

IV. STRATEGY FOR PUBLIC SHELTER DEFICIT REDUCTION

The Division is statutorily responsible (per Sections 252.35(2)(a)2, and 252.385(1) and (2), Florida Statutes) for developing a strategy to eliminate the deficit of “safe” public hurricane shelter space in Florida. The Division’s strategy includes the following components:

- Component 1 - Develop and implement model hurricane evacuation shelter selection guidelines that define minimum criteria for “safe” public shelter space.
- Component 2 - Implement a shelter survey program and prepare an inventory of buildings, both public and private, that are appropriately designed and located to serve as hurricane evacuation shelters.
 - A. Evaluate existing shelter inventory facilities to determine their status with respect to established guidelines;
 - B. Determine actual hurricane evacuation shelter space capacity in existing inventory and identify additional unutilized space; and
 - C. Identify and evaluate facilities not currently in local shelter inventories to provide options for increasing shelter space capacity.
- Component 3 - Retrofit appropriate facilities so that, at a minimum, hurricane evacuation shelters meet model guidelines.
- Component 4 - All new construction of public school facilities that are appropriate for use as hurricane evacuation shelters, are to be designed and built to conform to the Public Shelter Design Criteria as established in the 1999 *State Requirements for Educational Facilities* (SREF), and carried over into *The Florida Building Code*, Section 423.25.
- Component 5- Shelter demand reduction through improved public information and education on hurricane shelter and evacuation issues.
- Component 6- Shelter demand reduction through decreased evacuation need.

In the wake of Hurricane Andrew in 1992, the State of Florida recognized the need to improve the availability and safety of public hurricane shelter space for its vulnerable citizens. The 1993 Legislature enacted a law that created a comprehensive strategy to eliminate the statewide deficit of “safe” hurricane shelter space. This strategy included a hurricane shelter survey and retrofit program, and design and construction of new public school facilities to enhanced “public shelter design criteria.” In 1993 the statewide hurricane shelter space deficit was estimated to be about 150,000 spaces. However, the actual status of many of Florida’s designated hurricane shelters was unknown.

The Florida Division of Emergency Management (the Division) was directed to administer a program to survey existing schools, universities, community colleges, and other state, county and municipally-owned public buildings to identify those that are appropriately designed and located to serve as shelters. The Division was also tasked with annually providing a list of facilities recommended to be retrofitted using state funds. To accomplish these tasks, The Division needed to develop and implement minimum safety criteria; that is, it had to define “safe.” The safety criteria had to be based upon recognized state and national standards, guidelines and “best practices,” and achievable within the means and resources available to the Division and its stakeholder partners.

After two years of research and field-testing, and in consultation with the University of Florida School of Building Construction, the Division recognized the American Red Cross’ *Guidelines for Hurricane Evacuation Shelter Selection* (ARC 4496) as the minimum safety criteria. ARC 4496 provides safety criteria for storm surge, rainfall flooding and wind hazards, plus a basic least-risk decision making process. However, to apply the criteria to field conditions and typical building stocks, the Division expanded its interpretation of ARC 4496 into a prescriptive least-risk decision making model. The model is qualitative and based largely upon building performance assessments after Hurricane Andrew (i.e., give preference to building qualities, or characteristics, that performed well in Hurricane Andrew, and avoid (or mitigate) those that performed poorly.) A condensed version of the model can be viewed at the following URL address:

<http://floridadisaster.org/bpr/Response/engineers/documents/CheatSheet.pdf>

The field survey procedures to implement the safety criteria were then incorporated into a modified version of the Federal Emergency Management Agency’s (FEMA) *Natural Hazard Vulnerability Survey Instructions* (FEMA TR-84). This type of survey and evaluation can be performed at relatively low cost by building inspectors, construction technicians, architects and engineers. The typical cost per building surveyed ranges from about \$500 to \$1,500, with an average of about \$850.

The Florida Division of Education (FDOE) concurrently developed a public shelter design criterion for use in new school facility construction projects. The FDOE, in consultation

with the University of Florida School of Building Construction, appointed a committee to assist in development of the criteria. The committee included representatives from many stakeholder agencies (e.g., state and local emergency management, school board, community college and university officials, ARC, architects, engineers, etc.) The charge to the committee was to develop a set of practical and cost-effective criteria. The final criteria recommended by the committee was consistent with the mass care provisions of the ARC's *Mass Care—Preparedness and Operations* (ARC 3031), and the hurricane safety criteria of ARC 4496.

The recommended wind design criterion was the American Society of Civil Engineers Standard 7 (ASCE 7) with a 40 mile per hour increase in basic map wind speed and an importance factor $I=1.00$. In addition, the hurricane shelter's exterior envelope (walls, roofs, windows, doors, louvers, etc.) must all meet a basic windborne debris impact standard (i.e., SSTD 12; 9lb 2x4 @ 34 mph). However, school board officials successfully protested the increase in base wind speed, so the minimum wind design criterion was reduced to ASCE 7 at basic map wind speed with an essential facility importance factor $I=1.15$. The 40 mile per hour increase in base wind speed is still recommended within the code, but not required. The criteria were promulgated into the State Requirements for Educational Facilities in April, 1997. The Division's model hurricane shelter evaluation criteria's preferred rankings were adjusted to be consistent with FDOE's public shelter design criteria (also known as the Enhanced Hurricane Protection Area or EHPA criteria).

By 1999, using a combination of in-house staff and engineering consultants, the Division had completed about 25 percent of the statewide baseline survey of public hurricane shelters. However, the results of the survey were not encouraging. About 95 percent of the surveyed hurricane shelter spaces could not meet the ARC 4496 criteria. As examples, 45 percent of the shelters had unreinforced masonry walls, 84 percent had unprotected windows, and 50 percent were located in buildings with uncertified long span light weight roofs. The Division also found that buildings designed and constructed prior to the mid-1980's rarely met the ARC 4496 criteria, and often would have required major design and retrofit/mitigation renovations to meet ARC 4496. More than half of the hurricane shelters surveyed fell into this group. Modern buildings constructed after the mid-1980s were often designed to ANSI A58 or ASCE 7 wind design standards, and in many cases just needed window protection to meet ARC 4496.

Based upon the findings of the survey, Florida's hurricane shelter capacity dropped from 988,378 spaces reported in 1995 to only about 186,910 spaces in 1999. By 2000, the statewide deficit stood at more than 1.5 million spaces. For the first time in Florida history, emergency managers, ARC and school board officials could quantify both the safety and available capacity of public hurricane shelters, instead of relying upon anecdotal concerns. Now that the scope of the challenge was known, the Division and its partner agencies began to implement an aggressive hurricane shelter deficit elimination program.

To date, the Division has completed the first statewide baseline survey, and initiated a

second baseline survey. The results of the surveys are used by state and local agencies to prepare and implement strategies to reduce, and ultimately eliminate, the deficit of ARC 4496 shelter space. The survey program has not only identified about 37,848 “as-is” spaces, but also directly, or in some cases indirectly, led to creation of more than 56 percent of the state’s retrofit capacity. Both state and federal resources have been used to fund the survey program. To date, the estimated total cost of surveys is about \$3 million, or about \$6.33 per “as-is” or retrofitted space.

In 2000, the Florida Legislature enacted a law identifying an annual funding source to support hurricane shelter retrofitting projects. The retrofit projects are identified through the survey program, and are only recommended when the retrofit can create spaces that meet ARC 4496. Since 1999, Florida has invested \$23 million in state funds to retrofit existing buildings, and the federal Hazard Mitigation Grant Program (HMGP) has invested \$34 million. Through federal and state funding, Florida has created 380,228 ARC 4496 spaces at an average cost of \$150 per space. Figure 4-1 is an example of a retrofitted school facility.



Figure 4-1. Typical retrofitted school building with window and louver protection.

To reduce the retrofitting cost burden upon local agencies, Division and HMGP retrofit/mitigation funds were often “global matched,” which eliminated a local cash match. Global matching is the pooling of resources to achieve a common goal. Projects funded by Florida’s hurricane shelter retrofit program that can concurrently meet HMGP’s benefit-cost and

eligibility requirements are used to offset local match requirements for HMGP-funded retrofits. About 202,383 of the 380,228 federal and state funded retrofit spaces were created through global match. Local government and private sector agencies also created an additional 36,428 spaces through retrofitting. A total of 416,656 spaces (excludes 2006/2006A) have been created through retrofitting, which accounts for 51 percent of the statewide ARC 4496 space inventory.

For Fiscal Year 2006-2007, the Legislature signed into law HB 7121 as Chapter 2006-71. One of the sections of Chapter 2006-71 appropriates \$15 million to structurally enhance or retrofit public hurricane evacuation shelters, and directs the Division to establish a statewide grant application process. The grant application process generated 35 applications that, after determination of eligibility, could create 23,736 spaces at a total cost of \$15.6 million. The projects are expected to be initiated and completed over a 12 to 36 month period. Therefore, the hurricane shelter grants, in combination other federal, state and local funds are expected to create about 150,000 spaces over the next two years.

Chapter 2006-71 appropriates \$52.8 million to the Division to install permanent emergency power capacity at designated SpNS. The emergency power system must be adequate to ensure that client occupied areas have back-up electrical power to support air-conditioning, lights, life safety systems and medical equipment. Once installed, the generators will provide emergency power to support an estimated 28,645 SpNS spaces

The new school EHPA requirement has also had a significant impact upon the availability of ARC 4496 shelter space. Initial progress was slow, with an Auditor General's report in 2001 indicating only about 65 percent compliance. However, EHPA capacity has increased from an average of 35,000 spaces per year, to 63,000 spaces being constructed for 2004. Schools are funded primarily by state and local capital outlay funds, and school districts are generally reporting that the EHPA construction cost premium is about three to six percent. Since 1997, EHPA construction has created 358,980 spaces, which accounts for 44 percent of the statewide ARC 4496 space inventory. Figure 4-2 is an example of an EHPA school facility that is under construction.

Figure 4-2. New school facility being constructed to the public shelter design criteria.



Another major contributor to reduction of the state’s public hurricane shelter space deficit has been reduction in demand. Since 2000, Florida’s reported public hurricane shelter demand has been reduced by at least 540,200 spaces. This was accomplished through the use of more precise coastal mapping techniques, improved storm surge mapping, more accurate census data, and improvements in public education and hurricane evacuation study demand modeling. Previous hurricane evacuation studies often indicated that 25 percent or more of a vulnerable population would seek public shelter during an evacuation for a major hurricane, but more recent studies indicate that only about 15 percent will actually seek public shelter. This is consistent with the findings of recent post-storm assessments, that indicate less than 10 percent of vulnerable populations seek public shelter. With reduced demand, the quantity of required public hurricane shelter spaces is reduced.

Since 1995, Florida has made significant progress toward improving the safety and availability of public hurricane shelter space. This has been accomplished through a comprehensive strategy of surveys, retrofitting, new construction and demand-reduction components. Florida now has 23 counties with a demonstrable surplus of public hurricane shelter spaces. Also, for the first time in recent history, Florida has four regions (RPC 2 – Apalachee, RPC 6 – East Central Florida, RPC 10 –Treasure Coast and RPC 11- South Florida) with a demonstrable surplus of public hurricane shelter space. Based upon current trends, Figure EX-1 indicates that Florida will eliminate its deficit of public hurricane shelter space around 2011.

Figure 4-3. Graph of Florida’s progress in reducing the hurricane shelter deficit

