Plan B: Tactical Guidelines for Unconventional Rescue Challenges

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Certification Statement

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Abstract

This research problem was Indian River County Fire Rescue (IRCFR) did not have a disaster management plan that prepared emergency responders for the unconventional rescue challenges that were experienced with catastrophic events. The purpose was to identify, and compare factors that demanded unique mitigation methods. Also, to develop an effective action plan in the form of a Standard Operating Procedure (SOP) that would facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods. The action research methodology was used to answer the research questions of how unconventional rescues were defined, and what were the disaster related aspects of rescue operations that demanded unique methods to mitigate. Also answered were questions that identified how those problems impacted other agencies or industry and what actions they had taken. The procedures included the analysis of a comprehensive literature review from both recent and contemporary sources, personal interviews with field experts, and a survey of other fire departments to answer the research questions. The results indicated the most prevalent cause of difficult rescue during disaster operational periods to be hurricane shutters. The lack of escape routes produced by shutters presented unique fire and rescue challenges that increased the dangers to occupants as well as firefighting personnel. In addition, when firefighters were faced with unconventional fire and rescue challenges, the tendency was to adapt and force what was known to fit the situation in some way. This practice potentially creates negative and dangerous consequences to personnel and those they attempted to assist. The recommendations are: a) that a proactive approach to the problem is taken; b) create an SOP to be used as a tactical guideline for hurricane shuttered buildings; c) gain assistance from industry professionals; and d) train personnel consistent with the new policy.
# Table of Contents

Title Page .................................................................................................................. 1

Certification Statement.............................................................................................. 2

Abstract..................................................................................................................... 3

Table of Contents...................................................................................................... 4

Introduction .............................................................................................................. 5

Background and Significance .................................................................................. 5

Literature Review .................................................................................................... 10

Procedures.............................................................................................................. 24

   Limitations and Assumptions................................................................................ 31

Results..................................................................................................................... 33

Discussion............................................................................................................... 43

Recommendations................................................................................................... 53

References.............................................................................................................. 61

Appendix A: Hurricane Shutter Photographs......................................................... 64

Appendix B: Survey................................................................................................. 65

Appendix C: Survey Results.................................................................................... 67

Appendix D: Survey Validation & Respondents ..................................................... 69

Appendix E: Draft Standard Operating Procedure, (Action Plan)......................... 73
Introduction

Plan B: Tactical Guidelines for Unconventional Rescue Challenges.

The problem is Indian River County Fire Rescue (IRCFR) does not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that are experienced with catastrophic events. These extraordinary circumstances threaten the safety and survivability of unprepared personnel as well as the lives of those they attempt to assist.

The purpose of this research is to identify, analyze and compare those factors found to be demanding of unique mitigation methods. Also, to develop an effective action plan in the form of a Standard Operating Procedure (SOP) that will facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods.

The action research methodology will be used to answer the following questions: a) What are unconventional rescue challenges?; b) What are the possible and probable disaster related aspects of rescue operations that would demand unique methods to mitigate?; c) How have these problems impacted other fire agencies or industry and what actions have they taken?

Background and Significance

“Indian River County is a storm ready community.” These words appear on a plaque located to the left of the main entry doors of Indian River County’s (IRC) Emergency Operation Center (EOC). Currently there is not a state or national grading system in place for evaluating the effectiveness, efficiency, or preparedness of an EOC. However, if one were to be established, IRC would receive high marks. Those who enter this complex may easily assume that all preparations for disaster have been made and that IRC Florida is ready. For the most part this is a
true statement, yet it is not entirely accurate. While provisions for disaster planning have been addressed or established within the county’s Comprehensive Emergency Management Plan, it is the operational readiness of rescue personnel that is lacking. Specifically, Indian River County Fire Rescue (IRCFR) does not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that are experienced with catastrophic events. These extraordinary circumstances threaten the safety and survivability of unprepared personnel as well as the lives of those they attempt to assist.

Located within this EOC is the headquarters of IRCFR, as the Fire Chief is also the Director of Emergency Services for IRC. In addition there are three other divisions that fall under his command who are situated in this building as well. They include: Animal Control, 911 database, and Emergency Management. It is this direct involvement of the Fire Chief that gives the IRC Emergency Services Department its organizational strength and unity. Also, it places ultimate responsibility for all emergency operations within IRC under the control of IRCFR.

Consisting of 12 fire rescue stations, IRCFR employs a diverse assembly of both male and females totaling 225 career personnel that in 2009 responded to 22,136 emergencies. (IRC, 2009) The total work force is divided into two groups; day and shift personnel. Day personnel are those that work a 37.5 hour week. The day personnel are further divided into functional groups that consist of a training division, fire prevention bureau, fire investigation, chief officers and administrative personnel. Shift personnel make up the majority of the fire rescue division’s operational workforce. There are three shifts, also called battalions that are identified by the letters A, B and C. The staffing for each shift consists of 70 personnel that operate on a 24 hour on-duty and 48 hours off-duty schedule.

The primary function of IRCFR is to provide emergency planning, risk reduction and
mitigation, in order to ensure the preservation of lives, environment and property for the people of IRC, Florida. These efforts are successfully accomplished by providing prompt, cost-effective fire protection and life safety services, as well as public education programs. IRCFR also responds to all structural, wildland and automobile fires; basic and advanced life support incidents; and includes special operation events, such as: hurricane and radiological disasters; hazardous materials response and mitigation; high angle and confined space rescue; airport firefighting rescue; marine firefighting and dive rescue for the inter-coastal waterway and the Atlantic ocean within its boundaries.

IRC is comprised of 497 square miles of mixed urban and wildland areas with the majority of the population concentrated in an area approximately 25 miles long and 15 miles wide that is situated along the Atlantic coastal region. According to the University of Florida, Bureau of Economics and Business Research (2009), the population of Indian River County, as of April 1, 2009, is estimated at 141,667 and increased during the winter season to 161,890. (University of Florida, 2009, p. 13) It is IRC’s location and concentrated population along the Atlantic coast of Florida that presents the greatest potential for disaster in the form of hurricanes and tropical storms. The Atlantic hurricane season is from June 1, through November 30, with the most active or peak months from August through October of each year. (Dorset, 2007) Tropical storm and hurricane tracking models place the city of Vero Beach, the county seat, geographically with map coordinates of 27.3E North/80.2E West. (IRC, 2008, p. 12) Based on tracking charts from 1871 through 2009, there have been 46 Atlantic hurricanes and tropical storms that have directly impacted IRC. (Hurricanecity, 2009) Vero Beach is ranked number 40 of the top 50 areas threatened by direct impacts, with an estimated expectancy of one storm every 3.0 years. Further, it should be noted that 25 of the top listed areas are located within the
state of Florida, and that Vero Beach is ranked number 18 within the state for direct impact potential. (Hurricanecity, 2010)

IRCFR has long dealt with the effects of hurricanes and tropical storms within its jurisdiction. However, it was the 2004 hurricane season which presented many fire and rescue challenges that threatened the safety and survivability of unprepared personnel. In September of that year, hurricanes Frances and Jeanne both made landfall in IRC. The combined damage assessment of IRC from the two storms was in excess of $1 billion dollars. (McCollum, 2004) Of that total, more than $2.5 million was estimated as the dollar loss by fire. (IRC, 2005) This damage was unprecedented for IRC, and the likes of which IRCFR personnel have not experienced prior to the 2004 season. Structural collapse, fires, and flooding taxed IRCFR personnel and its resources throughout both events. Due to a large emergency call volume, many incidents saw only a single engine response or a delay in subsequent arriving companies. Factored into that equation were the challenges presented by hurricane shutters covering windows and doors to buildings. Not only did the shutters limit egress and ventilation within buildings, they became a hazard to any occupant attempting to escape.

This researcher had personally responded to and participated in the suppression and rescue activities for many of these fires. It was observed that responding personnel were not familiar with hurricane shutter designs, nor had they experienced a fire or rescue situation where shutters impeded fire rescue efforts. IRCFR personnel had not received training, nor had the fire administration planned for these obstacles. The inability to enter or ventilate a building forced personnel to rethink their actions and resort to improvising. Some responders used good judgment in their actions; however, many found themselves taking undue risks, while others were unsure of what to do. By the grace of God and the skin of our teeth, there were no severe
injuries or loss of life to IRCFR personnel. The philosophy became learn as you go, and by the end of the operational periods many personnel still did not have a grasp on what they should or should not do. Since that time, IRCFR has not addressed these challenges, nor has there been any training of personnel in anticipation of future events. The potential for another hurricane or tropical storm to affect IRC is significant. According to Doctors Bill Grey and Phil Klotbach of Colorado State University, the 2010 hurricane season is anticipated to be above average and include 11 to 16 named storms, with at least five becoming major hurricanes. (Nipps, 2009) The lack of preparation from an organizational perspective is a serious problem. Newer personnel do not have the experience necessary for making informed decisions, and as IRCFR personnel leave or retire, the knowledge base will be lost.

There are relevant linkages between the specific content areas of the national fire academy’s course R306, Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM-R306) and this research problem. Indian River County Fire Rescue does not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that are experienced with catastrophic events. These extraordinary circumstances threaten the safety and survivability of unprepared personnel as well as the lives of those they attempt to assist. The linkages were established through application of both the primary curriculum theme and the course goal of EAFSOEM-R306 to this research. The primary curriculum theme and purpose of this course is to “improve the knowledge, skill and attitudes of fire service leaders when applied to large scale emergency incidents in their communities” (USFA, 2009a, p. SM 1-4). The comprehensive subject matter includes risk assessment, standards, capability assessment, damage assessment, and emergency operations. The goal of this course is to “prepare senior staff officers in the administrative functions
necessary to manage the operational component of a fire and rescue department effectively” (USFA, 2009a, p. SM 1-3).

In taking a more proactive approach to disaster preparedness, by way of formulating research findings in order to assist personnel prepare for unique rescue situations, an effective standard operating procedure can be developed. These tools will assist with improving efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods. In turn, this research also relates to and supports three of the four United States Fire Administration (USFA) operational objectives: a) Improve local planning and preparedness b) Improve the fire and emergency services’ capability for response to and recovery from all hazards, and c) Improve the fire and emergency services’ professional status. (USFA, 2009b, p. II-2)

Literature Review

Indian River County Fire Rescue (IRCFR) does not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that are experienced with catastrophic events. The objective is to provide a compressive literature review of recent and contemporary sources relating to this research problem. These findings will be evaluated in an attempt to develop an action plan in the form of a standard operating procedure that will facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods. With the potential for hurricanes or tropical storms to produce a variety of rescue challenges, and the estimated expectancy of Indian River County (IRC) to be directly impacted every 3.0 years, concentration for this research will be directed toward the rescue challenges experienced with those events. (Hurricanecity, 2010)
The Federal Emergency Management Agency (FEMA) described the hazards associated with hurricanes and tropical storms to be the result of tornadoes, flooding, storm surges, or high winds. (FEMA, 2007a) According to the National Hurricane Center (NHC) more than one half of all hurricanes that make landfall produce a tornado, and that their intensity is usually much less than those of the great plain states. However, they also advised that substantial damage can be expected when these tornadoes are accompanied by hurricane force winds. (National Hurricane Center, n.d.) As stated by Brian Nolan, Emergency Management Coordinator for IRC, there had not been a report of a tornado associated with tropical storms or hurricanes touching down in IRC that he was aware of. However, as with any storm, the potential for a tornado does exist. (B. Nolan, personal communication, January 29, 2010) Flooding, as indicated by FEMA, is caused by torrential rain fall and storm surges. Rainfall levels can be expected to range between 10 and 15 inches, while storm surges can increase the main water levels by more than 15 feet. They advised that from 1970 to 1999, drowning in flood waters resulted in 78% of all children who died during hurricanes or tropical storms. (FEMA, 2006)

When asked about flooding within IRC, Nolan indicated there were many low lying areas within the county that were susceptible to this hazard. He explained that if rain fall were significant, it could challenge and surpass the capabilities of the county’s water drainage system; thereby causing drainage canals to overflow. This was the case during the 2004 hurricane season. Nolan described situations where water levels in some flooded neighborhoods were too high for emergency vehicles to travel, as well as the difficulties of safely distinguishing between roads and drainage swells or canals. He added that flooding from rain fall did present a problem; however, the concern was storm surge and the effects it would have to structures along the Atlantic and intercostals waterways. Nolan explained that land elevations within the county
averaged about 23 feet above sea level and that it ranged anywhere from close to five feet below sea level to about 30 feet above. However, IRC would not be expected to experience the same flood situations as those found in the City of New Orleans during hurricane Katrina. (B. Nolan, personal communication, January 29, 2010) The NHC described storm surges to be caused by the high winds pushing ocean water toward the shoreline. This will produce flooding by increasing normal water levels significantly, and quickly cause structural failure by eroding the foundations of buildings near the coastline. (National Hurricane Center, 2009b) The high winds associated with these storms are the most significant factor, and therefore determine how they are categorized. This includes their speed, strength, and the perceived damage caused to structures and the environment. According to FEMA, a tropical storm has an average wind speed between 39 to 73 miles per hour (mph), and once the sustained winds reaches 74 mph or greater it is considered a hurricane. (FEMA, n.d.) The NHC further classified hurricanes into one of five categories, as defined by the Saffir-Simpson scale. This scale is based on the intensity of the sustained wind speeds and potential destructive force. (National Hurricane Center, 2009a)

In analyzing the research problem, a distinction between conventional and unconventional rescue must be made. A simple definition of conventional was found in Merriam-Webster’s Collegiate Dictionary (2003), “…2 a: acting or behaving according to commonly accepted or approved ways” (p.273). Also found was unconventional, “1: being out of the ordinary” (p.1362). Though this would be considered true by definition of the words “conventional” and “unconventional”, they were not however sufficient enough to satisfy a clear understanding of how they apply to rescue operations. The International Fire Service Training Association’s (IFSTA) publication of Essentials for Firefighting and Fire Department Operations (2008) is the text used for instructing and testing Florida fire recruit academy students. The
information contained within its pages provides the minimum standards and basic guidelines
necessary for conducting most fire ground operations. Rescue was described as the removal of
persons from danger. Conventional was used only in discussion of gaining access to trapped or
endangered persons by use of standard fire department tools and equipment. (Goodson, &
Murnane, 2008)

Rodney K. Johnston, a Battalion Chief of training for IRCFR explained that Conventional
rescue can be considered those situations where specialized equipment or training is not required.
An example was given that described how firefighters would gain access to a building, and
remove a person from danger by entering through the same doors or windows used by the
occupants. Also, personnel will follow Standard Operating Procedures (SOP) such as conducting
a right hand search pattern every time they enter a smoke filled environment to search for
victims. He explained these rescue operations to be common or ordinary, and that they could be
handled without difficulty by all firefighters. Johnston included that many times the general
equipment found on a fire engine, such as a flat head axe and a pry bar, are all that is needed to
force entry into a building. However, when personnel are faced with situations that they are not
accustom or out of the ordinary; such as not being able to enter a building through the normal
means, the rescue becomes challenging and more difficult. Many times firefighters who are
faced with these challenges will resort to what they have trained on, SOPs, or good judgment in
order to try and make what they know to fit the situation as best they can. (R. Johnston, personal
communication, January 31, 2010)

In a personal communication with Battalion Chief Niko King of the City of Sacramento
Fire Department (CSFD), this researcher discovered one such instance where rescue personnel
were faced with an unusual challenge. King is a member of the CSFD’s swift water rescue team
which is one of 10 type I teams in the state of California. In August of 2005, King, along with 13 members of the team responded to a call for assistance with the rescue operations of hurricane Katrina. Their 10 day deployment involved rescuing of persons from the flooded areas throughout the city of New Orleans. King advised they utilized Rubber Inflatable Boats (RIB) to maneuver through the flooded areas. The first few days were spent rescuing persons that were stranded by the water. They began by searching the flooded streets for those that were immediately visible. At that time they did not enter buildings, but did assist those that responded when the team called out to them. He stated that their daily assignments were based on need, and that once the initial removal of the stranded was completed, they were given additional tasks. One such task included searching the interior of flooded buildings. The water, as described by King, was between four and five feet deep on average. The difficulty encountered with searching these buildings came from the redundancy of different teams searching the same buildings. King advised this was due to not having a standardized marking system that was recognized by each rescue group. Of all the rescue challenges faced by his team, the most significant and unusual came from searching those buildings with water levels too high for safe entry. With the water levels well above doors and windows, the team utilized their RIBs to maneuver near the building’s roofs. Equipped with chain saws, they cut four foot by four foot holes into the roofs to check for live persons, or dead victims that may have sought refuge in attic spaces from the rising water. King advised this was not something they had ever thought of doing, nor were they aware of others who have. Though they did not have training for this type of rescue, they used their roof ventilation knowledge as the basis for how to perform the cuts. As a result of the success with this operation, King advised it has now become part of their swift water rescue training. King explained it is important for all personnel to have a general knowledge of building
construction. In addition, it is important that rescuers be taught how to breach a roof or wall, so when faced with a situation where the normal means of entry are blocked or not accessible, they will be prepared. (N. King, personal communication, January 10, 2010)

Hurricane shutters present such a condition where rescue personnel are challenged with difficulties as they attempt to enter buildings. When protecting from an impending tropical storm or hurricane, home and business owners will cover windows and doors with materials that can protect from the associated strong winds. The most popular means by which this is accomplished is with the purchase and installation of hurricane shutters. The Atlantic Oceanographic Meteorological Laboratory (AOML) listed the six most common varieties of hurricane shutters as: a) Automatic roll down, b) Accordion, c) Bahamas, d) Awning, e) Storm panel, and f) plywood. With the exception of plywood, which are homemade and can vary in thickness, the primary materials used in the construction of commercially produced shutters are aluminum or steel. The AOML also offered photographs of these shutter types that can be seen in appendix A. (AOML, 1998)

The South Florida Sun-Sentinel described the differences between each type of hurricane shutter as follows: The automatic roll down style shutters are constructed of Polyvinylchloride (PVC) or a metal, usually aluminum or galvanized steel. These shutters are permanently attached above and to the outside of windows or doors (see figure 1 in Appendix A). A set of tracks are also permanently anchored to the exterior wall. They are used to guide the shutters as they roll down into place. This type of shutter is operated by an electric motor, or in the event of a power outage can be done so manually. Accordion shutters also operate on a set of tracks and are permanently secured to the outside of windows and doors (see figure 2&3 in Appendix A). This is a horizontal design with one section at each end of the opening. They are constructed of
several sections of aluminum hinged together that unfold as they are pulled across the opening. For large openings, reinforcement rods need to be installed to the shutter’s exterior after deployment to insure full strength. The locking mechanism for this shutter type is located on the exterior, in the center, where the two folded sections meet. Bahamas and awning type shutters are similar in design and deployment (see figure 4, 5, & 6 in Appendix A). Their construction varies from wood, aluminum, galvanized steel, and PVC. They too are permanently attached above a window. These shutters are hinged at their anchor point then lowered and locked in place when deployed. The storm panel shutters are constructed of one-eighth inch corrugated galvanized steel or aluminum (see figure 7 in Appendix A). These panels are 12 inches wide and cut to the length of the window or door they cover. When installed, each panel overlaps the other to give it maximum strength. The panels themselves are not permanently anchored to the building and require the occupant to manually install them when needed. There are two ways of installing these panels; both involve bolting them in place every six inches. First is to secure them to tracks that are permanently anchored to the exterior wall. Second is to use only bolts that are permanently set into the wall alongside the windows or doors. The bolts are loosened as the panel is hung horizontally, and screwed down to secure each panel. The sixth shutter type listed is of plywood construction (see figure 8 in Appendix A). These are home-made with a recommended minimum thickness of 5/8 of an inch thick. For securing plywood shutters it was recommended that two-inch anchors be used at a minimum distance of one every 12 inches. (Kwok, 2008)

FEMA described the principle basis of hurricane shutters to be protection of windows from wind-born debris and keeping the contents, and occupants within a building safe. FEMA also indicated that shutters must be securely fastened to the building so they are not pulled away
by the strong winds associated with these storms. (FEMA, 2007b) John D. Smith of Storm Stoppers, an Orlando, Florida based company, expressed concerns about the manner in which shutters were secured to buildings. He explained the installation and anchoring of hurricane shutters to a building’s exterior does not take into consideration that occupants do not have the ability to remove them from the inside. In addition, he stressed that fire rescue personnel would be faced with an unsafe situation when attempting to enter these buildings, as well as the difficulties involved with removing shutters. “Bolted-on hurricane shutters prevent a tremendous safety hazard. Since 2004, almost a dozen homeowners have died in fires, when they couldn’t go out the window exits” (Smith, 2008a, ¶ 2).

The City of Miami Fire Rescue Department (MFR) experienced such a situation where hurricane shutters affected rescue operations. On November 12, 1995, they responded to a fire at the Salvation Army Adult Rehabilitation Center that resulted in the deaths of two occupants. Sheila-Faith Barry wrote of the extreme difficulty MFR had in removing hurricane shutters from the building’s windows as they attempted to rescue occupants on the second and third floors. They encountered metal hurricane shutters whose design was similar to that of jalousie type windows. The louvered sections of the shutters were opened or closed by a crank and lever mechanism located on the inside of the windows. The shutters were not removable and permanently anchored to the building. Their design allowed only for light or air flow. Those occupants that attempted to escape through those windows found it especially difficult to break the shutters free and were only successful in removing a few slats. “There were instances of persons becoming stuck in windows from which the shutters had only been partially removed” (Barry, 1995, p. 2).

Edward Prime III, the IRCFR Assistant Chief of Support Services, was asked to identify
how hurricane shuttered buildings affected fire rescue operations within IRC. He recalled the 2004 hurricane season where IRC experienced several structure fires in the months of September and October during post hurricane Frances and Jeanne operations. He explained how fires in shuttered buildings presented a unique set of challenges that IRCFR personnel were unaccustomed. Prime added that a limited means of egress and increased heat due to shutter installation often resulted in a more hazardous firefighting scenario. Additional resources were often required to assist with shutter removal due to the difficulty and time required. He further added that fires in shuttered buildings frequently resulted in defensive rather than offensive strategy. Electrical power surges from the reenergizing of electrical service to buildings were the cause for many of the fires. In many instances the fire had claimed these buildings prior to the arrival of fire rescue personnel. (E. Prime III, personal communication, January 11, 2010). The National Fire Incident Reporting System (NFIRS) data provided by IRCFR, reported an estimated total dollar loss by fire in 2004 to be $7,517,676. (Documed Systems International, Inc., 2008) An estimated $2.5 million of these losses occurred during the September events of Frances and Jeanne. (IRC, 2005)

A more recent event occurred on September 22, 2008, when IRCFR provided mutual aid to the Indian River Shores Public Safety Department (IRSPS) where a fire destroyed a three story condominium. Nick Schauman, a Lieutenant with the IRSPS Department, was the commanding officer of that fire. Schauman estimated fire loss from that structure alone was in excess of 40 million dollars. He explained that there were no threats of any tropical activity at the time of the incident; however, the building had hurricane shutters in place on more that 95% of its windows. Further, this not only prevented effective ventilation and fire suppression efforts, it
also hampered occupants from exiting the building and required the rescue assistance of firefighters. (N. Schauman, personal communication, February 13, 2010)

Structure fires within hurricane shuttered buildings had contributed to the death of Florida residents. The South Florida Sun Sentinel newspaper reported the death of a 72 year old woman in Hollywood, Florida. They advised a fire began in the kitchen area and blocked her escape through an exterior door. Fire officials offered that she may have been able to escape through a window; however, the shutters prevented her from doing so. (Francois & Kaye, 2007)

A Fort Lauderdale, Florida, man was also unable to flee a fire in his home. He was overcome by the smoke and died from high levels of carbon monoxide (CO) where rescue efforts were stalled due to the shutters still in place. Battalion Chief Dan Hanes, of the Fort Lauderdale Fire Department, blamed the failed ventilation efforts on the shutters as well. (Lesson, 2004) Another example reviewed occurred on September 24, 2004, in Homestead, Florida, where tragically four children and one adult were killed when plywood shutters and burglar bars that covered their windows trapped them within the burning structure. (Sainz, 2004) In comparison, burglar bars differ from hurricane shutters both in design and purpose; however, they share significant similarities when exterior mounting and egress are considered. Jennifer Roberson wrote in the U. S. Fire Administration’s (USFA) technical report number 138 Security (Burglar) Bars, “By blocking windows with bars, they are ensuring that alternative escape paths through windows are no longer an option” (Roberson, 2002, p. 2). Roberson acknowledged the challenges that security bars presented to fire suppression and stressed the importance for firefighting personnel to be familiar with the safe removal of the bars. Public education programs of the potential dangers were also recommended. According to Roberson, the version of the National Fire Incident Reporting System (NFIRS) used for data collection did not have provisions within it to account
for the presence of security bars and attributed this to the limited attention security bars had been
given. She explained that prior to 1993 there were no regulatory measures that governed their
installation or use; and further, that legislation was often drafted soon after a tragic event.
However, public outcries and the urgency for passing a law frequently diminished as did the
memory of the event. According to the report, since that time some states have adopted
requirements for security bars to be released from the interior. (Roberson, 2002)

Identifying the presence of hurricane shutters or other unusual conditions are part of an
initial scene survey. According to IFSTA, the safety of personnel and the success of any
emergency operation must begin with a proper size up of the given situation. This included
performing a risk benefit analysis. (Goodson, & Murnane, 2008) Size up, as defined by Deputy
Assistant Chief John Norman of the New York City Fire Department (FDNY) is “an evaluation
of problems and conditions that affect the outcome of a fire” (Norman, 2005, p.7). Norman also
described the principle of a risk benefit analysis to simply be justification for an action based on
the circumstance presented. He explained that firefighters should not endanger themselves unless
there would be positive gains made by their actions. This included weighing the risk of injury to
personnel when rescuing a savable life, as compared to the same actions when there was no
chance of life. (Norman, 2005) Deputy Chief James P. Smith, of the Philadelphia Fire
Department (PFD), echoed the words of Norman as he gave warning to those who would be too
aggressive. In discussion of buildings that were heavily damaged or prone to collapse, the
decision to enter when there was no life hazard present would be foolish. In addition, he
indicated the first arriving officer must weigh the safety of personnel in the decision of
committing to an offensive attack or taking a defensive position. (Smith, 2008b)
In an attempt to identify how others have been impacted by hurricane shutter use, this researcher administered a survey to fire rescue departments throughout the State of Florida (Appendix B). The review of data collected indicated many departments had been directly affected by tropical storms and hurricanes within their response areas. Of the potential hazards associated with tropical storms or hurricanes, the leading concern was the high winds. As indicated by the survey, the most common responses given of the challenges that had impacted their personnel when hurricane shutters were encountered included: a) limited means of egress, b) ventilation challenges, c) increased heat, and d) difficulty in removing shutters. Also indicated by the survey was that many did not have a written policy for their personnel. (Appendix C)

Lieutenant Gregg Dixon of Palm Beach County Fire Rescue (PBCFR), Florida, advised that he and others from PBCFR had responded to many structure fires where hurricane shutters presented difficulties. Dixon explained they did not have a written policy, or tactical guideline for dealing with shuttered buildings. However, many of their personnel recognized the need for firefighter safety in those situations and took it upon themselves to train for future events. He described their strategy of removing all shutters prior to entry. In addition, he indicated that prying or dismantling the shutters was time consuming, and that they found much success with gasoline powered circular saws equipped with metal cutting blades. (G. Dixon, personal communication, February 26, 2010)

West Manatee Fire Rescue (WMFR) of Manatee County, Florida, also acknowledged the dangers that hurricane shutters presented and the special challenges to occupants and fire rescue personnel. Within their SOPs, WMFR has a written policy that referred to hurricane shutters during fireground operations at structure fires. In Section 37, Article K, Special Situations, personnel were instructed to consider the problem at hand, and the degree of difficulty in
removing shutters. In addition, WMFR offered tactical guidelines for fires within occupied structures. These guidelines included removing the shutters: a) by hand, b) with hand tools, c) with power tools, and d) leaving them in place. (West Manatee FR, 2008)

Industries, as well as agencies outside the fire service, have addressed the dangers of hurricane shutters in fire situations. With no requirements in place for hurricane shutters to have a release mechanism from within a building, the IntegriDyne Company located in Broward County, Florida, offered a solution with their quick release device. This product was specific for use on storm panel type shutters that were anchored to the exterior of windows or doors. Their quick release fastener, called Ensure Escape™, did not require home owners to retrofit or modify their existing storm panels. The panels are easily released from the interior for escape, or the exterior for rescue and firefighting operations. (IntegriDyne, 2006)

Jenifer Canton, a general manager for the Home Depot of Sebastian, Florida, offered assistance and information. She advised that many of the materials used in the installation of hurricane shutters were available for purchase at most home improvement retailers. She added that home and business owners were permitted to buy and install their own shutters; however, whenever possible they were discouraged to do so. The Home Depot, as well as most other home improvement retail stores, recommends to their customers that the installation of hurricane shutters be done by qualified contractors to insure that they are installed safely and correctly. By having an installation affidavit signed by a licensed contractor, many times home owners are given a reduction in their home owner’s insurance policy premium. (J. Canton, Personal communication, February 22, 2010)

Kyle Kofke, owner of Treasure Coast Construction Management located in Vero Beach, Florida, also provided assistance in better understanding the dangers of home owners installing
their own hurricane protection. He advised fear of a storm’s destructive force may result in the self installed storm panels, plywood, or other shutter types to be over secured; thereby, making them more difficult to remove. He acknowledged the danger shutters presented to occupants or firefighters when faced with fire, and offered his assistance to train fire rescue personnel how they were constructed and installed. Kofke indicated that of all shutter types, that the accordion style was the easiest to remove because of it only having one locking device in the center or at one end of the shutter. He included that storm panels were the most commonly installed shutter as well as the most time consuming to remove. This was due to the amount of wing nuts or anchoring screws used in securing them. Role down, as explained by Kofke were the most difficult of all to gain access through. He said in the case of storm panels or role down, that cutting the panels off with a power saw and a metal cutting blade would be the fastest way of removing them. (K. Kofke, personal communication, February 19, 2010)

In summary of the literature review, this researcher was able to provide a comprehensive research analysis and compare the findings of recent, contemporary and primary sources. Findings that originated from outside the boundaries of the fire service influenced a more in depth understanding and assisted greatly in this research. The unconventional rescue challenges that were experienced with tropical storm or hurricane events were identified. Included were those factors found to be demanding of unique mitigation methods, how these problems impacted other fire agencies and industry, as well as the actions they took. And finally this researcher was able to discover the key components necessary to develop and facilitate an effective action plan in the form of a standard operating procedure that will facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods.
Procedures

The procedures that were utilized in the development of this applied research project (ARP) were conducted through the succession of steps. Step one was divided into four parts: a) to identify that a problem with fire service operations in emergency management existed within Indian River County (IRC), b) to find justification from an organizational perspective that this study would assist Indian River County Fire Rescue (IRCFR), c) to establish a link between the research problem and specific content areas of the National Fire Academy’s (NFA) Executive Fire Officer Program (EFOP) course R306, Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM-R306), and d) to establish a link between the research problem and one of four operational objectives specified by the United States Fire Administration (USFA). The research began with listing potential problems consistent with the four parts of step one. This process involved personal knowledge related to IRCFR and utilization of the EAFSOEM-R306 student manual in order to comply with parts c and d (USFA, 2009a).

Step two was choosing, from the aforementioned list, the most significant problem affecting IRCFR, as well as the research methodology used for this study. The problem was IRCFR did not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that were experienced with catastrophic events. Those extraordinary circumstances threatened the safety and survivability of unprepared personnel as well as the lives of those they attempted to assist. Further, throughout this researcher’s 22 years of service with IRCFR, he had personally responded to and participated in the suppression and rescue activities conducted during disaster emergency operational periods. It was observed that when challenged by unique rescue situations, the operational readiness of rescue personnel was
lacking. It was determined that the action research methodology would be used to identify, analyze and compare those factors found to be demanding of unique mitigation methods in order to develop an effective action plan in the form of a standard operating procedure that would facilitate improved efficiency in rescuing trapped citizens and provide for the safety of emergency response personnel during disaster operational periods.

Step three was to develop a series of questions that would aid the researcher in creating a standard operating procedure for IRCFR personnel. With the potential for Indian River County (IRC) to be directly impacted by hurricanes or tropical storms, and the variety of rescue challenges that could be expected, concentration for this research was directed toward the rescue challenges experienced with those events. The three research questions were as follows: a) What are unconventional rescue challenges?; b) What are the possible and probable disaster related aspects of rescue operations that would demand unique methods to mitigate?; and c) How have these problems impacted other fire agencies or industry and what actions have they taken?

Step four was to find answers to each research question by conducting a comprehensive literature review from both recent and contemporary sources. The objective was to analyze and compare the findings of others in order to discover the key components necessary for developing and facilitating an effective standard operating procedure that would facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods. The preliminary research began by utilizing the on-line library search of the National Emergency Training Center’s (NETC) Learning Resource Center (LRC) for existing literature relating to unique rescue challenges associated with tropical storms and hurricanes. This included a review of applied research papers written by other executive fire officer students and case studies within technical reports. The literary search was
then expanded beyond the boundaries of the fire service to include the writings of professionals within the hurricane protection industry, private and governmental agencies, and news media. This was accomplished by examining articles in journals, periodicals, books and manuscripts. An internet search on the World Wide Web, using search engines such as www.google.com, www.dogpile.com, www.highbeam.com and www.yahoo.com were also utilized to find hurricane operational rescue related materials. Additionally, primary sources through interviews with experts associated with specific research questions were sought.

Step five was geared toward creating a foundation for all questions used in this study by first establishing an understanding of the differences between conventional and unconventional rescue challenges. Hence the first question, what are unconventional rescue challenges? This researcher attempted to provide a simple answer by using the definitions of conventional and unconventional found in the “Webster’s Eleventh New College Dictionary”; however, it was not sufficient enough to satisfy a clear understanding. A more complex explanation involving the association of these terms with fireground and rescue operations was sought from the following sources: a) The International Fire Service Training Association’s (IFSTA) publication of “Essentials for Firefighting and Fire Department Operations”; b) Norman’s publication of “Fire Officer’s Handbook of Tactics”; and c) Smith’s publication of “Strategic and Tactical Considerations on the Fireground”. (Goodson, & Murnane, 2008; Merriam – Webster, 2003; Norman, 2005; Smith, 2008b)

A Personal communication with Rodney K. Johnston, Battalion Chief of training for IRCFR was conducted. Johnston was chosen to assist because of his knowledge as a training officer. In addition, Johnston was also familiar with hurricane operations within IRC. An additional communication was conducted with Battalion Chief Niko King of the City of
Sacramento (CSFD), California. His personal experience with rescue operations after hurricane Katrina provided helpful information as he further explaining the differences between conventional and unconventional rescue challenges. (N. King, personal communication, January 10, 2010; R. Johnston, personal communication, January 31, 2010)

Once a foundation of understanding was established of what an unconventional rescue challenge was, step six explored and reviewed information that would assist with answering the second question, *What are the possible and probable disaster related aspects of rescue operations that would demand unique methods to mitigate?* This began with identifying the types of hazards associated with tropical storms and hurricanes. Information provided by the Federal Emergency Management Agency (FEMA), and The National Hurricane Center (NHC), provided an understanding of how these storms were classified, and the destructive forces that accompanied them. It was necessary to identify which potential threat presented the greatest challenge for unconventional rescue within IRC. Statistical data provided by Hurricanecity assisted in determining the estimated expectancy of these storms to IRC. A communication with IRC Emergency Management Coordinator, Brian Nolan, was conducted. He proved to be invaluable in assisting this researcher to narrow the research efforts to a more specific area of concentration. With his assistance, the rescue challenges associated with hurricane shuttered buildings became the focus for the remaining literature review. (B. Nolan, personal communication, January 29, 2010; FEMA, 2006; FEMA, 2007a; FEMA, 2007b; FEMA, n.d.; Hurricanecity, 2010; National Hurricane Center, 2009a; National Hurricane Center, 2009b; National Hurricane Center, n.d.)

An understanding of hurricane shutters was necessary to establish a knowledge base. This was provided by defining the various types of shutters that were commonly utilized by IRC
citizens, and others in hurricane prone regions. The materials used in their construction and the manner in which they were deployed were analyzed for their contributing factors to the hazards. Information regarding the six most common varieties of shutters was obtained through the Atlantic Oceanographic Meteorological Laboratory (AOML). In addition, photographs of the various shutter types were provided by the AOML, and included by this researcher in appendix A in order to better illustrate the descriptions given. A more thorough explanation of each shutter type, manner of their installation and operation was provided by the South Florida Sun-Sentinel. Writings from the Federal Emergency Management Agency (FEMA) and the National Hurricane Center (NHC) were used to describe the principal basis of hurricane shutters use. A discussion from John D. Smith of the Storm Stoppers company was reviewed to discover how the manner in which shutters were anchored to a building directly impacted an occupants inability to escape a fire. (AOML, 1998; FEMA, 2007b; Kwok, 2008; National Hurricane Center, 2009a; Smith, 2008a)

The United States Fire Administration (USFA) technical report 090 “Two Fatality Board and Care Facility Fire” in Miami was reviewed to understand the impact that permanently attached hurricane shutters had on occupants and fire rescue personnel. Also reviewed was the USFA technical report 138 “Special Report: Security (Burglar) Bars”. This document was used to illustrate a comparison of the life safety hazards between hurricane shutters and security bars. Newspaper articles that identified hurricane shutters to be the cause of occupants not escaping fires were reviewed. Of the many hurricane shutter related deaths reported throughout the state of Florida, three cases were chosen to be included in this research to provide examples that ranged in age from children to the elderly. (Barry, 1995; Francois & Kaye, 2007; Lesson, 2004; Roberson, 2002; Sainz, 2004)
Personal interviews with Lieutenant Nick Schauman of Indian River Shores Public Safety, and Assistant Chief Edward Prime III of IRCFR were conducted because of their knowledge through experience of fires in shuttered buildings. They were asked to provide information to aid this study by offering their views through experience of the life safety hazards and contributing factors that shutters presented. In addition, they were asked to provide insight from a fire rescue perspective of the rescue, ventilation and suppression challenges that were encountered at structure fires where shutters were present. (E. Prime III, personal communication, January 11, 2010; N. Schauman, personal communication, February 13, 2010)

Step seven involved the evaluation of available resources through answering the third and final question, *How have these problems impacted other fire agencies or industry and what actions have they taken?* This began with reviewing the writings of Deputy Assistant Chief John Norman, of the New York City Fire Department (FDNY), Deputy Chief James P. Smith of the Philadelphia Fire Department (PFD), and the International Fire Service Training Association (IIFSTA). They were used to assist in identifying fireground safety factors. Some of the areas included risk benefit analysis, initial scene survey, and forcible entry techniques. (Goodson, & Murnane, 2008; Norman, 2005; Smith, 2008b)

It was also important to discover how other fire rescue departments were impacted by hurricanes shutter use, did they experience any rescue challenges as a result of them, and what have they done to prepare for future events. A survey was created for that purpose and can be found in appendix B. The development of the survey was based on the three research questions, findings of the literature review, along with utilization of personal knowledge and experience. The survey generating tool provided by www.surveymonkey.com was used to create the survey and gather its responses. Closed-ended, multiple choice, and open-ended questions were used in
the survey. Each question type was important to include for gathering direct data as well as allowing the respondents to offer their own views or opinions. Prior to administering the survey, it was validated by five chief officers who provided input toward question clarity and relevance. The valuators that participated can be found in appendix D. The sample size selected from the FFCA to participate in the survey was determined by the total number of fire rescue departments in the state of Florida. This included career, combination, and volunteer departments. The number of participants used in the survey was 335, of which there were 64 respondents, or 19.10%. A list of respondents can be found in appendix D. The survey was conducted over a one month period of February 2010. All participants were informed that the purpose of the survey was to gather information for use as a comparison in an applied research project. It was explained that their individual answers would be anonymous and that the results of the survey would be available to them. Once the survey results were collected and analyzed, the final results were then given to the respondents via electronic mail. Results of the survey can be found in appendix C.

A personal communication with Lieutenant Gregg Dixon of Palm Beach County Fire Rescue (PBCFR), Florida, was conducted. He was chosen because of his knowledge through experience, as well as the measures that he and other members of PBCFR took regarding fires in shuttered buildings. PBCFR does not have a written policy directed toward hurricane shutter safety; however, Dixon explained the training initiative taken by many of their personnel. This included their unwritten methods of combating the challenges presented with shuttered buildings that included shutter removal techniques. A written policy in the form of a Standard Operating Procedure (SOP) was found to be in use by the West Manatee Fire Rescue (WMFR) of Manatee County, Florida. This document was reviewed to identify key points regarding fireground safety,
and tactical considerations. Also, the SOP contained recommendations for shutter removal that were of great assistance to this research. (G. Dixon, personal communication, February 26, 2010; West Manatee FR, 2008)

Agencies outside the fire service were sought for innovative ideas and to discover any proactive actions taken. This researcher discovered that the IntegriDyne Company had addressed the dangers that hurricane shutters presented with their quick release designs. This researcher also discussed the research problem with suppliers and installers of hurricane shutters. The Home Depot of Sebastian, Florida, and Treasure Coast Construction Management of Vero Beach, Florida, both offered to provide assistance with the training of IRCFR personnel regarding hurricane shutter materials, installation, and removal. (IntegriDyne, 2006; J. Canton, personal communication, January 11, 2010; K. Kofke, personal communication, February 19, 2010)

Step eight began with a review of the information gathered in steps one through seven. All the key components discovered from the research questions were grouped together and written on a separate note page. They were then arranged in a sequential order that was consistent with the development of the study. Finally, the results of the findings and key components were used to develop an effective action plan in the form of a standard operating procedure that would facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods.

Limitations and Assumptions

The limitations of this study included several factors. First was the limited availability of printed material as compared to that which was available by the use of the internet. Library searches for books, journals, and magazines required extensive use of time. In many cases, it was discovered that the contents of the material located were not relevant to the project. The use of
search engines for related information via the internet proved to be valuable in regards to the ability of making the search more specific; however, the abundance of related information found on the internet became very time consuming. The amount of fire service material, and sources that originated from outside its boundaries were also limited in regarding hurricane shutter safety. At times this material was redundant as well as minimal in comparison.

The Survey tool used for this study (Appendix B) also contributed as a limitation. The second question of the survey was written as an open end question. This was used to identify specific rescue challenges that were experienced by the respondents during hurricane operational periods. Unfortunately the results or the survey, (Appendix C) indicated there were only seven respondents that chose to answer that question directly. The limited or lack of response could have been avoided by the use of a multiple choice type question. In addition, an error was made by this researcher in question seven of the survey. When the respondents were asked if their organization provided public education for hurricane safety, the word “shutter” had been omitted. The number of respondents that indicated yes may have assumed the question referred to general safety tips or preparation advice for an impending storm and not specific to the potential entrapment by hurricane shutters. Interesting to note was the assumption made by this researcher that others would have already solved this problem. Many fire rescue departments acknowledged the potential problems associated hurricane shutters; yet, few have taken action. Further, while conducting an examination of IRCFR fire incident reports, there was no specific collectable data available for hurricane shutters. The National Fire Incident Reporting System (NFIRS) version 5.0 that was used by IRCFR did not have a code reference for the presence of hurricane shutters. With this information limited to the narrative section, collection of statistical data is nearly impossible, and therefore could not be made on a local, state or national level.
Results

The results discovered from the first four steps of the procedures for this study began with: a) identifying that a problem with fire service operations in emergency management existed within Indian River County (IRC); and b) finding justification from an organizational perspective that this study would assist Indian River County Fire Rescue (IRCFR). This was answered by the researcher’s personal knowledge, experience, and observations that were achieved from 22 years of service with IRCFR. Assistance was given to this researcher by the IRC Emergency Management Coordinator in narrowing the research efforts to a more specific area of concentration. It was with his assistance that the rescue challenges associated with hurricane shuttered buildings became the focus. (B. Nolan, personal communication, January 29, 2010) This researcher had personally responded to and participated in the suppression and rescue activities of fires during hurricane operational periods where hurricane shutters had hampered fire rescue operations. It was observed that responding personnel were not familiar with hurricane shutter designs, nor had they experienced a fire or rescue situation where shutters impeded fire rescue efforts. IRCFR personnel had not received training nor had the administration planned for those obstacles. Justification for this research from an organizational perspective included that the probability of hurricanes or tropical storms affecting the state of Florida each year was high, and that it was expected for IRC to be impacted in some way. Also, past events have provided the need for training personnel and the development of a Standard Operating Procedure (SOP).

The procedures also resulted with establishing a link between the research problem and the specific content area of the National Fire Academy’s (NFA) Executive Fire Officer Program (EFOP) course R306, Executive Analysis of Fire Service Operations in Emergency Management

Plan B 33
(EAFSOEM-R306). IRCFR did not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that were experienced with catastrophic events. Those extraordinary circumstances threatened the safety and survivability of unprepared personnel as well as the lives of those they attempted to assist. The linkages were established through application of both the primary curriculum theme and the course goal of EAFSOEM-R306 to this research. The primary curriculum theme and purpose of this course was to “improve the knowledge, skill and attitudes of fire service leaders when applied to large scale emergency incidents in their communities” (USFA, 2009a, p. SM 1-4). The comprehensive subject matter included risk assessment, standards, capability assessment, damage assessment, and emergency operations. The goal of this course was to “prepare senior staff officers in the administrative functions necessary to manage the operational component of a fire and rescue department effectively” (USFA, 2009a, p. SM 1-3). In turn, this research also related to and supported three of the four United States Fire Administration (USFA) operational objectives: a) Improve local planning and preparedness b) Improve the fire and emergency services’ capability for response to and recovery from all hazards, and c) Improve the fire and emergency services’ professional status. (USFA, 2009b, p. II-2)

The fifth step of the procedures for this study included a review of literature, and personal communications that assisted this researcher in discovering the answer to the first question: “What are unconventional rescue challenges?” The definitions of unconventional were compared with conventional as they related to rescue. Their meanings were found to be complex and that several sources of literature were needed to formulate a general understanding. Information found in literature, fire service related writings, as well as communications from professionals within the fire rescue service provided the following results. Conventional was
defined as ordinary, or something that was common. When coupled with rescue it became any situation that rescuers could expect on a regular basis, or were familiar with. Unconventional were those situations that were considered out of the ordinary, or those that required specialized equipment, Training, or thought. Personnel that were faced with a situation that they were unaccustomed, such as a building where windows and doors were covered by hurricane shutters, needed a knowledge base from which to make sound and safe decisions. Without some sort of understanding, personnel would most likely resort to improvising, or trying to make what they did know fit the situation. (Goodson, & Murnane, 2008; Merriam –Webster, 2003; N. King, personal communication, January 10, 2010; R. Johnston, personal communication, January 31, 2010) Also discovered was the importance of early and proper scene size-up, or initial survey of the fireground. This was where the recognition of a challenging rescue had to be identified. This was also the point where the need for additional resources or specialized equipment would be made. Equally important was that fire rescue personnel were required to weigh the risks or dangers involved with a particular rescue prior to committing personnel to action. (N. King, personal communication, January 10, 2010; Norman, 2005; Smith, 2008b)

The results found from a review of literature, and personal communications in the sixth step of the procedures for this study assisted in answering the second question: “What are the possible and probable disaster related aspects of rescue operations that would demand unique methods to mitigate?” With an established foundation of what an unconventional rescue was and the importance of identifying its presence early, it was important to understand how hurricane protection became a factor. It was discovered that based on tracking charts from 1871 through 2009, there have been 46 Atlantic hurricanes and tropical storms that have directly impacted IRC. (Hurricanecity, 2009) IRC was ranked number 40 of the top 50 areas threatened by direct
impacts, with an estimated expectancy of one storm every 3.0 years. Also, found was that 25 of the top listed areas were located within the state of Florida, and that IRC was ranked number 18 within the state for direct impact potential. (Hurricanecity, 2010) The destructive forces associated with tropical storms and hurricanes were explained by the Federal Emergency Management Agency (FEMA), and the National Hurricane Center (NHC). They discussed how the destructive forces of those storms resulted from tornadoes, flooding, storm surge, and high winds. Of those elements, the high winds associated with these storms were the most significant factor, and therefore determined how they were categorized. This included their speed, strength, and the perceived damage caused to structures and the environment. (FEMA, 2006; FEMA, 2007a; FEMA, 2007b; FEMA, n.d.; National Hurricane Center, 2009a; National Hurricane Center, 2009b; National Hurricane Center, n.d.)

The most significant factor of those storms that presented the greatest challenge to rescue personnel was buildings with hurricane shutters installed. That included the materials used in their construction, their placement on the exterior of a structure, as well as the how they were deployed over a window or door. The Atlantic Oceanographic Meteorological Laboratory (AOML) listed the six most common varieties of hurricane shutters as: a) Automatic roll down, b) Accordion, c) Bahamas, d) Awning, e) Storm panel, and f) plywood. (AOML, 1998) The differences discovered between each type of hurricane shutter were as follows: The automatic roll down style shutters were constructed of Polyvinylchloride (PVC) or a metal, usually aluminum or galvanized steel. Those shutters were permanently attached above and to the outside of windows or doors. A set of tracks were also permanently anchored to the exterior wall. They were used to guide the shutters as they rolled down into place. This type of shutter was operated by an electric motor, or in the event of a power outage could be done so manually.
Accordion shutters also operate on a set of tracks and were permanently secured to the outside of windows and doors. This was a horizontal design with one section at each end of the opening. They were constructed of several sections of aluminum hinged together that unfold as they were pulled across the opening. For large openings, reinforcement rods needed to be installed to the shutter’s exterior after deployment to insure full strength. The locking mechanism for this shutter type was located on the exterior, in the center, where the two folded sections met. Bahamas and awning type shutters were similar in design and deployment. Their construction varied from wood, aluminum, galvanized steel, and PVC. They too were permanently attached above a window. Those shutters were hinged at their anchor point then lowered and locked in place when deployed. The storm panel shutters were constructed of one-eighth inch corrugated galvanized steel or aluminum. Those panels were 12 inches wide and cut to the length of the window or door they covered. When installed, each panel overlapped the other to give it maximum strength. The panels themselves were not permanently anchored to the building and required the occupant to manually install them when needed. There were two ways of installing those panels; both involve bolting them in place every six inches. First was to secure them to tracks that were permanently anchored to the exterior wall. Second was to use only bolts that were permanently set into the wall alongside the windows or doors. The bolts were loosened as the panel was hung horizontally, and screwed down to secure each panel. The sixth shutter type listed was plywood construction. Those were home-made with a recommended minimum thickness of 5/8 of an inch thick. For securing plywood shutters it was recommended that two-inch anchors be used at a minimum distance of one every 12 inches. (Kwok, 2008)

The manner in which hurricane shutters were anchored to structures was discovered to be a contributing factor that made rescue a more difficult challenge. They were very difficult to
remove and required much time. John D. Smith, of the Storm Stopper Company, acknowledged the required anchoring of hurricane shutters posed the greatest risk to homeowners as they prevented occupants to remove them the interior and escape. (Smith, 2008a) This conclusion was further strengthened through the events documented in the USFA technical report 090 “Two Fatality Board and Care Facility Fire.” Occupants that tried to break out and escape through the permanently anchored hurricane shutters were either unsuccessful or became stuck by only creating a small opening. Further, it was discovered that firefighters were met with extreme difficulty in their attempts to remove the shutters and perform rescue. (Barry, 1995) The life safety hazards contributed by anchoring shutters to a structure lead this researcher to make a comparison of hurricane shutters and security bars. It was discovered, through the case studies provided within the USFA technical report 138 “Special report: Security (Burglar) Bars”, that without a release mechanism inside a structure, occupants were unable to escape. (Roberson, 2002) The results discovered from the review of literature and the procedures used in this research also identified many unfortunate cases where hurricane shutters prevented occupants from escaping fires. The Newspaper accounts of Francois & Kaye, Lesson, and Sainz tragically confirmed that hurricane shutters prevented occupants from escaping fire, and those deaths were not discriminated by age. (Francois & Kaye, 2007; Lesson, 2004; Sainz, 2004)

Fire rescue personnel were also found to be negatively affected by the unique challenges of hurricane shutter use. These factors were identified through a personal conversation with Edward Prime III, the IRCFR Assistant Chief of Support services. Through his recollection of the 2004 hurricane season, where hurricanes Frances and Jeanne directly impacted IRC, it was discovered that fires in shuttered buildings presented a unique set of challenges that IRCFR personnel were unaccustomed. It was further discovered that a limited means of egress and
increased heat due to shutter installation often resulted in a more hazardous firefighting scenario. Additional resources were often required to assist with shutter removal due to the difficulty and time required. Also, fires in shuttered buildings frequently resulted in a defensive rather than offensive strategy. (E. Prime III, personal communication, January 11, 2010) Nick Schauman, a Lieutenant with the Indian River Shores Public Safety Department (IRSPS), further strengthened the discoveries of the contributing factors discovered from the Prime conversation. Schauman described the challenges he experienced at a structure fire where the presence of hurricane protection on more than 95% of that building contributed to many life safety factors that included: a) a delayed discovery of fire; b) the need for additional resources; c) occupants required the assistance of fire personnel to escape; d) the building was unsafe for fire rescue personnel due to the limited means of egress; and e) the difficulty of removing the shutters resulted in a defensive operation as well as a very high dollar loss from fire. (N. Schauman, personal communication, February 13, 2010)

The results found through a review of literature, survey questions, and interviews that were utilized in the seventh step of the procedures, answered the third question: "How have these problems impacted other fire agencies or industry and what actions have they taken?" It was discovered through the writings of Deputy Assistant Chief John Norman, of the New York City Fire Department (FDNY), Deputy Chief James P. Smith of the Philadelphia Fire Department (PFD), and the International Fire Service Training Association (IFSTA), that a thorough initial survey or size-up of the an incident must be performed prior to committing rescue personnel to any hazardous situation. This included a visual check of conditions on all four sides of a building, as well as above and below. The importance of this investigation is to identify the presence of anything that could harm personnel or contribute to making rescue difficult. In
addition, this was where the identification of the need for additional resources should be made. 
(Goodson, & Murnane, 2008; Norman, 2005; Smith, 2008b)

The results of a survey used to discover how other fire rescue departments were impacted by hurricanes shutters also assisted in answering this question. Of the 335 Florida fire departments that were given the survey, there were 64 respondents. This equated to 19.10% of the sample size. The survey, (Appendix B) and its results, (Appendix C) identified that many of these fire departments had been impacted by hurricanes and tropical storms during hurricane season. When asked to identify unique rescue challenges that they had experienced during hurricane operational periods, many did not respond directly. When asked to identify the hazard associated with hurricanes and tropical storms they found to contribute to making rescue more challenging, the following results were found: a) 3.1% tornadoes, b) 7.8% flooding, c) 17.1% storm surge, d) 67.1% high winds, e) 42.0% indicated that they were unsure, and f) 4.2% that it was a combination of factors. Also discovered from the survey responses was that hurricane shutters had presented the following unique rescue challenges within their jurisdictions as follows: a) 51.6% limited means of egress, b) 46.9% difficulty in removing shutters, c) 18.7% required additional resources, d) 32.8% resulted in a defensive rather than offensive strategy, e) 23.4% ventilation challenges, f) 9.4% delayed fire discovery, g) 29.7% increased heat, and h) 3.1% were unsure. Also discovered from the survey results was that 17.1% of the respondents trained their personnel for fire situations in hurricane shuttered buildings, however, only 3.1% had a written policy. It was discovered that 82.8% did have public education programs for hurricane safety.

A personal communication with Lieutenant Gregg Dixon, of Palm Beach County Fire Rescue (PBCFR), Florida, resulted in discovering that personnel within his department had taken
the initiative to conduct training without a written hurricane shutter policy. They found that removing the shutters prior to entry into a fire building provided a safer working environment for their personnel. This allowed for improving the atmosphere of a smoke filled environment that was beneficial to the survivability of occupants during rescue operations. The recommendations offered by Dixon included that cutting the shutters with a gasoline powered circular saw equipped with a metal cutting blade would be more efficient and less time consuming than attempting to pry or dismantling them. (G. Dixon, personal communication, February 26, 2010)

Of the survey respondents that indicated they did have a written policy, the West Manatee Fire Rescue (WMFR) of Manatee County, Florida, forwarded a copy to assist with this research. Their SOP regarding tactical guidelines for fires within occupied structures included specific considerations for hurricane shuttered buildings. The document considered four recommendations for removing the shutters: a) by hand, b) with hand tools, c) with power tools, and d) leaving them in place. (West Manatee FR, 2008)

The review of literature and personal communications resulted in discovering that professionals outside the fire service recognized the challenges of removing hurricane shutters during an emergency situation. The IntegriDyne Company had addressed the dangers that hurricane shutters presented. They offered a solution to the problem that was available to the hurricane shutter industry. Though their quick release design was a relatively new product, it had been approved for use on residential homes by the state of Florida. The results indicated that this product had a limited distribution, and was only available through the company directly or select shutter installation companies. (IntegriDyne, 2006) Communications with Kyle Kofke, owner of Treasure Coast Construction Management, and Jenifer Canton, a general manager for the Home Depot of Sebastian, Florida, resulted in gaining their assistance with training fire rescue
personnel. They both offered to allow emergency responders the opportunity to examine the materials used in shutter construction and installation. It was also identified through discussion that of all the shutter types, the accordion style was the easiest to remove because of it only having one locking device in the center or at one end of the shutter. Kofke and Canton included that storm panels were the most commonly installed shutter as well as the most time consuming to remove. This was due to the amount of wing nuts or anchoring screws used in securing them. Role down, as explained by Kofke were the most difficult of all to gain access through. He reiterated Dixon’s comments of storm panels or role down type shutters; that cutting the panels off with a power saw and a metal cutting blade would be the fastest way of removing them. (G. Dixon, personal communication, February 26, 2010; J. Canton, Personal communication, February 22, 2010; K. Kofke, personal communication, February 19, 2010)

The cutting of hurricane shutters, as indicated by Dixon and Kofke, was suggested as being the quickest way to remove them in order to gain entry. (G. Dixon, personal communication, February 26, 2010; K. Kofke, personal communication, February 19, 2010) The materials of shutter construction indicated that the best course of action was to utilize the same techniques as those used for cutting metal roll down security doors. Norman, along with Smith and IFSTA, recommended that when using a circular type power saw to cut metal, the saw blade should not be spinning when it first comes in contact with the cutting surface. They indicated that starting from a stopped position and then increasing the speed of the blade provided the safest method. They warned that the saw not be used by reaching above the operators head, as that would also contribute to injury. (Goodson, & Murnane, 2008; Norman, 2005; Smith, 2008b)

In the final step of the procedures, a comprehensive analysis of the data was conducted. This resulted in the development of an action plan that was consistent with the answers found to
the four research questions: a) *What are unconventional rescue challenges?* b) *What are the possible and probable disaster related aspects of rescue operations that would demand unique methods to mitigate?* and c) *How have these problems impacted other fire agencies or industry and what actions have they taken?* This action plan is in the form of a draft standard operating procedure. It will be used to facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods. The action plan can be found in appendix E.

Discussion/Implications

The first area of discussion involves a review of literature, and personal communications to define unconventional rescue. The words unconventional and rescue were looked at separately. A dictionary definition of the word unconventional was compared with that of conventional. The distinction between the two was simply understood as conventional being something that was normal or common, and that unconventional was something out of the ordinary. These meanings do, however, become more complex when used to describe rescue. Rescue, as related to fireground operations and discovered from the results of this study, is no more than removing someone from harm. However, it goes beyond the consideration of situations that would or would not require specialized equipment. After reviewing the writings of Deputy Assistant Chief John Norman of the New York City Fire Department (FDNY), Deputy Chief James P. Smith of the Philadelphia Fire Department (PFD), and International Fire Service Training Association (IFSTA), it became clear that coupling rescue with unconventional or conventional can have numerous interpretations by different persons. For example; if fire rescue personnel were educated, trained and experienced with a specific type of rescue operation, they may consider it to be conventional. On the other hand, if different personnel were not educated,
trained or experienced with the same type of rescue operation, they would consider it to be unconventional. In other words, what is normal for one group may be totally unheard of by others. (Goodson, & Murnane, 2008; Norman, 2005; Smith, 2008b)

This is evident with the rescue operations of hurricane Katrina that were described by Battalion Chief Niko King of the City of Sacramento Fire Department (CSFD). In New Orleans he and his swift water rescue team were asked to search and rescue persons from flooded building. This is not something that they had ever encountered or trained on. In fact, it was the cutting of holes in roofs and looking for persons in attic spaces that caused them to pause and scratch their heads. According to King, they had never heard of nor thought of having to do anything like that. To them this was something way out of the ordinary, or an unconventional rescue. Without any training for this specific operation, they relied on what they did know. They performed the same operations, with regard to cutting into the roofs, as they would have for vertically ventilating a fire building. This example best describes the thoughts given by Rodney K. Johnston, a Battalion Chief of training for Indian River County Fire Rescue (IRCFR). Chief Johnston explained that when personnel are faced with situations that they are not accustom or out of the ordinary; such as not being able to enter a building through the normal means, the rescue becomes challenging and more difficult. Many times firefighters who are faced with these challenges will resort to what they have trained on, SOPs, or good judgment in order to try and make what they do know fit the situation as best they can. (N. King, personal communication, January 10, 2010; R. Johnston, personal communication, January 31, 2010)

The second area of discussion involves how this study developed from a broad idea of creating a disaster management plan that prepares emergency responders for the unconventional rescue challenges that are experienced with catastrophic events, to a more specific tactical
Plan B

guideline for those challenges encountered with hurricane shuttered building. Personal knowledge and experience has made this researcher aware of the dangers that are brought with hurricanes and tropical storms. This study began with hurricanes and tropical storms as a general area where rescues had the potential of becoming difficult and or challenging. It was also understood by this researcher that Indian River County (IRC) had received direct impact from these storms throughout its history. However, the review of statistical data found through Hurricanecity provided a real sense of urgency for this research. The potential and frequency for a hurricane or tropical storm to impact IRC directly is staggering. This researcher was surprised to find that IRC is ranked number 40 of the top 50 areas threatened by direct impacts each year. This includes an estimated expectancy of one storm every 3.0 years. Even more alarming is that 25 of the top listed areas are located within the state of Florida, thus making IRC’s ranking number 18 within the state for direct impact potential. (Hurricanecity, 2010)

The review of literature and personal communications assisted in identifying the factors associated with these storms that contribute to challenging rescue situations. The possible and probable disaster related aspects of rescue operations that would demand unique methods to mitigate were found to be the result of flooding, storm surge, tornadoes, and high winds. This was identified through the Federal Emergency Management Agency (FEMA) and described by the National Hurricane Center (NHC), and the Atlantic Oceanographic Meteorological Laboratory (AOML) as being the leading causes of catastrophe. As this researcher further analyzed these findings it became apparent that high winds were the leading cause and the most significant factor for IRC. Brian Nolan, Emergency Management Coordinator for IRC confirmed this as he explained that with any storm the potential for tornadoes, flooding and storm surge does exist; however, of all the potential outcomes presented by hurricanes or tropical storms,
wind damage presented the greatest concern to the citizens of IRC. It is from that hazard that occupants secure their structures with hurricane shutters. (AOML, 1998; B. Nolan, personal communication, January 29, 2010; FEMA, 2006; FEMA, 2007a; FEMA, 2007b; FEMA, n.d.; Hurricanecity, 2010; Hurricane Center, 2009a; National Hurricane Center, 2009b; National Hurricane Center, n.d.)

The use of hurricane shutters is identified as a true hazard for rescuers and occupants alike. They present a false sense of security to the unsuspecting victims of fire, and contribute to making rescue and fire fighting operations challenging and more difficult. The discoveries made while gathering information to be used in this study assisted in directing the research efforts toward a technical plan for hurricane shuttered buildings. Occupants who find themselves in a fire situation are prevented from escaping. This is due to hurricane shutter design, installation, and deployment. The NHC as well as FEMA agreed that the principal basis of shutters is to prevent incoming pressures from winds associated with tropical storms and hurricanes to enter and weaken the roof of a structure. They also stressed that shutters were to be strong enough to prevent debris from being blowing through the opening they were protecting. Yet, neither FEMA nor the NHC discussed the dangers of becoming trapped by these shutters. Their primary concern was to prevent injury or structural damage from wind. As described by FEMA and the NHC, the ability to withstand the effects of storms is directly dependent on both the strength of the materials used to construct hurricane shutters and their ability to remain in place. This was supported by the South Florida Sun-Sentinel (SFSS) and John D. Smith of the Storm Stoppers Company as they further explained the importance of the shutters being anchored securely to the building. Smith, however, acknowledged that the required anchoring of hurricane shutters posed the greatest risk to homeowners as they prevented removal from the interior, thus blocking their
Included in this discussion are the reported fatalities that were directly related to hurricane shutter use. Barry illustrated the difficulties encountered by occupants attempting to escape through shuttered windows in the United States Fire Administration’s (USFA) technical report 090 “Two Fatality Board and Care Facility Fire.” During this fire, occupants attempted to break out and escape through the permanently anchored hurricane shutters, but were either unsuccessful or became stuck when they were only able to create small openings. (Barry, 1995) The newspaper accounts of Francois & Kaye, Lesson, and Sainz tragically confirmed that hurricane shutters prevented occupants from escaping fire. These deaths occurred in different locations throughout Florida, and the victims ranged in age from children to the elderly. In each of the cases, the occupants were found near a window they tried to open; however, they were unsuccessful in removing the shutters that blocked their escape. (Francois & Kaye, 2007; Lesson, 2004; Sainz, 2004)

The life safety hazards contributed by anchoring shutters to a structure lead this researcher to make a comparison of hurricane shutters and security bars. Though security bars are also found over windows and doors, they differ in design and purpose from hurricane shutters; however, they do present similar characteristics in preventing escape. It was discovered, through the case studies provided within the USFA technical report 138 “special report: Security (Burglar) Bars” that without a release mechanism inside a structure, occupants were unable to escape. (Roberson, 2002) Two significant factors were identified in Roberson’s report. First was that the case studies of reported deaths used to illustrate the magnitude of the problem showed similarities to those found for this study. Second was the lack of National attention to the life
safety hazards of security bars. In the report Roberson indicated that the presence of security bars was not always listed in fire incident reports and therefore difficult to collect accurate data. She attributed this to the version of the National Fire Incident Reporting System (NFIRS) used for her study. The 4.0 version of NFIRS did not have provisions within it to account for the presence of security bars. (Roberson, 2002) This researcher discovered the same difficulties when attempting to retrieve Indian River County Fire Rescue (IRCFR) fire incident data. The NFIRS version 5.0 that is used by IRCFR does not have a specific code reference for the presence of hurricane shutters thus limiting such information to the narrative section.

The results of this study identified that hurricane shutters also contribute as a life safety hazard to firefighters as well as endangering occupants. IRCFR Assistant Chief of Support Services, Edward Prime III, and Nick Schauman of the Indian River Shores Public Safety Department (IRSPS) supported each other as they explained some of the difficulties encountered at fires in shuttered buildings. Firefighters were unaccustomed to fighting fires in buildings where windows were covered by shutters. This was compounded by the lack of a guideline or policy used for strategic and tactical purposes. Here firefighters were subjected to the same hazards faced by occupants as they entered to search for victims or for suppression. This researcher also experienced the difficulties discussed by Prime and Schauman. In many cases firefighters were unable to enter the buildings due to extreme heat being generated within the buildings. Shutters that covered windows or other openings prevented the hot gasses from escaping and presented a danger to firefighters as they attempted to ventilate by forcing the shutters from the building. Other reasons include the amount of fire or structural instability found upon arrival. Prime and Schauman agreed that shutters allow fires to burn undetected for longer periods of time. This delay in discovery gives a fire ample time to weaken structural and roof
supports. Too often fires found in shuttered buildings result in a total loss to the structure as firefighters are forced to perform in a defensive mode and concentrate on protecting exposures. (E. Prime III, personal communication, January 11, 2010; N. Schauman, personal communication, February 13, 2010)

The next area of discussion involves the results found through literature, interviews, and a survey of how these problems have impacted other fire agencies and industry as well as some of the actions they have taken. The lack of an operating procedure or guideline as indicated by Prime and Shauman is also common within other fire rescue organizations. The survey used for this study was administered to the 335 career, combination, and volunteer fire rescue departments throughout the state of Florida. This was done in order to find if they too had experienced unconventional rescue challenges within shuttered buildings during hurricane or tropical storm operational periods, and to identify if or how they had prepared their personnel for future events. Of the 64 respondents, few directly indicated that they had experienced unique rescue challenges during these operational periods. However, many did acknowledge that shutters do contribute to making rescue more challenging. It should be noted that 82.8%, or 53 of the respondents indicated that they provided public education programs for hurricane safety. Unfortunately this researcher did not indicate hurricane shutter safety programs, and did not notice the error until after the survey results were collected. It is therefore the opinion of this researcher that the respondents would have most likely assumed the question was referring to general safety tips and preparation advice for an impending storm, and not specific to the potential entrapment by hurricane shutters. Further only 17.1%, or 11 of the 64 respondents, indicated they train their personnel for fire and rescue operations within hurricane shuttered
buildings. In addition only 3.1%, or 2 of the 64 respondents, indicated that they had a written policy. (Appendix C)

One Department that conducts training for fire and rescue operations within hurricane shuttered buildings is Palm Beach County Fire Rescue (PBCFR), Florida. The interview conducted by this researcher with PBCFR Lieutenant Gregg Dixon was inspiring. Without a written policy of any kind, personnel within his department took it upon themselves to come up with a solution. Palm Beach County is approximately 90 miles South of IRC, and shares much of the same hurricane and tropical storm concerns. During the 2004 hurricane season, PBCFR had experienced many of the same challenges with hurricane shuttered buildings as those of others along the Atlantic coastal region, and IRC. After the events of Hurricane Frances and Jeanne, personnel from PBCFR did not wait for approval their administration or direction from their training department. They identified the need to prepare and wanted to assure the safety of personnel and those they attempted to assist. Much of the advice given by Dixon is used in the draft SOP of this study. The lessons learned through their training efforts indicated that cutting the shutters was more efficient than to try and remove them. The recommendations given by Dixon are close in comparison with those found in the written policy of West Manatee Fire Rescue (WMFR), Florida. Both PBCFR and WMFR indicate that the first step to take before personnel commit to any rescue operation is to identify the presence of hazards. Norman, Smith and IFSTA also discussed that a thorough initial survey of an incident must be performed prior to committing rescue personnel to any hazardous situation. This included a visual check of conditions on all four sides of a building, as well as above and below. The importance of this investigation is to identify the presence of anything that could harm personnel or contribute to making rescue difficult. This was where the identification of the need for additional resources
should be made. This researcher agrees that a proper scene survey or size-up must be performed by the first arriving crews. This is essential for creating a successful and safe operation, and is a practice that is normally conducted by IRCFR personnel. (G. Dixon, personal communication, February 26, 2010; Goodson, & Murnane, 2008; Norman, 2005; Smith, 2008b West Manatee FR, 2008)

Industry too understands the potential impacts that hurricane shutters can present in making rescues challenging or difficult. As identified in this study, each hurricane shutter type outlined by AOML, and the SFSS, were deployed and secured to the exterior of windows and doors differently. The description of each shutter type shows that of the six, the automatic roll down, and the panel style provided the greatest threat to occupants, as well as being the most difficult for firefighters to gain entry through. These differences and difficulties associated with these shutters were also confirmed by this researcher’s own experiences during the 2004 events of hurricanes Frances and Jeanne. The discussions with Jenifer Canton, the general manager for the Home Depot of Sebastian, Florida, and Kyle Kofke, owner of Treasure Coast Construction Management included that of the six shutter types, the panel style was the most commonly used shutter. (AOML, 1998; Canton, Personal communication, February 22, 2010; K. Kofke, personal communication, February 19, 2010; Kwok, 2008) Though it may be considered a small part of the solution process, the action taken by Kofke and Canton in offering their assistance with training IRCCFR personnel, and their making for hands on availability of the materials used in shutter construction, is commended by this researcher.

An innovator found in the hurricane shutter industry has addressed the dangers of hurricane shutters in fire situations. The quick release device offered through IntegriDyne does not require home owners to retrofit or modify their existing storm panels. The panels were easily
released from the interior for escape, or from the exterior for rescue and firefighting operations. Kofke and Canton were not familiar with this product. It was not available through The Home Depot, nor had Kofke any knowledge of it prior to the discussion. (Canton, Personal communication, February 22, 2010; IntegriDyne, 2006; K. Kofke, personal communication, February 19, 2010) From a rescue standpoint, this product has merit. The ability given to occupants to quickly removing hurricane shutters through the interior side of their homes is invaluable, and is the opinion of this researcher that the quick release device sold through the InterDyne Company would be the best solution to the problem. Unfortunately, it is still a relatively new product and its use is not mandated by any local, state or federal laws at this time. Hurricane shutters can become costly, and the added expense of the quick release device is not always a concern of the consumer.

The fifth area of discussion is the organizational implications of the study results. It had been made clear that hurricane shutters introduce a unique set of challenges for fire rescue personnel during disaster operational periods, as well as present a false sense of security to the unsuspecting victims of fire. Equally clear is that the lack of a written tactical guideline within an SOP will force personnel to fit an unusual situation as best they can with their current level of training. Included in this equation are the potential dangers to IRCFR firefighters. Newer personnel do not have the experience necessary for making informed decisions, and as IRCFR personnel leave or retire, the knowledge base that was gained from past events will be lost. In recognizing the potential hazards that are presented when hurricane shutters are encountered on buildings, it would be expected that SOP’s, policies, or training specific to this issue would have been addressed sooner and by more fire service professionals. During 22 years of service with IRCFR, this researcher had personally responded to and participated in the suppression and
rescue activities of fires where hurricane shutters had hampered fire and rescue operations. And yet, IRCFR has not taken action to prepare personnel to handle these situations. This researcher has also lived through the damaging effects of hurricanes and tropical storms to his own home, and in no way is attempting to discourage shutter use.

From an organizational perspective, this research included that past events within IRC, and the reported deaths in other Florida communities, suggest that policies be written and personnel be prepared for difficult and unusual rescue challenges. The probability of hurricanes or tropical storms affecting the state of Florida each year is high, which means that IRC should expect to be impacted in some way. The problem continues today as the extraordinary circumstances associated with hurricane shutters threaten the safety and survivability of unprepared personnel as well as the lives of those they attempt to assist. The time has come for this issue to be addressed, and not wait until another tragedy occurs before responding with a solution. The probable future impact on IRCFR’s effectiveness to prevent or reduce a catastrophe is dependent on an effective and proactive approach, and is one that IRCFR must champion if it is to be victorious.

Recommendations

The recommendations provided by this researcher are based on the problem that Indian River County Fire Rescue (IRCFR) does not have a disaster management plan that prepares emergency responders for the unconventional rescue challenges that are experienced with catastrophic events. These extraordinary circumstances threaten the safety and survivability of unprepared personnel as well as the lives of those they attempt to assist. These recommendations clearly support the data presented and the results found by answering the action research questions. Their purpose was to identify the key components necessary for developing an
effective action plan in the form of a draft Standard Operating Procedure (SOP) for use as a tactical guideline that will facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods. As a result of this study the following represents the short and long term recommendations for IRCFR:

- Acknowledge the problem and show a commitment for solving the issue. In doing so, the Indian River County (IRC) Director of Emergency Services/Fire Chief shall first meet with the Assistant Chief of Operations, and the Assistant Chief of Support Services and Training. This meeting shall be to discuss the need for developing a tactical guideline in the form of a new SOP for fire and rescue operations in hurricane shuttered buildings.

- The SOP shall be titled “Special Operations: Tactical guidelines for fireground operations in hurricane shuttered buildings”

- Develop a committee that consists of the Assistant Chief of Operations, the Assistant Chief of Support Services and Training, all Training Division Officers, three shift Battalion Chiefs, and one bargaining unit member designated by Local 2201 of the International Association of Firefighters (IAFF).

- The IRC Director of Emergency Services/Fire Chief shall be kept abreast of all findings and results of subsequent meetings.

- Conduct a committee meeting to begin discussions and preliminary framework for the development of an effective SOP.

- During this committee meeting, the following assignments should be delegated, and given a three week time period for completion:
o The Assistant Chief of Operations, and the Assistant Chief of Support Services and Training shall focus on the types of assistance that can be provided to IRCFR. This shall include contacting Jenifer Canton, the general manager for the Home Depot of Sebastian, Florida; and Kyle Kofke, owner of Treasure Coast Construction Management. Others in the hurricane shutter industry, and neighboring fire agencies should also be sought.

o Training Division officers shall consult with the three shift Battalion Chiefs, and the union delegate to review current departmental policies, practices, and procedures that may be pertinent to the new SOP.

o All committee members shall that work to develop a set of operating procedures and a training outline that will prepare personnel responding to emergencies in shuttered buildings.

o The consideration of integrating a risk reduction strategy and timeline that includes adequate training of emergency response personnel should included in the discussions.

• Return three weeks later for a second meeting to review the committee’s progress of the assigned tasks. At which time a third meeting shall be scheduled. The third meeting shall be a round-table workshop with invitation given to Kofke, Canton, other industry professionals, and representatives from neighboring fire departments.

• Hold the third committee/workshop meeting to include:

  o Kofke and Canton to identify assistance they can offer.

  o Neighboring departments to discover target areas or concerns that may not have been identified by the SOP committee.
• Hurricane shutter industry to identify new engineering and technology.

• Present the intent of the SOP. The involvement and utilization of the feedback provided from these organizations will be valuable in writing a final draft.

• Schedule a fourth committee meeting for the next week where the committee members shall begin the writing the new SOP. It should be noted to all committee members that a maximum of an eight hour work day should be considered ample time for developing the draft.

• Return two weeks later for the fourth committee meeting. The Committee members shall work collectively to write the new SOP based on:
  o Their individual notes and concerns.
  o Information provided by industry professionals.
  o Current training practices, policies and procedures.
  o Target areas or concerns outlined by other fire agencies.

• Upon completion of the draft SOP, a copy shall be given to the IRC Director of Emergency Services/Fire Chief, and to the IRC Human Resource Director for their approval. Request a response to be made within a two week period to both the Assistant Chief of Operations, and the Assistant Chief of Support Services and Training with the following:
  o A reply of approved.
  o A reply of not approved. This should include their reason for disapproval.

• Questions or concerns that may be answered by the two assistant chiefs.
• With a reply of not approved, or questions and concerns that cannot be satisfactorily answered, a meeting shall be scheduled to include all committee members, the IRC Director of Emergency Services/Fire Chief, and to the IRC human resource director.

• The intent of this meeting shall be to answer questions and resolve concerns in order to receive final approval of the SOP.

• Once the draft SOP has been approved, a copy shall be forwarded to the IAFF local 2201’s executive board, and all IRC fire rescue stations for their review.

• The union executive board and all IRC stations shall be given a two week period for reviewing the new SOP prior to it becoming finalized.

• At this time, questions or concerns made by IRCFR personnel shall be communicated through the union executive board; who will respond directly to the IRC Director of Emergency Services/Fire Chief.

• In the event an issue is found in need of resolution through discussion with the union executive board, the IRC Director of Emergency Services/Fire Chief shall schedule another committee meeting where he, its members, and the union president can discuss and make appropriate change to the document.

• Once all parties have agreed to the new document, and the two week review period has passed, final approval of the new SOP shall be given.

• Begin implementation of the SOP and the training of fire rescue personnel.

The expected organizational benefits of developing an effective tactical guideline in the form of a new SOP for fire and rescue operations in hurricane shuttered buildings include:

• Being better prepared for unconventional fire and rescue challenges during disaster operational periods
• Providing for the safety of IRCFR personnel.

• Facilitating improved efficiency in rescuing trapped citizens.

• Improved public perception of IRCFR in disaster preparedness, and response.

• Prevent, or reduce the likelihood of injury or death from fires during hurricane season.

• Reducing the total dollar loss by fire in hurricane shuttered buildings.

• Creating a support network between neighboring fire departments, outside agencies, and industry.

• Supporting 3 of the four United States Fire Administration (USFA) operational objectives:
  
  o Improve local planning and preparedness,
  
  o Improve the fire and emergency services’ capability for response to and recovery from all hazards,
  
  o Improve the fire and emergency services’ professional status. (USFA, 2009b, p. II-2)

IRCFR should provide an appropriate follow-up evaluation of this SOP consisting of:

• Review the tactical guidelines of the SOP with all IRCFR personnel prior to the start of hurricane season each year.

• Developing a format for measuring the success and failures of the SOP. This shall be done in coordination with the IRC Director of Emergency Services/Fire Chief and the members of the SOP committee. This should include observations of personnel and the department’s compliance to the SOP during disaster operational periods where fire and rescue incidents involve hurricane shutters.
• Annual meetings between the committee members, and Director of Emergency Services/Fire Chief. This meeting is to review the progress, direction, concerns, needs and overall effectiveness of the SOP. Updated training for all fire rescue personnel should be identified, discussed and scheduled. The findings of this meeting shall be used to evaluate the need for amending the SOP.

In conclusion, the recommendations that this researcher would extend to IRCFR and future researchers who may wish to replicate some or all of this study are:

• Be proactive and do not wait until a tragedy occurs before acknowledge the problem.

• Try to view the impacts such an SOP would have from many different perspectives. This should include training, personnel, and the operational needs.

• Request through the United States Fire Administration (USFA) that the National Fire Incident Reporting System (NFIRS) include a way of collecting data on hurricane shutter use.

• Petition with the Florida State Fire Marshal’s Office, and Bureau of Fire Standards and Training that education for unconventional rescue in hurricane shuttered buildings becomes a mandatory part of the fire recruit academy curriculum. In addition that this problem be addressed uniformly by all fire rescue departments throughout the state.

• Develop a community education program that promotes hurricane shutter safety, and encourage the use of quick release devices on storm panel type shutters.

• Creating a support network between neighboring fire departments, outside agencies, and industry.
• Use caution when developing a measuring tool for the success and failures of the SOP. Evaluating the success of this type of tactical guideline will be extremely difficult if shuttered buildings are not affected by fire.

• Promote and assure for the safety of our personnel and community. If only one person benefited from implementing an SOP with tactical guidelines for fire and rescue operations in hurricane shuttered buildings, then it was worth doing and should be considered successful.

• If trying to replicate the study, the only other advice to offer is keep looking for more information. Perhaps additional information will become available from other fire departments, industry or other professionals using this approach.

• The final and most sincere recommendation this researcher can offer is to personally assist and answer questions. Contact this researcher at Indian River County Fire Rescue, 1500 Old Dixie Highway Vero Beach Florida, 32960.

• Be Safe!
References


APPENDIX A
Hurricane Shutter Types
From the Atlantic Oceanographic Meteorological Laboratory (AOML)

Figure 1: Roll Down Shutters
Photograph taken by Neal Dorset

Figure 2: Accordion Shutters
Photograph taken by Neal Dorset

Figure 3: Accordion Shutters
photograph taken by Neal Dorset

Figure 4: Bahamas Shutters
photograph taken by Neal Dorset

Figure 5: Bahamas Shutters
Photograph taken by Neal Dorset

Figure 6: Awning Shutters
Photograph taken by Neal Dorset

Figure 7: Storm Panel Shutters
Photograph taken by Neal Dorset

Figure 8: Plywood Shutters
Photo taken by Stan Goldenberg
Plan B: Tactical Guidelines for Unconventional Rescue Challenges

1. Default Section

Please answer these questions to the best of your ability. Any information you can provide will be useful.

The purpose of this research is to develop a training guide and standard operating procedure that will facilitate improved efficiency in rescuing trapped citizens, and provide for the safety of emergency response personnel during disaster operational periods when faced with unique rescue challenges.

Note: "Hurricane Shutters" in this survey are defined as any covering, be it approved, makeshift, or plywood, that are used to secure and protect any window, door, or other means of egress from damage associated with hurricanes or tropical storms.

1. Survey Respondent Information

Name and Rank: 
Department: 
Address: 
City/Town: 
State: -- select state --
ZIP/Postal Code: 
County: 
Email Address: 
Phone Number: 

2. What unique rescue challenges has your organization faced during hurricane operational periods?

3. Which of the potential hazards associated with hurricanes and tropical storms has contributed to rescue challenges within your jurisdiction? (Check all that apply)

- N/A
- Tornadoes
- Flooding
- Storm surges
- High winds
- Unknown

Other (please specify)
### 4. Has the use of hurricane shutters presented unique rescue challenges in your jurisdiction? (Check all that apply)

- [ ] N/A
- [ ] Limited means of egress
- [ ] Difficulty in removing shutters
- [ ] Required additional resources
- [ ] Resulted in a defensive rather than an offensive strategy
- [ ] Ventilation challenges
- [ ] Delayed fire discovery
- [ ] Increased heat
- [ ] Unknown
- [ ] Other (please specify)

### 5. Does your department currently train for fire and rescue operations within hurricane shuttered buildings?

- [ ] Yes
- [ ] No
- [ ] Unknown
- [ ] Other (please specify)

### 6. Does your department currently have a written fire-ground SOG for your personnel regarding hurricane shutter safety?

- [ ] Yes
- [ ] No
- [ ] Unsure
- [ ] Other (please specify)

### 7. Does your organization provide public education programs for hurricane safety?

- [ ] Yes
- [ ] No
- [ ] Other (please specify)

---

Thank you for your assistance. If you have any documents, SOG, or training guide you wish to share, please contact me at angelone@canada.com

Thank you,
Raniero Angelone
## APPENDIX C
### Survey Results

1. **Survey Respondent Information**

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<thead>
<tr>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
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<td>64</td>
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</tbody>
</table>

The sample size selected from the Florida Fire Chief’s Association to participate in the survey was determined by the total number of fire rescue departments in the state of Florida. This included career, combination, and volunteer departments. The number of participants used in the survey was 335, of which there were 64 respondents, or 19.10% of the sample size.

2. **What unique rescue challenges has your organization faced during hurricane operational periods?**

<table>
<thead>
<tr>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.9%</td>
<td>7</td>
</tr>
</tbody>
</table>

Other:
1. We have not had significant problems, but as with other jurisdictions, the potential for problems does exist.
2. To the best of my knowledge we have not had a problem.
3. We are located in central Florida, which is less affected by hurricanes than coastal communities.
4. Structural collapse of occupied structures. Inability to drive rescue vehicles and equipment on flooded streets.
5. Hurricane shutters delayed ventilation efforts at structure fires.
6. A large problem is that people keep their shutters up longer than they have to.
7. Flooding and downed power lines

3. **Which of the potential hazards associated with hurricanes and tropical storms has contributed to rescue challenges within your jurisdiction? (check all that apply)**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>9.4%</td>
<td>6</td>
</tr>
<tr>
<td>Tornadoes</td>
<td>3.1%</td>
<td>2</td>
</tr>
<tr>
<td>Flooding</td>
<td>7.8%</td>
<td>5</td>
</tr>
<tr>
<td>Storm surges</td>
<td>17.1%</td>
<td>11</td>
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<tr>
<td>High winds</td>
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<td>43</td>
</tr>
<tr>
<td>Unknown</td>
<td>42.0%</td>
<td>27</td>
</tr>
<tr>
<td>Other please specify</td>
<td>4.7%</td>
<td>3</td>
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</tbody>
</table>
4. Has the use of hurricane shutters presented unique rescue challenges in your jurisdiction? (check all that apply)  

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>23.4%</td>
<td>15</td>
</tr>
<tr>
<td>Limited means of egress</td>
<td>51.6%</td>
<td>33</td>
</tr>
<tr>
<td>Difficulty in removing shutters</td>
<td>46.9%</td>
<td>27</td>
</tr>
<tr>
<td>Required additional resources</td>
<td>18.7%</td>
<td>12</td>
</tr>
<tr>
<td>Resulted in a defensive rather than offensive strategy</td>
<td>32.8%</td>
<td>21</td>
</tr>
<tr>
<td>Ventilation challenges</td>
<td>23.4%</td>
<td>15</td>
</tr>
<tr>
<td>Delayed fire discovery</td>
<td>9.4%</td>
<td>6</td>
</tr>
<tr>
<td>Increased heat</td>
<td>29.7%</td>
<td>19</td>
</tr>
<tr>
<td>Unknown</td>
<td>3.1%</td>
<td>2</td>
</tr>
<tr>
<td>Other please specify</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

5. Does your department currently train for fire and rescue operations within hurricane shuttered buildings?  

<table>
<thead>
<tr>
<th>Response</th>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>17.1%</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>75.0%</td>
<td>48</td>
</tr>
<tr>
<td>Unknown</td>
<td>7.8%</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

6. Does your department currently have a written fire-ground SOG for your personnel regarding hurricane shutter safety?  

<table>
<thead>
<tr>
<th>Response</th>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>3.1%</td>
<td>2</td>
</tr>
<tr>
<td>No</td>
<td>64.0%</td>
<td>41</td>
</tr>
<tr>
<td>Unknown</td>
<td>32.8%</td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

7. Does your organization provide public education programs for hurricane safety?  

<table>
<thead>
<tr>
<th>Response</th>
<th>Respondent Percent</th>
<th>Respondent Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>82.8%</td>
<td>53</td>
</tr>
<tr>
<td>No</td>
<td>12.5%</td>
<td>8</td>
</tr>
<tr>
<td>Unknown</td>
<td>1.6%</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>3.1%</td>
<td>2</td>
</tr>
</tbody>
</table>

Other: 1. No Response  
2. No Response
APPENDIX D
Survey Validation and Respondents

Survey Validation
Burkeen, Brian. Assistant Chief of Emergency Medical Services
   Indian River County Fire Rescue
   bburkeen@ircgov.com

Justice, Dale. Assistant Chief of Operations
   Indian River County Fire Rescue
   djustice@ircgov.com

Nolan, Brian. Emergency Management Coordinator
   Indian River County Emergency Services
   Bnolan@ircgov.com

Prime, Edward III. Assistant Chief Support Services
   Indian River County Fire Rescue
   bburkeen@ircgov.com

Sunderman, Lori. Fire Chief
   City of Stuart Fire Rescue
   lsunderman@ci.stuart.fl.us

Survey Respondents
Alachua County Department of Public Safety
Bay County Emergency Services
Bayshore Fire Rescue
Bradenton Fire Department
Brevard County Fire Rescue
Brooksville Fire Department
Broward Sheriff Office Fire Rescue
Cape Canaveral
City of Coral Springs Fire Rescue
City of Cocoa Beach Fire Department
City of Gainesville
City of Lecanto
City of Marco Island Fire rescue
City of Miami Fire Rescue
City of Oldsmar Fire Rescue
City of Port Orange Fire Rescue
City of Seminole Fire rescue
Columbia County Fire Department
Coral Springs Fire Department
Deltona Fire Department
Dunedin Fire Department
East Naples Fire Rescue
Escambia Fire Rescue
Flagler Beach Fire Rescue
Gitchrist County Fire Rescue
Hardee County Emergency Management
Hialeah Fire Department
Hollywood Fire Rescue
Indian River County Fire Rescue
Jacksonville Fire Rescue
Jasper Fire Rescue Department
Kissimmee Fire Department
Lynn Haven Fire & Emergency Service
Martin County Fire Rescue
Melbourne Fire Rescue
Miami Dade Fire Rescue
Nassau County Fire Rescue
North Bay Fire Control District
Ocala Fire Rescue
Orange County Fire Rescue
Orlando Fire department
Ormond Beach Fire Department
Osceola County Fire Rescue
Oviedo Fire Department
Palm Beach Gardens Fire Rescue
Palm Beach Shores Fire Department
Panama City Beach Fire Department
Pasco County Fire Rescue
Pensacola Fire Department
Plant City Fire Rescue
Plant City Fire Rescue
Polk County Fire Rescue
Ponce Inlet Fire Rescue
Port Orange Fire Rescue
Punta Gorda Fire Department
Putnam County Department of Emergency Services
Sanibel Fire Rescue District
Seminole County EMS/Fire/Rescue
Seminole Tribe Fire Rescue
Spring Hill Fire Rescue
Southern Manatee Fire Rescue
South Trail Fire District
St Cloud Fire Rescue
Stuart Fire Rescue
Sumter County Fire Rescue
Sunrise Fire Rescue
Tallahassee Fire Department
Tampa Fire Rescue
Taylor County Public Safety
Winter Garden Fire Rescue Department
West Manatee Fire Rescue
Introduction:
Firefighters are sometimes faced with difficult fire and rescue situations where normal fireground operations do not apply, or present with extraordinary dangers. When faced with unconventional fire and rescue challenges, the tendency will be to adapt and force what is known to fit the situation in some way. This practice can have negative and dangerous results to personnel and those they attempt to assist.

For example: The inability to enter a building by conventional means through doors or windows, as well as the dangers of these openings being blocked, requires an alternate plan of attack.

This SOP will assist personnel when such out of the ordinary situations are encountered. In essence, when unconventional rescue situations arise, and normal is no longer applicable, consider plan B.

Overview:
Hurricane shutters present unique fire and rescue challenges to occupants as well as firefighting personnel. Past events have shown that occupants attempting to flee a fire in a shuttered building have become trapped. Many times their bodies have been found near windows and doors as they were unable to escape. In addition, the lack of escape routes increases the dangers to fire rescue personnel who choose to enter these buildings.

Rescue operations that become necessary during hurricane or tropical storm operational periods can be attributed to high winds, storm surge, tornadoes, or flooding. These factors combine to cause structural damage or fire where occupants may become trapped. Also, IRCFR personnel are reminded that these situations may or may not result in fire. In addition, emergencies within hurricane shuttered buildings are not limited to disaster operational periods. Many home and business owners will deploy or install their shutters in advance of an impending storm, and leave them in place long after it has passed.
Problems:
Some of the problems that may be encountered with these structures include:
- A delay in fire discovery
- Fires well involved prior to arrival
- Limited means of escape
- A delay in rescuing victims
- Difficulty in removing shutters
- Required additional resources
- Ventilation challenges
- Extra smoky conditions
- Increased heat conditions
- Increased chance of flashover and or backdraft
- Inability for the fire to self vent from windows
- Result in a defensive rather than offensive strategy

Policy
It is important to identify the presence of hurricane shutters as soon as possible, and should be done during the initial scene survey by the first arriving personnel. The presence of shutters warrants an immediate call for additional resources, and there should be no delay in doing so. It is equally important that a risk and hazard analysis be conducted, and wait for the arrival of subsequent arriving units prior to committing personnel to any fire or rescue operation.

It shall be considered strictly forbidden to enter a hurricane shuttered building without first assuring for the safety of responding personnel. The officer who elects to allow personnel into such a structure shall be solely responsible for his or her decision and thus accountable for the resulting consequences of his or her actions.

It shall be the policy of Indian River County Fire Rescue that no fire rescue personnel enter a structure whose windows and doors are covered by hurricane shutters unless:
- A Rapid Intervention Team (RIT) is in place.
- A victim is within sight of the entry door and can be removed quickly.
- There is no immediate danger of fire or entrapment. This is only for a quick rescue.
- Shutters have been removed from at least one window or door of every room to the building.
## Shutter Removal:
The removal of hurricane shutters may present with much difficulty, and will depend on several factors:

- Type of shutter design
- Material used in their construction
- Amount, type and location of fasteners
- Method of shutter deployment
- Location of locking devices
- Accessibility to the shutters
- Type of tools available
- Number of personnel on scene
- Time required for removal

Shutter removal is a slow and tedious process due to the aforementioned factors. With exception to plywood shutter design, brute strength and use of pry bars or other forcible entry tools is not the best answer. The anchoring of a shutter’s track or mounting bracket to a building is extremely difficult to force, and can result in injury. However, should the decision be made to remove them manually, four key factors will assist in making the shutter removal operation less taxing on personnel:

1. **Concentrate on what is keeping the shutter on the track or bracket.** In the case of hurricane panel designs, there will be a wing nut or screw every six inches at each end for horizontal designs, and at the bottom for vertical designs. Use of screw drivers or cordless drills with a wing nut adapter is recommended.

2. **Examine how the shutter was deployed.** An awning or Bahamas style shutter may be hinged at the top and have a simple latching device at the bottom. In that case manipulate the latching device and lift the shutter out of the way. Use caution to secure the shutter in the open position so that it does not close back over the window.

3. **Look for locking devices.** Some shutter, such as the accordion style, may have a locking device at one end or the center. For these designs simply force this locking device and push the shutter out of the way.
4. **Know when to say when.** Use caution not to get so focused on the removal process that you lose sight of the entire operation. Some shutters will be extremely difficult and time consuming to remove. This is the case with roll down designs as they present the greatest challenge to firefighters. These shutter rolls down into position by way of a set of end tracks. If an exterior locking device is found, cut it and lift the shutter to roll it back up. If there is no visible exterior locking device, then it may be manually chain or electrically gear driven. These mechanisms cannot be forced from the exterior and will require cutting the shutter.

**Shutter Cutting**

Though it is a common practice not to cause undue damage or destroy; the urgency of a given situation or limited available resources may require cutting the hurricane shutters. This is by far the quickest way to assure for a safer and more effective fireground operation. The two shutter designs that would benefit most from a decision to cut are the panel and roll down type.

A gasoline powered rescue circular saw equipped with a metal cutting blade, such as the K-12 saws carried on our engines, should be used. All operating and safety procedures found in section 105.09 “power saw operations”, of these SOP’s shall be followed for all cutting operations. Also, it is important to remember to begin the cut with the blade stopped on the metal surface and to slowly increasing the saw blade speed until the desired cutting speed is achieved. This will prevent the saw from skipping along the surface and causing injury.

The best method of cutting the hurricane panel design is to cut either the securing bolts, or the panel itself. When cutting the panel, the cut should be made parallel to the bolts and to the inside. Once the cuts are made, the shutter panels will fall or slide away from the window or door.

The roll down design is more challenging and requires some planning before cutting. The cutting operation will be similar to that of large roll down security or garage doors. There are three methods of cutting that should be considered. First is the inverted V. This is the simplest way to make an opening. However, the opening may be too small for rescue due to its narrowing at the top. Second is the three cut method. This is performed by cutting three vertical relief cuts and sliding out the panel sections. This cut will only be successful if the shutter construction will allow for the slats to slide. Third is the box cut. This is simply cutting a large square into the shutter. The recommended order of cuts is top, far side away from the operator, bottom, and then near side. This will allow for the cut section to fall and not injure personnel.
Strategic Considerations
Ability to remove shutters
Ability to adequately ventilate the structure
Inability to gain access into the structure
Increase need for PAR
Availability of additional resources
Assign additional RIT
Protect exposures
Take a defensive position

Tactical Guideline
Remove the shutters by hand.
Remove the shutters with hand tools
Remove/cut the shutters with power saws
Leave the shutters in place and revise your strategy