Appendix B

2010 Florida Building Code—Building
Section 423.25 Public Shelter Design Criteria
423.25 Public shelter design criteria.

423.25.1 New facilities. New educational facilities for school boards and community college boards, unless specifically exempted by the board with the written concurrence of the applicable local emergency management agency or the Department of Community Affairs (DCA), shall have appropriate areas designed as enhanced hurricane protection areas (EHPAs) in compliance with this section.

Exception: Facilities located, or proposed to be located, in a Category 1, 2, or 3 evacuation zone shall not be subject to these requirements.

423.25.1.1 Enhanced hurricane protection areas (EHPA). The EHPA areas shall provide emergency shelter and protection for people for a period of up to 8 hours during a hurricane.

423.25.1.1.1 The EHPA criteria apply only to the specific portions of (K-12) and community college educational facilities that are designated as EHPAs.

423.25.1.2 The EHPAs and related spaces shall serve the primary educational or auxiliary use during non-shelter occupancy.

423.25.2 Site. Factors such as low evacuation demand, size, location, accessibility and storm surge may be considered by the board, with written concurrence of the local emergency management agency or the DCA, in exempting a particular facility.

423.25.2.1 Emergency access. EHPAs shall have at least one route for emergency vehicle access. The emergency route shall be above the 100-year floodplain. This requirement may be waived by the board, with concurrence of the local emergency management agency or the DCA.

423.25.2.2 Landscaping. Landscaping around the EHPAs shall be designed to preserve safety and emergency access. Trees shall not conflict with the functioning of overhead or underground utility lines, or cause laydown or impact hazard to the building envelope.

423.25.2.3 Parking. During an emergency condition, vehicle parking shall be prohibited within 50 feet (15,240 mm) of an EHPA. Designated EHPA parking areas may be unpaved.

423.25.2.4 Signage. Floor plans of the facility, indicating EHPAs, shall be mounted in the emergency manager's office/area.

423.25.3 Design. EHPAs may be above or below ground and may have more than one story, provided the design satisfies the wind load and missile impact criteria. Modular and open-plan buildings may serve as EHPAs provided the design satisfies the wind load and missile impact criteria.
423.25.3.1 **Excluded spaces.** Spaces such as mechanical and electrical rooms, storage rooms, open corridors, kitchens, science rooms and labs, vocational shop areas and labs, computer rooms, attic and crawl spaces shall not be used as EHPAs.

423.25.3.2 **Capacity.** Fifty percent of the net square feet of a designated educational facility shall be constructed as EHPAs. The net square feet shall be determined by subtracting from the gross square feet those spaces, such as mechanical and electrical rooms, storage rooms, open corridors, kitchens, science rooms and labs, vocational shop areas and labs, computer rooms, attic and crawl spaces that shall not be used as EHPAs. The board, with concurrence of the applicable local emergency management agency or DCA, may adjust this requirement if it is determined to be in its best interest. The capacity of an EHPA shall be calculated at 20 square feet (2 m²) per occupant (adults and children five years or older).

423.25.3.3 **Toilets.** Toilet and hand washing facilities should be located within the EHPAs and provided at one toilet and one sink per 40 occupants. These required toilet and hand-washing facilities are not in addition to those required for normal school occupancy and shall be included in the overall facility fixture count.

423.25.3.3.1 Support systems for the toilets, e.g., bladders, portable toilets, water storage tanks, etc., shall be capable of supplying water and containing waste, for the designed capacity of the EHPAs.

423.25.3.3.2 Plumbing and valve systems of "normal" toilets within the EHPAs may be designed for conversion to emergency operation to meet the required demand.

423.25.3.4 **Food service.** Where feasible, include counter tops for food distribution functions in the EHPAs.

423.25.3.5 **Manager's office.** An administration office normally used by a school administrator shall be identified as the EHPA manager's office and shall be located within the EHPA. The office shall have provisions for standby power, lighting, communications, main fire alarm control panel and storage for the manager's equipment.

423.25.4 **Structural standard for wind loads.** At a minimum, EHPAs shall be designed for wind loads in accordance with ASCE 7, Minimum Design Loads for Buildings and Other Structures, Risk Category IV-(Essential Buildings). Openings shall withstand the impact of wind-borne debris missiles in accordance with the impact and cyclic loading criteria per ASTM E-1886 and ASTM E-1996 or SBC/SSTD 12. Based on a research document, Emergency Shelter Design Criteria for Educational Facilities, by the University of Florida for the DOE, it is highly recommended by the department that the shelter be designed using the map wind speed plus 40 mph.
423.25.4.1 Missile impact criteria. The building enclosure, including walls, roofs, glazed openings, louvers and doors, shall not be perforated or penetrated by a flying object. For walls and roofs, the missile criteria are as provided in ASTM E-1886 and ASTM E-1996-or SBC/SSTD 12.

423.25.4.1.1 Materials used for walls, roofs, windows, louvers, and doors shall be certified for resistance to missile impact criteria.

423.25.4.1.2 The glazed openings or permanent protective systems over glazed openings shall be designed for cyclic loading.

423.25.4.2 Roofs. Roof decks shall be cast-in-place 4-inch (102 mm) or more, normal weight concrete. Concrete decks shall be waterproof. Systems other than cast-in-place concrete shall have adequate bearing, anchorage against wind uplift, diaphragm action, and resistance to rain that are equivalent to a cast-in-place system.

Exception: Structural precast concrete roofs, composite metal decks with normal weight concrete roofs, or other systems and materials that meet the wind load and missile impact criteria may be used.

423.25.4.2.1 Light weight concrete or insulating concrete may be used on roof decks of EHPAs provided the roof decks are at least 4-inch (102 mm) cast-in-place normal weight concrete or other structural systems of equivalent strength.

423.25.4.2.2 Roof openings (e.g., HVAC fans, ducts, skylights) shall be designed to meet the wind load and missile impact criteria.

423.25.4.2.3 Roof coverings shall be specified and designed according to the latest ASTM and Factory Mutual Standards for materials and wind uplift forces. Roofs shall be inspected by a licensed engineer/architect and a representative of the roofing manufacturer.

423.25.4.2.4 Roofs shall have adequate slope and drains sized for normal use and shall have emergency overflow.

423.25.4.2.5 Parapets shall satisfy the wind load and missile impact criteria; roof overhangs shall resist uplift forces.

423.25.4.3 Windows. All unprotected window assemblies and their anchoring systems shall be designed and installed to meet the wind load and missile impact criteria.

423.25.4.3.1 Windows may be provided with permanent 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.
423.25.4.3.2 EHPAs shall have mechanical ventilation systems. Ventilation shall be provided at a minimum rate of 2 cfm per square foot of EHPA floor area. The mechanical ventilation system shall be connected to the EHPA's emergency power.

423.25.4.4 Doors. 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 covered with permanent protective systems designed and installed to resist the wind load and missile impact criteria.

423.25.4.5 Exterior envelope. The exterior envelope, louvers over air intakes and vents, and gooseneck type intakes and vents of EHPAs shall be designed and installed to meet the wind load and missile impact criteria.

423.25.4.5.1 HVAC equipment mounted on roofs and anchoring systems shall be designed and installed to meet the wind load criteria.

423.25.4.5.2 Roof mounted HVAC equipment shall have a 12-inch-high (305 mm) curb around the roof opening and be designed to prevent the entry of rain water.

423.25.4.6 Foundations and floor slabs. Foundations shall be designed to resist all appropriate loads and load combinations, including overturning moments due to wind. The floor elevation and necessary life safety and other emergency support systems of EHPAs shall be elevated above the maximum storm surge inundation elevation associated with a Category 4 hurricane event. Storm surge elevations shall be identified by the most current edition of the regional Sea Lake and Overland Surges from Hurricanes (SLOSH) studies and atlases.

423.25.5 Electrical and standby emergency power system. The EHPA shall be provided with a standby emergency electrical power system, per Chapter 27, NFPA 70 Articles 700 and 701, which shall have the capability of being connected to a backup generator or other optional power source. Where economically feasible, an equivalent photovoltaic system may be provided. The EHPA's emergency systems includes, but are not limited to: (1) an emergency lighting system, (2) illuminated exit signs, (3) fire protection system(s), alarm (campus wide) and sprinkler, and (4) minimum ventilation for health/safety purposes. The fire alarm panel shall be located in the EHPA manager's office. A remote annunciator panel shall be located in or adjacent to the school administrator's office. When generators are installed, the facility housing the generator, permanent or portable, shall be an enclosed area designed to protect the generators from wind and missile impact. Air intakes and exhausts shall be designed and installed to meet the wind load and missile impact criteria. 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.
423.25.5.1 EHPA lighting. Emergency lighting shall be provided within the EHPA area, EHPA manager's office, toilet rooms, main electrical room and generator spaces and shall be at least 10 footcandles (100 lux) of general illumination, which can be reduced to 1/2 footcandle (5 lux) in the sleeping areas during the night.

423.25.5.2 Optional standby circuits. Additional nonlife safety systems, as defined by Chapter 27, NFPA 70 Article 702 (optional standby circuits), may be supplied power, if available, by the Standby Emergency Power System. These systems shall be connected to the Standby Emergency Power System via an electrical subpanel to the Standby Electrical Power System's main electrical panel. This will allow selective or total load shedding of power if required. The fire alarm, emergency lighting and illuminated exit signs throughout the entire campus shall receive first priority to power provided by the Standby Emergency Power System per Chapter 27, NFPA 70 Article 700. The systems listed are not all encompassing but are in order of priority. Local officials may request additional non-life safety systems they deem necessary for health, welfare and safety of the public during occupancy:

1. Remainder of the school's campus security lighting (building and site).
2. Additional ventilation systems within the EHPA, including heat.
3. Intercom system.
4. Food storage equipment.
5. Additional electric receptacles, other than those required by Section 423.25.5.3.

423.25.5.3 Receptacle outlets. A minimum of four electrical outlets, served with power from the standby circuits, shall be provided in the EHPA manager's office.

423.25.6 Inspections. EHPAs shall be considered "threshold buildings" in accordance with Section 553.71(7), Florida Statutes, and shall comply with Sections 553.79(5), 553.79(7), and 553.79(8), Florida Statutes.

423.25.6.1 Construction of EHPAs shall be inspected during the construction process by certified building code inspectors or the design architect/engineer(s) certified pursuant to Part XII Chapter 468, Florida Statutes and threshold inspectors for compliance with applicable rules and laws.

423.25.6.2 The emergency electrical systems shall be inspected during the construction process by certified electrical inspector or Florida-registered professional engineers certified pursuant to Part XII Chapter 468, Florida Statutes, skilled in electrical design.

423.25.6.3 EHPAs shall be inspected and recertified for compliance with the structural requirements of this section every five years by a Florida-registered professional engineer skilled in structural design. If any structural system, as specified in this section, is damaged or replaced, the recertification shall be obtained prior to the beginning of the next hurricane season.
23.25.6.4 All shutter systems, roofs, overflow scuppers, and structural systems of EHPAs shall be inspected and maintained annually prior to hurricane season and after a major event. All emergency generators shall be inspected under load conditions including activation of the fire alarms, emergency lights as per applicable equipment codes and NFPA standards, and including mechanical systems and receptacles connected to the emergency power.

2013 Florida Building Code—Building, Fifth Edition

The 2013 FBC—Building is scheduled to become effective on December 31, 2014. The public shelter design criteria provisions of 2010 FBC—Building will be relocated/renumbered in Chapter 4 to be Section 453 instead of Section 423. This revision was necessary to bring the ICC 500 storm shelter standard code reference of the FBC into alignment with the 2012 International Building Code (IBC). The ICC 500 reference is located in Section 442 in the 2010 FBC—Building, but Section 423 Storm Shelters in the 2012 IBC. Therefore, the ICC 500 reference will be located in Section 423 of 2013 FBC—Building.

Other revisions are highlighted below in yellow with additions in underline font and deletions in strikethrough font:

4253.25.1 New facilities. New educational facilities for school boards and community college boards, unless specifically exempted by the board with the written concurrence of the applicable local emergency management agency or the Florida Division of Emergency Management (DEM) Department of Community Affairs (DCA), shall have appropriate areas designed as enhanced hurricane protection areas (EHPAs) in compliance with this section.

Exception: Facilities located, or proposed to be located, in a Category A, B or C 1, 2, or 3 evacuation zone shall not be subject to these requirements.

All further references to DCA in the code are then struck (DCA) and replaced by DEM (DEM).

4253.25.3.2 Capacity. Fifty percent of the net square feet of a designated educational facility shall be constructed as EHPAs. The net square feet shall be determined by subtracting from the gross square feet those spaces, such as mechanical and electrical rooms, storage rooms, open corridors, kitchens, science rooms and labs, vocational shop areas and labs, computer rooms, attic and crawl spaces that shall not be used as EHPAs. The board, with concurrence of the applicable local emergency management agency or DEM DCA, may adjust this requirement if it is determined to be in its best interest. The capacity of an EHPA shall be calculated at 20 square feet (1.86 m²) per occupant (adults and children five years or older).

4253.25.4.3.2 EHPAs shall have mechanical ventilation systems. Ventilation shall be provided at a minimum rate of 2 cfm per square foot (0.6 m³/min. per square meter) of EHPA floor area. The mechanical ventilation system shall be connected to the EHPA's emergency power.

4253.25.6 Inspections. EHPAs shall be considered "threshold buildings" in accordance with Section 553.71(11), Florida Statutes, and shall comply with Sections 553.79(5), 553.79(7), and 553.79(8), Florida Statutes.