Appendix E

Hurricane Evacuation Shelter Space Capacity and Net Usability Factors

Hurricane Evacuation Shelter Space Capacity

Fifty percent of the net square footage (NSF) of new educational facilities are required to be designed and constructed to meet the EHPA code provisions. Certain types of spaces may be excluded from the EHPA provisions (excluded spaces). However, based on design constraints or preferences, the excluded spaces may be incorporated into or within an EHPA's exterior envelope. The EHPA occupant capacity is used by board staff, emergency managers and design professionals to determine the occupant capacity and infrastructure-related operational requirements (such as quantities of potable water, toilets, hand washing sinks, and parking). EHPA's may be located in a single large room or a combination of rooms, located on one or more stories, and possibly in more than one building. To begin the EHPA capacity calculation process, identify those rooms or spaces that are to be excluded. Section 453.25.3.1, *Florida Building Code--Building* and Section 252.385(4)(b), F.S. serve as guides to identify excluded space.

The following is a summary of example excluded spaces:

Excluded Spaces. Mechanical, electrical, plumbing and other utility rooms; telecommunication and information technology equipment rooms; storage rooms and closets; exterior/outside circulation and open corridors; restrooms, toilet rooms, and shower and drying areas; kitchen and food preparation rooms and serving areas; science rooms and labs; computer and information technology rooms and labs; mechanical shop areas; vocational and industrial technology shop areas and labs; library and media rooms and labs; administrative office and support areas; record vaults; and, attics and crawl spaces.

Included Spaces. All other spaces, rooms and areas not listed as an excluded space.

The NSF of EHPA floor space is determined by subtracting excluded spaces from the designated educational facility's gross square feet (GSF).

Net Square Feet, NSF = Gross Square Feet, GSF - ∑ Excluded Space Floor Areas, sq.ft.

The board, with the concurrence of the local emergency management agency or the Division may adjust this requirement if in its best interest. This includes determination of excluded/included spaces or formula for calculation of design occupant capacity.

Net usable floor area is defined as follows:

Usable Square Feet (USF, or Net USF). NSF floor area of included spaces reduced to account for: structural building features, such as thickness or dimensions of partitions, walls and columns; fixed, mounted or movable objects, such as instructive, illustrative or decorative features; cabinetry, casework and consoles; furniture, fixtures and equipment; or other features that under probable conditions cannot be removed or stored away to maximize available floor space during use as a hurricane evacuation shelter.

Net Usable Square Feet, USF = Net Square Feet, NSF - ∑ Excluded Floor Areas, sq.ft.

As an alternative method to calculate USF, the following empirical usability factors can be used instead:

1. Reduce the NSF of either individual or multiple cumulative designated spaces (rooms or areas) with concentrated furnishings or fixed seating by 50 percent. Examples are auditoriums, amphitheater, conference rooms and certain classroom types with numerous closely spaced furnishings, materials, supplies, or instructive, illustrative or decorative features (e.g., primary or elementary). To calculate a space's Net USF multiply NSF by 0.50.
2. Reduce the net square footage of either individual or multiple cumulative designated spaces with unconcentrated furnishings (e.g., loose tables and chairs) and no fixed seating by 35 percent. Examples are educational classrooms and skills labs, dining areas, band and music rooms, and exhibition galleries. To calculate a space's Net USF multiply NSF by 0.65.
3. Reduce the NSF of either individual or multiple cumulative designated spaces (rooms or areas) with assembly or open floors and without fixed seating by 15 percent. Examples are gymnasiums, dance floors, open multipurpose rooms, and interior/inside circulation corridors. Retractable seating is not considered fixed seating. To calculate a space's Net USF multiply NSF by 0.85.

An example list of Department of Education room design codes, descriptions and reduction factors is available in Table E-2. Table E-2's Net Usability Factors are empirical in that they are based upon large-scale typical conditions. Boards, local emergency management agencies and shelter program partners, and design professionals may adjust the empirical usability factors to address site-specific or operational conditions.

If gross square footage (outside wall perimeter dimensions) is known instead of net square footage (inside wall surface perimeter dimensions), multiply GSF by 0.943 to estimate NSF.

GSF * 0.943 = NSF, or to convert NSF to GFS: **NSF * 1.06 = GSF**

The hurricane evacuation shelter capacity of an EHPA is calculated using 20 square feet per occupant. The FBC formula is as follows:

Occupant Capacity = (GSF - ∑ Excluded Space, sq.ft.) / 20

To calculate occupant capacity based upon Net USF floor area, the formula is:

Occupant Capacity = ∑ (NSF Included Spaces, sq.ft. * Usability Factors) / 20

Or,

Occupant Capacity = [(GSF * 0.943) - ∑ (NSF Included Spaces, sq.ft.*Usability Factors)]/20

The designer should be aware that SpNS "client" occupant capacity is based upon a recommended 60 sq.ft. per client. The 60 sq.ft. includes an allowance for an oversized cot or bed, medical equipment and supplies, and access for medical staff or care-giver.

In an emergency, on a short-term basis during hurricane conditions, the American Red Cross and emergency management officials may temporarily reduce the occupant floor area requirement to 15 square feet per occupant. This emergency contingency measure does not affect the EHPA criteria's requirement to use 20 square feet per occupant to calculate design capacity.

The designer should be aware that for adults and children with certain access or functional needs support service (FNSS) requirements, such as persons that need wheelchairs or scooters, lift equipment, service animal and/or personal assistance services, FEMA recommends a floor space allocation of 100 sq.ft. (assumed Net USF). For design and planning purposes, the larger FNSS accommodation space may apply to one (1) of every 10 occupants. In some cases the 100 sq.ft. may be shared with a caregiver (i.e., 50 sq.ft. each).

Assuming that the FNSS space is shared by a caregiver (50 sq.ft. each), replace 20 sq.ft. with 26 sq.ft. This will reduce the facility's occupant capacity to account for the FNSS spaces. However, the EHPA code doesn't recognize use of the larger occupant allowance. Therefore, 20 sq.ft. should be used to calculate mechanical, electrical, plumbing and other related design feature requirements.

For guidance purposes only, Table E-1 provides the Division's recommendations for calculating the number of occupants of both evacuation and extended duration shelter types. The floor area allowances apply to all sizes of shelters from small with design occupants of less than 50 to mega-shelters with thousands of occupants. The allowances include additional accommodation space for persons needing FNSS. The definitions for the shelter types can be found in Appendix D, Glossary. To use Table E-1, identify the Type of Shelter (or expected duration of occupancy) and the appropriate Floor Area Minimum Recommendation. Then replace the code minimum value of "20" in the Occupant Capacity formula(s) given previously with the value selected from Table E-1. The calculated occupant capacity will provide the total number of occupants with a reduction to accommodate FNSS spaces.

As an example, for a general population risk evacuation shelter with a total of 10,000 NSF of floor area and 0.85 usability factor, replace the "20" with "26" as follows:

(10,000 * 0.85) / 26 = 326 occupant spaces

Of the 326 total calculated occupant spaces, two of 10 (2:10), or 20 percent, 65 are needed to accommodate FNSS occupants (@ 50 Net USF each). The remaining 261 code minimum spaces, or ~80 percent, are based on 20 Net USF each.

326 * 0.20 = 65 FNSS spaces @ 50 Net USF each
326 - 65 = 261 code minimum spaces @ 20 Net USF each

Table E-1. Florida Hurricane Evacuation Shelter Occupant Space Calculation Recommendations with FNSS for Dormitory Areas		
Type of Shelter (Duration of Occupancy)	**Floor Area Minimum Recommendation, average net usable sq.ft.**	**Floor Area Range, average net usable sq.ft.**
General Population		
EHPA Minimum Risk Evacuation (8 hours)	20	20
ICC 500 Minimum Risk Evacuation (24 hours)	20	20
Risk Evacuation Shelter (24 - 72 hours)	26	22-46
Host Evacuation Shelter (24 - 72 hours)	26	26-46
Recovery/Short Term Shelter (72 hours - 2 weeks)	42	42-64
Long Term Shelter (more than 2 weeks)	60	60-82
Special Needs Population		
EHPA Minimum Risk Evacuation (8 hours)	20	20
ICC 500 Minimum Risk Evacuation (24 hours)	20	20
Risk Evacuation Shelter (24 - 72 hours)	60	60-82
Host Evacuation Shelter (24 - 72 hours)	60	60-82
Recovery/Short Term Shelter (72 hours - 2 weeks)	80	80-100
Long Term Shelter (more than 2 weeks)	100	100-120

Table E-2. Hurricane Evacuation Shelter Net Usability Factor

Design Code Number	Design Description	Minimum Room sq.ft.	Normal sq.ft. per student	Net Usability Factor
00001	Primary Classroom (K-3)	600	40	0.50
00002	Intermediate Class (4-8)	600	39	0.65
00003	Senior High Class (9-12)	600	32	0.65
00004	Intermediate Class (*no longer used*)	608	32	0.65
00005	Elementary Resource (*no longer used*)	416	32	0.65
00008	Elementary Math Skills Lab (*no longer used*)	608	32	0.65
00009	Elementary Social Studies Lab (*no longer used*)	608	32	0.65
00010	Primary Skills Lab (K-3)	600	49	0.65
00011	Intermediate/Middle Skills Lab (4-8)	600	39	0.65
00012	Senior High Skills Lab (9-12)	600	32	0.65
00015	Elementary Open Plan Area (*no longer used*)	1,920	32	0.65
00021	Middle/Junior High Resource (*no longer used*)	416	32	0.65
00024	Middle/Junior High Math Skills Lab (*no longer used*)	608	32	0.65
00025	Middle/Junior High Social Studies Lab (*no longer used*)	608	32	0.65
00026	Middle/Junior High Lang Arts Lab (*no longer used*)	608	32	0.65
00029	Middle/Junior High Art Lab (*no longer used*)	630	42	0.50
00030	Primary Open Plan (K-3)	1,368	38	0.65
00031	Intermediate/Middle Open Plan (4-8)	1,408	32	0.65
00032	Senior High Open Plan (9-12)	1,600	27	0.65
00035	Senior High Class (*no longer used*)	513	27	0.65
00036	Senior High Resource (*no longer used*)	416	32	0.65
00039	Senior High Math Skills Lab (*no longer used*)	512	32	0.65
00040	Resource Room	290	29	0.65
00041	Senior High Language Arts Lab (*no longer used*)	512	32	0.65
00047	Senior High Art Lab (*no longer used*)	530	53	0.50
00050	Art – Elementary	600	37	0.50
00051	Art – Middle	630	42	0.50
00052	Art – Senior High	530	53	0.50
00055	Music - Elementary	1000	0	0.50
00060	ESE Special Class (Part Time)	650	65	0.50
00061	ESE Part-time	600	65	0.50
00062	ESE Full-Time	600	95	0.50
00063	ESE Vocational	600	95	0.50
00064	ESE Part Time/Full Time Lab	600	0	0.50
00065	ESE Resource	290	95	0.50
00075	Vocal Music Class (Middle-Senior High)	513	57	0.65
00076	Band Class (Middle-Senior High)	1,200	35	0.65
00077	Orchestra Class (Middle-Senior High)	513	57	0.65
00078	General Music Class (Middle-Senior High)	518	37	0.65
00079	Guitar Lab (Middle-Senior High)	518	37	0.65
00110	PE Multipurpose Room (Middle-Senior High)	800	0	0.85
00111	Junior High Gym	1	0	0.85
00112	Senior High Gym	1	0	0.85
00113	Gym Seating	1	0	0.85
00118	PE Wrestling Room	402	0	0.85
00119	PE Gymnastics & Dance	420	0	0.85
00316	Teacher Lounge/Dining	1	0	0.65
00317	General School Space	1	0	0.65
00340	Dining Area	1	0	0.65
00360	Auditorium	1	0	0.50
00361	Multipurpose Room	1	32	0.65
00363	Stage	1	0	0.65
00370	Lobby	1	0	0.85
00700	Inside Circulation	1	0	0.85
00708	J.R.O.T.C.	1	42	0.65
00802	Instructional Conference Room	225	0	0.50
00830	Ensemble	300	0	0.65
00840	Vocational Related Classroom	256	0	0.65