPS) battery device.

(Added by Ord. 12-34)

Sec. 16-13.10 Construction documents.

Construction documents for the Residential Safe Room shall be directly prepared by a Hawaii licensed professional structural engineer.

(Added by Ord. 12-34)

Sec. 16-13.11 Notification.

The owner of the safe room shall notify the State Department of Defense and county civil defense agency of the property's Tax Map Key or Global Positioning System coordinates.

(Added by Ord. 12-34)

Sec. 16-13.12 Special inspection.

The construction or installation of the safe room shall be verified for conformance to the drawings in accordance with International Building Code Chapter 17.

(Added by Ord. 12-34)

