

## **Article 14. State- and City-Owned High Occupancy Buildings – Design Criteria for Enhanced Hurricane Protection Areas**

### **Sections:**

- 16-14.1 Intent and scope.**
- 16-14.2 Site criteria.**
- 16-14.3 Enhanced hurricane protection area program requirements.**
- 16-14.4 Design wind, rain, and impact loads.**
- 16-14.5 Ventilation.**
- 16-14.6 Standby electrical system capability.**
- 16-14.7 Quality assurance.**
- 16-14.8 Maintenance.**
- 16-14.9 Compliance re-certification if altered, deteriorated, or damaged.**

### **Sec. 16-14.1 Intent and scope.**

The purpose of this article is to establish minimum life safety design criteria for enhanced hurricane protection areas within high occupancy state- or county-owned buildings permitted to be occupied during hurricanes of up to Saffir Simpson Category 3. This article shall apply to Occupancy Category III and IV buildings defined by ROH Section 16-1.1 (173), Table 1604.5, of the following specific occupancies:

- (1) Covered structures whose primary occupancy is public assembly with an occupant load greater than 300.
- (2) Health care facilities with an occupant load of 50 or more resident patients, but not having surgery or emergency treatment facilities.
- (3) Any other state- or county-owned building with an occupant load greater than 5,000.
- (4) Hospitals and other health care facilities having surgery or emergency treatment facilities.

**Exception:** Facilities located within flood zone V and flood zone A that are designated by the owner to be evacuated during hurricane warnings declared by the National Weather Service, shall not be subject to these requirements.

(Added by Ord. 12-34)

### **Sec. 16-14.2 Site criteria.**

- (a) Flood and Tsunami Zones. Comply with ASCE 24-05, Flood Resistant Design and Construction, based on provisions for Occupancy Category III.
  - (1) Floor slab on grade shall be 1.5 feet above the Base Flood Elevation of the county's flood hazard map, or at higher elevation as determined by a modeling methodology that predicts the maximum envelope and depth of inundation, including the combined effects of storm surge and wave actions with respect to a Category 3 hurricane.
  - (2) Locate outside of V and Coastal A flood zones unless justified by site-specific analysis or designed for vertical evacuation in accordance with a method approved by the building official. When a building within a V or

Coastal A zone is approved, the bottom of the lowest structural framing member of any elevated first floor space shall be 2 feet above the Base Flood Elevation of the county's flood hazard map, or at a higher elevation as determined by a modeling methodology that predicts the maximum envelope and depth of inundation, including the combined effects of storm surge and wave actions with respect to a Category 3 hurricane.

- (3) Locate outside of Tsunami evacuation zones unless justified by site-specific analysis or designed for vertical evacuation in accordance with a method approved by the building official.
- (b) Emergency vehicle access. Provide at least one route for emergency vehicle access. The portion of the emergency route within the site shall be above the 100-year flood elevation.
- (c) Landscaping and utility laydown impact hazards. Landscaping around the building shall be designed to provide standoff separation sufficient to maintain emergency vehicle access in the event of mature tree blowdown. Trees shall not interfere with the functioning of overhead or underground utility lines, nor cause laydown or falling impact hazard to the building envelope or utility lines.
- (d) Adjacent buildings. The building shall not be located within 1,000 feet of any hazardous material facilities defined by ROH Section 16-1.1(173), Table 1604.5. Unanchored light-framed portable structures shall not be permitted within 300 feet of the building.

(Added by Ord. 12-34)

**Sec. 16-14.3 Enhanced hurricane protection area program requirements.**

- (a) Applicable net area. At least fifty percent of the net square feet of a facility shall be constructed to qualify as an enhanced hurricane protection area. The net floor area shall be determined by subtracting from the gross square feet the floor area of excluded spaces, exterior walls, columns, fixed or movable objects, equipment or other features that, under probable conditions, cannot be removed or stored during use as a storm shelter.
- (b) Excluded spaces. Spaces such as mechanical and electrical rooms, storage rooms, attic and crawl spaces, shall not be considered as net floor area permitted to be occupied during a hurricane.
- (c) Occupancy capacity. The occupancy capacity shall be determined by dividing the net area of the enhanced hurricane protection area by 15 square feet net floor area per person.
- (d) Toilets and hand washing facilities. Provide minimum water closets and lavatories as required by International Building Code Chapter 29, these facilities shall be accessed within the building and located within the perimeter of the enhanced hurricane protection area.
- (e) Accessibility. Where the refuge occupancy accommodates more than 50 persons, provide an ADA-accessible route to a shelter area at each facility with a minimum of one wheelchair space for every 200 enhanced hurricane protection area occupants determined per ROH Section 16-14.3(c).

(Added by Ord. 12-34)

**Sec. 16-14.4 Design wind, rain, and impact loads.**

- (a) Structural design criteria. The building Main Wind Force Resisting System and structural components shall be designed per ASCE 7 for a 115 mph minimum peak 3-second gust design speed with a load factor of 1.6, and an Importance Factor for Occupancy Category III. Topographic and directionality factors shall be the site-specific values determined per Article 1, Section 1609. Design for interior pressure based on the largest opening in any exterior façade or roof surface.
- (b) Windborne debris missile impact for building enclosure elements. Exterior glazing and glazed openings, louvers, roof openings and doors shall be provided with windborne debris impact resistance or protection systems conforming to ASTM E1996-05 Level D, i.e., 9 lb. 2 X 4 @ 50 fps (34 mph).
- (c) Cyclic pressure loading of impact resistive glazing or windborne impact protective systems. Resistance to the calculated maximum inward and outward pressure shall be designed to conform to ASTM E1996-05.
- (d) Windows. All unprotected window assemblies and their anchoring systems shall be designed and installed to meet the wind load and missile impact criteria of this section.
- (e) Window protective systems. Windows may be provided with permanent or deployable protective systems, provided the protective system is designed and installed to meet the wind load and missile impact criteria and completely covers the window assembly and anchoring system.
- (f) All exterior and interior doors subject to possible wind exposure and/or missile impact shall have doors, frames, anchoring devices, and vision panels designed and installed to resist the wind load and missile impact criteria or such doors, frames, anchoring devices, and vision panels shall be provided with impact protective systems designed and installed to resist the wind load and missile impact criteria of this section.
- (g) The building enclosure, including walls, roofs, glazed openings, louvers and doors, shall not be perforated or penetrated by windborne debris, as determined by compliance with ASTM E1996-05 Level D.
- (h) Parapets shall satisfy the wind load and missile impact criteria of the exterior envelope.
- (i) Roofs.
  - (1) Roof openings. Roof openings (e.g., HVAC fans, ducts, skylights) shall be provided with protection for the wind load and missile impact criteria of ROH Sections 16-14.4(b) and 16-14.4(c).
  - (2) High wind roof coverings. Roof coverings shall be specified and designed according to the latest ASTM Standards for high wind uplift forces.
  - (3) Roof drainage. Roofs shall have adequate slope, drains and overflow drains or scuppers sized to accommodate 100-year hourly rainfall rates in accordance with ROH Section 16-1.1(181), but not less than 2-inches per hour for 6 continuous hours.

(Added by Ord. 12-34)

**Sec. 16-14.5 Ventilation.**

- (a) Mechanical ventilation. Mechanical ventilation as required per the International Mechanical Code. Air intakes and exhausts shall be designed and installed to meet the wind load and missile impact criteria of ROH Section 16-14.4(b).
- (b) HVAC equipment anchorage. HVAC equipment mounted on roofs and anchoring systems shall be designed and installed to meet the wind load criteria. Roof openings for roof-mounted HVAC equipment shall have a 12-inch-high curb designed to prevent the entry of rain water.

(Added by Ord. 12-34)

**Sec. 16-14.6 Standby electrical system capability.**

- (a) Provide a standby emergency electrical power system per International Building Code Chapter 27 and NFPA 70 Article 700 Emergency Systems and Article 701 Legally Required Standby Systems, which shall have the capability of being connected to an emergency generator or other temporary power source. The emergency system capabilities shall include:
  - (1) An emergency lighting system,
  - (2) Illuminated exit signs,
  - (3) Fire protection system(s), alarm and sprinkler, and
  - (4) Minimum mechanical ventilation for health/safety purposes.
- (b) Emergency generator. When emergency generators are pre-installed, the facility housing the generator, permanent or portable, shall be an enclosed area designed to protect the generators from wind and missile impact. Generators hardened by the manufacturer to withstand the area's design wind and missile impact criteria shall be exempt from the enclosed area criteria requirement.

(Added by Ord. 12-34)

**Sec. 16-14.7 Quality assurance.**

- (a) Information on construction documents. Construction documents shall include design criteria, the occupancy capacity of the enhanced hurricane protective area, and project specifications shall include opening protection devices. Floor plans shall indicate all enhanced hurricane protection area portions of the facility and exiting routes there from. The latitude and longitude coordinates of the building shall be recorded on the construction documents.
- (b) Special inspection. In addition to the requirements of International Building Code Chapter 17, special inspections shall include at least the following systems and components:
  - (1) Roof cladding and roof framing connections.
  - (2) Wall connections to roof and floor diaphragms and framing.
  - (3) Roof and floor diaphragm systems, including collectors, drag struts and boundary elements.
  - (4) Vertical wind force-resisting systems, including braced frames, moment frames and shear walls.
  - (5) Wind force-resisting system connections to the foundation.
  - (6) Fabrication and installation of systems or components required to meet the impact-resistance requirements of ROH Section 16-1.1(177).

**Exception:** Fabrication of manufactured systems or components that have a label indicating compliance with the wind-load and impact-resistance requirements of this code.

- (c) Quality assurance plan. A construction quality assurance program shall be included in the construction documents, including:
- (1) The materials, systems, components and work required to have special inspection or testing by the building official or by the registered design professional responsible for each portion of the work.
  - (2) The type and extent of each special inspection.
  - (3) The type and extent of each test.
  - (4) Additional requirements for special inspection or testing for seismic or wind resistance.
  - (5) For each type of special inspection, identification as to whether it will be continuous special inspection or periodic special inspection.
- (d) Peer review. Construction Documents shall be independently reviewed by a Hawaii-licensed Structural Engineer. A written opinion report of compliance shall be submitted to the State Civil Defense, Building Official, and owner.
- (Added by Ord. 12-34)

**Sec. 16-14.8 Maintenance.**

The building shall be periodically inspected every three years and maintained by the owner to ensure structural integrity and compliance with this section. A report of inspection shall be furnished to the State Civil Defense. (Added by Ord. 12-34)

**Sec. 16-14.9 Compliance re-certification if altered, deteriorated, or damaged.**

Alterations shall be reviewed by a Hawaii-licensed structural engineer to determine whether any alterations would cause a violation of this section. Deterioration or damage to any component of the building shall require an evaluation by a Hawaii-licensed structural engineer to determine repairs necessary to maintain compliance with this section. (Added by Ord. 12-34)