Executive Analysis of Fire Service Operations in Emergency Management

Establishing Damage Assessment Criteria for The Woodlands Fire Department

Richard S. Windham

The Woodlands Fire Department

The Woodlands, Texas

June 2008
CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: ________________________________
Abstract

The problem was TWFD did not have standardized damage assessment evaluation criteria. The purpose was to establish standardized damage assessment evaluation criteria. Action research was used to answer the following research questions a) What is the purpose of establishing and utilizing standardized evaluation criteria for conducting damage assessments?, b) What types of evaluation criteria should be established for conducting damage assessments?, and c) What types of evaluation criteria are other fire departments utilizing for conducting damage assessments? A survey was used to gather data related to damage assessment criteria. Results indicate standardized evaluation criteria enhance efficiency and should contain less than five damage categories. Recommendations include training personnel on the criteria and sharing the criteria with other agencies.
# TABLE OF CONTENTS

Certification Statement ......................................................... page 2
Abstract ................................................................. page 3
Table of Contents .......................................................... page 4
Introduction ................................................................. page 5
Background and Significance ................................................ page 6
Literature Review ............................................................ page 10
Procedures ................................................................. page 21
Results ................................................................. page 24
Discussion ................................................................. page 27
Recommendations .......................................................... Page 29
References ................................................................. page 31

Appendix A ................................................................. page 33
Appendix B ................................................................. page 35
Establishing Damage Assessment Criteria for The Woodlands Fire Department

In September 2005, The Woodlands, Texas, was preparing for the arrival of a category 5 hurricane named Rita. This storm was predicted to make landfall in the Galveston, Texas, area and was expected to proceed due North, directly into the highly populated greater Houston area. The Woodlands, Texas, located approximately 20 miles due north of Houston, sat directly in the anticipated path of this storm. Several days prior to the predicted date of landfall, key community leaders in The Woodlands and The Woodlands Fire Department (TWFD) command staff personnel began meeting and implementing the fire department’s Emergency Operations Plan (EOP) in anticipation of widespread wind damage, localized flooding, and injured and/or displaced residents. Fortunately for The Woodlands, Rita took a more Easterly path and made landfall in the East Texas area, sparing the greater Houston area and The Woodlands of any significant storm damage.

While The Woodlands was spared a direct hit by this hurricane, a problem was identified during the implementation of the fire department’s Emergency Operations Plan. The problem is TWFD does not have standardized criteria established to perform rapid damage assessments following an incident. The purpose of this research project is to establish standardized evaluation criteria which TWFD could use to conduct post incident rapid damage assessments. This research project uses the action research method. The research questions examined by this project are a) What is the purpose of establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments?, b) What types of evaluation criteria should be established for conducting post incident rapid damage assessments?, and c) What types of evaluation criteria are other fire departments utilizing for conducting post incident rapid damage assessments?
Background and Significance

TWFD was formed in 1973 with the hiring of a few paramedics to provide first aid and emergency medical services primarily to the construction workers building the very first portions of The Woodlands. Shortly after the hiring of these paramedics, volunteers from Mitchell Energy and Development Company, the primary developer of The Woodlands Texas, began providing fire suppression services to the area. Since that time, TWFD has grown into a full career fire department consisting of 122 employees. These 122 employees consist of 1 fire chief, 3 deputy chiefs, 3 battalion chiefs, 3 captains, 18 lieutenants, 21 driver/operators, 54 firefighters, 1 dispatch supervisor, 3 dispatch shift supervisors, 10 dispatchers, 1 public educator, 1 inspector, 2 administrative assistants, and 1 maintenance technician. These employees operate out of six fire stations and one dispatch center.

TWFD provides fire suppression, advance life support first response, hazardous material response, technical rescue, public education, and new commercial construction inspections services. TWFD also provides emergency dispatch services for 14 other fire departments throughout Montgomery County, Texas. TWFD currently staffs five fire engines, two ladder trucks, and one supervisor/command vehicle. Three additional vehicles, a heavy rescue vehicle, a hazardous material vehicle, and a brush truck, are operated as front line equipment, but are not staffed. When dispatched, these three vehicles respond with staff off the other vehicles.

Montgomery County, Texas, has an Office of Emergency Management and an Emergency Management Coordinator. The county Emergency Management Coordinator also serves as the Chief Deputy for the Montgomery County Sheriff’s Department. The county Office of Emergency Management is responsible for ensuring Montgomery County is prepared for various emergency situations and for effectively coordinating county resources during those
emergency situations. The county fire departments have come together and formed an association known as the Montgomery County Fire Chiefs Association. This association’s purpose is to maintain open lines of communications among the 16 county fire departments, to maximize county fire resources, to coordinate county fire training activities, and to work towards consistency with vital policies and procedures.

The Woodlands, Texas, located 20 miles due North of Houston, Texas, encompasses approximately 45 square miles, and has a residential population of just over 88,000. The Woodlands has a large commercial area that includes the corporate headquarters for several major corporations including Anadarko Petroleum and Chicago Bridge and Iron, several high-tech research facilities, a 13,000-seat outdoor entertainment venue, and a major regional shopping mall. The Woodlands is a fairly unique community in that it is not an incorporated municipality but a master-planned community and has grown over the years to become the largest populated community in Montgomery County, Texas.

TWFD is a fully paid municipal type fire department fully certified by the Texas Commission on Fire Protection. However, they do not have any true governmental authority or liability protection, such as code enforcement powers, governmental limits of liability protection, or emergency declaration authority. For The Woodlands, these typical local governmental authorities lie at the lowest level of an official governmental body, the Montgomery County Commissioners Court. Due to the current governmental situation within The Woodlands, emergency management, and all aspects associated with emergency management, has been and continues to be a challenge due to TWFD not being recognized as an official emergency organization by county officials.
For years, TWFD has had an Emergency Operations Plan that provides guidance and outlines how the fire department and the community will respond during large scale emergencies. In September 2005, with Hurricane Rita heading directly for the upper Texas coast, the Emergency Operations Plan was initiated. On the morning of September 23, 2005, with a predicted landfall within 24 hours due South of The Woodlands, in the Galveston, Texas area, and a predicted inland movement of due North, The Woodlands Fire Department’s Incident Management Team was activated.

Since the inception of The Woodlands in the early 1970s, the greater Houston area has only suffered one direct strike by a hurricane. In 1983, Hurricane Alicia, made landfall at Galveston, Texas and headed inland due North, very similar to the predicted landfall location and inland movement path of Hurricane Rita. Hurricane Alicia was a Category 3 storm that quickly weakened once over land causing minimal damage to inland areas, including The Woodlands. Because of the minimal amount of damage resulting from Hurricane Alicia and the low emphasis on federal disaster aid and emergency assistance at the time, no type of formal damage assessment process was developed or used by The Woodlands Fire Department at that time or since that time. However, times have changed and it was quickly recognized that if Hurricane Rita made landfall as predicted and took an inland path as predicted, The Woodlands would suffer significant damage and losses and needed a way too quickly and effectively capture and record that information.

On the evening of September 23, 2005, just hours before the predicated landfall of Hurricane Rita, TWFD’s Planning Section Chief began developing a damage assessment process for use by fire department and local law enforcement personnel to evaluate and report damage throughout the community immediately following the passage of the storm. This hastily
prepared damage assessment process focused on ensuring area coverage and had no established
criteria for personnel conducting the assessment to evaluate and report the level or degree of
damage observed. What one responder may have categorized as damage another responder may
have categorized as destroyed. This situation could have easily resulted in inconsistent and
inaccurate damage assessment reports and ultimately incorrect distribution of emergency
response and support resources.

Because of its close proximity to The Texas Gulf Coast it is without question that The
Woodlands and The Woodlands Fire Department will face this exact threat in the future, in
addition to the many other scenarios and possible incidents that could result in wide scale
damage and the need to quickly assess that damage. To this day The Woodlands Fire
Department does not have any standardized damage assessment criteria for field personnel to use
to conduct damage assessments. Without some basic damage assessment criteria, The
Woodlands Fire Department will not be able to quickly and accurately conduct damage
assessments, severely hampering its ability to appropriately deploy its limited resources.

According to the Executive Analysis of Fire Service Operations in Emergency
Management – Student Manual (2007), damage assessments are important not only for the initial
response but also for the recovery phase of an incident. This manual goes on to compare damage
assessments to an incident size up and indicates the damage assessment process can be a
component of the incident size up process (Executive Analysis of Fire Service, 2007). As with
any incident, having an accurate situational size up, and in the case of emergencies resulting in
large scale damage a good damage assessment, will allow the incident commander to have a
good understanding of the situation they are attempting to manage and will, in most cases, lead
to an appropriate response by emergency agencies. This concept directly supports the United
Conducting rapid damage assessments is nothing new to the fire service. Firefighters do it all the time, at almost every emergency incident. While it may not be recognized nor categorized as a damage assessment, a simple size up at a structure fire is a form of damage assessment. A damage assessment is simply the gather of information about a situation and using that information to determine the impact of the situation on both life and property (Executive Analysis of Fire Service, 2007). This literature review will document what others have discovered and written on the damage assessments as it relates to the following research questions: a) What is the purpose of establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments?, b) What types of evaluation criteria should be established for conducting post incident rapid damage assessments?, and c) What types of evaluation criteria are other fire departments utilizing for conducting post incident rapid damage assessments?

The first research question examined in this literature review is “What is the purpose of establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments?” To fully examine this research particular research question, the purpose and importance of standardization in general will be explored first.

Standardization is critical to the success of all businesses and industries. Standards allow us to essentially speak the same language on a specific subject such as standardized criteria for evaluating medical disorders, standardized language for computers to communicate with one another, standardized business and commerce practices, and yes standardized criteria for
conducting post incident rapid damage assessments. The information technology industry is a classic example of where standards allow for global compatibility (Smoot & Flanigan, 1999). When exploring the effects of standardization on business and commerce, Roberti (2004) states that establishing and utilizing standardized business principles and practices provides a certain level of predictability making it easier to do business thus contributing to significant economic growth.

Based on the information provided by these two authors, it can be said that the development and use of standards provides an avenue for compatibility and ease of doing business. With respect to emergency services and emergency response, these points are critical when dealing with large scale incidents that inflict damage over a wide area.

The American Military has extensive experience in the area of assessing damage. While the purpose of the military’s damage assessment process is to determine the success and effect of military missions on enemy combatants and facilities, the underlying intent is the same as the rapid damage assessments performed by the fire service, to assess and report damage and assist with decision making on resource deployment. The military refers to this type of assessment as battle damage assessment or BDA. Accurate battle damage assessments are critical to the military’s success and or failure during military conflicts.

According to Diehl and Sloan (2005), assessing battle damage was a simple process many years ago when battles were relatively small and confined in area and time. Military commanders could personally observe the battles progress as it occurred. However, as combat has become more complex, battle fields are more wide spread, military commanders are more remote from actual battle areas, and the significant increased use of combined military forces the traditional process of assessing and reporting damage has become obsolete. One major issue of
Damage Assessment

Concern noted with the traditional battle damage assessments process, as observed during Operations Enduring Freedom and Iraqi Freedom, was battle damage assessments were “plagued by nonstandard reporting formats” (Diehl & Sloan, 2005, p. 62) resulting in slow and inaccurate damage assessment reports. This prompted the military to develop joint combat assessment solutions including mission reporting standardization (Diehl & Sloan, 2005).

In a report describing the necessary requirements for conducting post disaster damage assessments, it is clearly stated that officials responsible for post-disaster operations must have accurate information about the situation at hand and that this information must be communicated in a timely manner to allow the appropriately deployment of available resources (Post-disaster damage assessment, 2000). Without accurate and timely situational information, unnecessary escalation of an incident could easily occur including additional loss of live, injury, and property damage.

When making damage assessment reports “imprecise terminology, or different interpretations of it, can cause confusion” (Post-disaster damage assessment, 2000, p. 6). Confusion can result in a significant lack of situational awareness and lead to a delayed and or an inappropriate response to the situation at hand. To reduce the likelihood of confusion occurring as related to damage assessment reporting, terminology used in damage assessment reports must be “clearly defined and standardized” (Post-disaster damage assessment, 2000, p.6).

Based on these writings it is apparent that the purpose of establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments is to provide a common avenue for the multiple agencies and various personnel that are responsible for conducting rapid damage assessments to make accurate damage assessments evaluations and report the assessment results to those individuals or groups that are responsible for making
decision on resource deployment and incident management. This information gives the decision makers a clear picture of the effects of the incident and allows them to make accurate decisions on resource deployment and ultimately deploy resources in a manner that will maximize the usefulness of the available resources and minimize the immediate and long term effects of the incident.

The second research question examined in this literature review is “What types of evaluation criteria should be established for conducting post incident rapid damage assessments?” No literature could be located that claims or even demonstrates that the use of one particular set of evaluation criteria produces more accurate damage assessment findings or is more effective than any other set of evaluation criteria. However, several variations of evaluation criteria were located in the available literature and while not all were used as evaluation criteria for performing post incident rapid damage assessments, they do serve as examples of potential evaluation criteria that could be adopted as standardized damage assessment criteria for conducting post incident rapid damage assessments.

The structural triage system adopted and used by the Federal Emergency Management Agency’s (FEMA) Urban Search and Rescue (USAR) Task force teams is one type of evaluation criteria. While not designed specifically for post incident rapid damage assessment, its purpose is essentially the same. According to Naum (1997), the structural triage system allows incident management teams to identify and assess incident priorities, determine the magnitude of the incident, determine resource needs, and develop initial strategies and tactical assignments. This is in essence what a basic incident size up accomplishes and according to the information presented in the Executive Analysis of Fire Service Operations in Emergency Management Student Manual (2007), a post incident rapid damage assessment is similar to the size up process.
The structural triage system that Naum (1997) describes consists of both a structural marking system and a basic three-tiered evaluation criteria. While the structural marking system is based on the damage assessment criteria, it is not within the scope of this particular study and as such will not be discussed. However, the three-tiered evaluation criteria is applicable to this study. The three-tiered evaluation criteria that is incorporated into this structural triage system is based on the damage sustained by the structure and the ability for search teams to enter the particular structure. The evaluation criteria consists of a minor damage category that is considered safe for search teams to enter, a significant damage category that may require some structural shoring prior to search teams entering, and a severe damage category that is not considered safe for search teams to enter (Naum, 1997).

The damage assessment evaluation criteria described in the document Post-Disaster Damage Assessment and Needs Analysis (2000) utilizes five separate and distinct categories of damage. This set of evaluation criteria is based on the usability of the structure. While based on the usability of the structure, the actual criteria as reported in the damage assessments are expressed as simple percentages of observed damage. The five different criteria are less than 25 percent, greater than 25 percent, greater than 50 percent, greater than 75 percent, and 100 percent.

Each of the five reporting categories that make up this particular set of evaluation criteria has a specific meaning as listed in the Post-Disaster Damage Assessment and Needs Analysis (2000). The less than 25 percent criteria means the structure sustained minor structural damage and is considered safe for use. The greater than 25 percent criteria means the structure has sustained some structural damage, it is safe for limited use, and the structure is capable of being repaired within one week. The greater than 50 percent means the structure has sustained
significant structural damage, it is not safe for use, and repairs will more than one week. The greater than 75 percent criteria means the structure has sustained major structural damage, it is not safe for use, and the structure is capable of being repaired within one month. The 100 percent criteria means the structure is not useable and not able to be repaired.

In a report by the Federal Emergency Management Agency (2007), documenting the damage caused by a tornado that struck Greensburg Kansas in May, 2007 and examining the accuracy of the newly created Enhanced Fujita Wind Speed Scale (EF Scale), a detailed evaluation criteria was utilized to compare the severity or degree of damage (DOD) actually observed on the ground with the expected damage based on the newly created EF Scale. The degree of damage criteria utilized in this study consists of 10 separate and distinct categories of damage and while used in this particular study to evaluate the accuracy of the EF Scale it could be utilized as a bases for a rapid damage assessment criteria.

The 10 category DOD criteria used in the Federal Emergency Management Agency (2007) analysis of the Greensburg, Kansas tornado was the most comprehensive and detailed criteria set discovered during this literature search. DOD 1 was described as a “Threshold of visible damage” (Federal Emergency Management Agency, 2007, p. 1-2), DOD 2 involved minor loss of roof covering and the possible loss of light weight vinyl or metal siding, and the loss of light weight accessories such as gutters and awnings. DOD 3 involved broken glass and DOD 4 involved the first level of significant structural damage including the major loss of roof coverings, collapse of chimneys, and or the loss of structural accessories such as porches and or carports. DOD 5 involved the shifting of the structure from the foundation. DOD 6 involved the major damage to the roof structure and DOD 7 involves the loss of exterior wall on the top story. DOD 8 involved the loss of most interior wall on the top story and DOD 9 the loss of most walls

Another set of damage assessment criteria that could be used as a basis for rapid damage assessment criteria is the damage criteria embedded in the original Fujita Scale. While the Fujita scale was developed and is used as a standardized method to measure the intensity of tornados based on wind speed, the actual determination of the wind speed is based on observed damage.

The damage criteria used as a bases for determining storm intensity includes six criteria: light damage, moderate damage, considerable damage, severe damage, devastating damage, and incredible damage (Fujita tornado damage scale, n.d.).

Light damage is described as minor damage to chimneys, trees with broken branches, and smaller trees uprooted. Moderate damage is described as the loss of roof covering loss and mobile homes blown off foundation. Considerable damage is described as loss of structural roof members, mobile homes destroyed, and light weight objects being turned into missiles. Sever damage is described as destruction of roofs and walls and heavy objects such as automobiles being thrown thru the air. Devastating damage is described as destruction of well constructed homes and heavy objects such as automobiles being turned into missiles. The last damage category in this particular criteria set is incredible damage and is described as well constructed buildings being totally blown away (Fujita tornado damage scale, n.d.).

Another damage assessment criteria set is contained in the Florida Division of Emergency Management’s Handbook for disaster assistance (2004). This criteria set contains four distinct categories of damage: affected, minor damage, major damage, and destroyed. A fifth category is also included in this particular criteria set to denote properties and areas that are inaccessible to evaluators.
Within this criteria set the term affected is described as a structure and or contents that have sustained some damage but is still usable and habitable without repairs. Minor damage is described as a structure that is damaged and uninhabitable but is repairable within a short period of time. Major damage is described as a structure that has sustained structural or significant damage and requires significant repairs to be habitable. Destroyed is described as a total loss (Handbook for disaster assistance, 2004).

Based on these documented damage assessment evaluation criteria sets and the fact that no documented literature sources could be found documenting one evaluation criteria is better or even preferable over a different evaluation criteria, a clear and discernable answer to the second research question, “What types of evaluation criteria should be established for conducting post incident rapid damage assessments?” could not be reached. However, thru this literature review, several potential damage assessment criteria sets were located and while some were not directly intended or designed as formal damage assessment evaluation criteria they could easily be utilized as such.

The third research question examined in this literature review is “What types of evaluation criteria are other fire departments utilizing for conducting post incident rapid damage assessments?” No published literature could be located specifically discussing or describing the types of evaluation criteria other fire department are utilizing for conducting damage assessments. However, several Executive Fire Officer Program Applied Research Project (ARP) reports were located at the National Fire Academy’s Learning Resource Center which describes damage assessment processes including the evaluation criteria contained within these processes.

Barksdale (2007), as part of an action research project to develop a damage assessment process for the Arlington County Fire Department, adopted a damage assessment form and an
associated evaluation criteria set from the Virginia Department of Emergency Management.

Barksdale did not discuss the process or justification for adopting this particular damage
assessment evaluation criteria set over other evaluation criteria sets. This particular damage
assessment criteria set contained four distinct categories of damage: affected habitable, minor,
major, and destroyed. As part of the draft damage assessment process that was developed by
Barksdale, detailed explanatory information was included to provide the damage assessment
evaluator guidance on categorizing damages. This explanatory information included the
definition of the individual damage evaluation categories, a general description of the damage
evaluation categories, specific things to look for related to each damage category, and guidance
on applying the damage assessment categories to flooding events.

Barksdale (2007), provided definitions for his evaluation criteria as follows. Affected
Habitable was defined as damage to chimney or porches and wet carpeting on the first floor.
Minor was defined as flooring and exterior walls sustaining minor damage and trees fallen on the
structure with roof damage consisting of missing shingles or roof tiles. Major was defined as
collapsed walls with damage to exterior framing and collapsed roofs. Destroyed was defined as
all structural components above the foundation leveled and significant damage to foundations
and basements.

Barksdale (2007), also provided some guidance to damage assessment evaluators on
estimating water depths. That guidance included standard brick as being 2 1/2 inches and
concrete or cinder block being 8 inches. Barksdale indicated standard doors as being 6 feet 8
inches tall and door knobs being approximately 36 inches off the floor. The last two water depth
estimating guidance Barksdale provided was that standard stair risers are 7 inches high and lap or
aluminum siding is usually 4 or 8 inches tall.
Hoecherl (2002), as part of an action and descriptive research project to develop a model damage assessment policy for the fort Lauderdale Fire-Rescue Department, utilized a damage assessment criteria set composed of five separate and distinct categories. Hoecherl did not discuss the process or justification for adopting this particular damage assessment evaluation criteria set over other evaluation criteria sets. The five categories of damage that made up the damage assessment criteria set used in Hoecherl’s process was no damage, minor, moderate, severe, and catastrophic.

Hoecherl (2002) also provided definitions for the damage categories as part of his damage assessment policy. The no damage category was defined as no significant damage observed. Minor was defined as damage to small tree limbs and signs, some downed power lines and no significant signs of structural damage. Moderate was defined as small amounts of roof coverings missing and some structural damage to roof along with moderate damage to infrastructure and public services. Severe was defined as heavy damage to many of the structures with most structures suffering some damage. Sever damage also included the total destruction to of some structures. Catastrophic was defined as extensive damage and total collapse of structures.

Hard (2007) adopted damage assessment criteria set consisting of four separate and distinct damage categories. These damage categories were developed as part of an action research project to produce a rapid damage assessment procedure for the Klamath County Fire District No. 1. As part of the draft procedure developed by Hard, definitions for each damage category was provided. The damage categories adopted by Hard are none, light, moderate, and heavy. Hard did not discuss within his report how these damage categories were derived.
Hard (2007) defined none as no apparent damage to structures and minor injuries to only a few individuals. Light was defined as a minor damage to structures including broken windows, small cracks in walls, and minor damage to infrastructures. Moderate was defined as significant damage to structures including structures shifted on foundations and collapsed or missing portions of structures. Heavy was defined as significant or complete destruction to structures.

The last damage assessment criteria set looked at as a part of this literature review was adopted by Wohlever (2007) in an action research project to develop a rapid assessment and reporting procedure for the Perkins Township Fire Department. In Wohlever’s research he adopted a four category damage assessment criteria set for fire stations and a three category damage assessment criteria set for all other structures.

The damage assessment criteria adopted for fire stations consisted of no damage, minor damage, major damage, and destroyed while the damage assessment criteria adopted for all other structures consisted of none or light damage, moderate damage, and heavy damage. Wohlever did not provide definitions or descriptions of the damage categories nor did he discuss how the damage categories were derived.

In summary, a disappointing amount of information related to damage assessment evaluation criteria and the value of selecting appropriate damage assessment evaluation criteria was found. No source in this literature review could be found that indicates damage assessment program developers gave any significant thought to the actual criteria in which damage was to be evaluated against. It was apparent from the writings of the United States Military’s experience with damage assessments, that standardized reporting formats are significant and without them the accuracy of the damage assessment information gathered and reported must be suspect. It was also apparent from the information examined as part of this literature review that
standardization in general is critical to the efficiency of any operation, including evaluating
damage following a large scale emergency. Most of the damage assessment processes examined
as part of this literature review appeared to keep the number of evaluation categories to five or
less distinct categories of damage and most provide evaluators with some sort of guidance on
properly classifying observed damage, either with definitions or descriptions of the different
categories.

Procedures

This research paper began with personal observations in September 2005, during
Hurricane Rita preparations and the obvious lack of a damage assessment process. Based on this
personal observation followed by personal discussions with national Fire Academy Faculty and
Staff, the problem statement and the basis for this research project was developed. This was
followed by the development of the purpose statement and associated research questions.

Following the development of the problem and purpose statements and associated
research questions, a literature search was conducted at the National Fire Academy’s Learning
Resource Center utilizing the online card catalog system. The free text search method was
utilized with “Damage Assessment”, “Disasters”, Disaster Planning”, and “Property Damage” as
primary keywords. The “Display 50 Results” setting was utilized for these searches. The results
of these key word searches were printed and reviewed on site for project relevancy. Sources
believed to be relevant to the research questions were retrieved and reviewed on site. Those
sources found to be actually relevant were copied and reviewed further throughout the course of
the project. Additional literature searches were conducted throughout the project using the
internet and the Google search engine using the same key words that were used in the search
conducted at the National Fire Academy’s Learning Resource Center. A document request was
submitted to the National fire Academy’s Learning Resource Center and the documents received as part of this request were reviewed for relevancy.

A survey was selected and used as the research tool to gather the required data to answer the project’s research questions. Survey questions were developed to gather information related to the damage assessment criteria utilized by fire service agencies within the state of Texas and were based on the information examined in the literature review directly related to available evaluation criteria. Survey questions 1 and 2 were designed to examine respondent’s use of standardization in response to the first research question, “What is the purpose of establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments?” Survey questions 3 and 4 were designed to compare the number of respondents whose communities have experienced a disaster type incident with those communities that have established standardized damage assessment evaluation criteria. Those respondents that reported in question four to not having standardized evaluation criteria were asked not to answer any additional survey questions and were thanked for their participation. Survey questions 5, 6, 7, and 8 were designed to gather data related the second and third research questions, “What types of evaluation criteria should be established for conducting post incident rapid damage assessments?” and “What types of evaluation criteria are other fire departments utilizing for conducting post incident rapid damage assessments?”.

A three month subscription to www.zoomerang.com, an internet survey service site, was purchased and utilized to administer the survey. The survey was placed on an internet survey service site and made available for one month. The on-line survey was tested for comprehension and ease of use by several individuals prior to opening the survey for outside completion. A request to participate in the survey and a link to access the on-line survey was distributed to 348
members of the Texas Fire Chiefs Association utilizing the association’s e-mail distribution list. Only the top official of each department listed on the Texas Fire Chief’s Association’s e-mail distribution list received the request to participate. Of the 348 requests to participate that were e-mailed out, 73 did not get delivered due to some technical error. This left a total of 275 individuals who received invitations to participate. The request contained introductory information on the researcher, the purpose of the project and the associated survey, and instructions on how to access the survey. Since the survey was internet based, it was not possible to include an actual formatted survey in this paper. However, a non-formatted copy of the survey used for this project is included as Appendix A to this paper.

Some limiting factors exist within this project that could threaten its validity. The first and most significant limiting factor involves the literature review. A very limited amount of published sources related to damage assessment program development could be located. In the literature sources that did discuss the damage assessment program development process there was no mention of the importance of or the process used to develop effective evaluation criteria. Another possible limiting factor is with the sample population used for the research survey. By using e-mail to invite individuals to participate in the survey it is easy to know how many initial invitations were sent to participate. However, with the uncertainty of the receiving party’s internet access and e-mail service, it is not possible, with any accuracy, to know how many of the invites were actually received by the invitees. In addition to this it is possible that the initial invite is forwarded by the original invitee to one or more individuals ultimately changing the total number of initial invitees. This could affect the validity of the survey results as applied to the total populations. Another limiting factor that could affect the validity of this project is the wording of the survey questions. No matter how much thought and careful wording of the
research questions, one can never be certain that the respondents fully understood the survey question as the researcher intended.

During the final writing phase of this paper, all sections were reviewed by several individuals, including several non-emergency service individuals, for ambiguous terms and concepts. No such terms or concepts were noted during the review and as such no definitions were needed or provided.

Results

Data obtained from the survey responses were used to answer the original research questions. Those original research questions are a) What is the purpose of establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments?, b) What types of evaluation criteria should be established for conducting post incident rapid damage assessments?, and c) What types of evaluation criteria are other fire departments utilizing for conducting post incident rapid damage assessments? Data obtained through the survey instrument was utilized to formulate the following answers to the original research questions: a) A majority of fire service agencies currently utilize standardization most often for the purpose of providing efficiency of emergency operations, enhancing the safety of personnel, and ensuring consistency, b) an evaluation criteria set based on the actual damage observed appears to be the preferred evaluation criteria, and c) a majority of fire departments utilize evaluation criteria consisting of less than five separate and distinct categories and definitions of each category of damage is usually provided.

A total of 69 surveys were completed and returned as part of this project. This equates to a 25% response rate. Of the 69 respondents, 48% indicated they utilize standardization extensively within their organization and 39% indicated they utilized standardization frequently.
Only 13% indicated they only occasionally utilized standardization and no respondents indicated they did not utilize standardization at all. When asked various reasons for utilizing standardization, 91% indicated they utilized standardization to provide for the safety of personnel, 87% indicated they utilized standardization to provide efficiency within emergency operations, 77% indicated they utilized standardization to provide for consistency, and 54% indicated they utilized standardization to provide a certain level of predictability.

When asked if the respondent’s community had experienced a disaster-type incident within the last 20 years, 55% indicated their community had experienced a disaster-type incident within the last 20 years and 45% indicated their community had not experienced a disaster-type incident within the last 20 years. This is the exact same response received when asked if the respondent’s department, or another department or agency within their jurisdiction or county, had standardized damage assessment criteria, 55% responded they or another department or agency within their jurisdiction or county did have standardized damage assessment criteria while 45% responded they or another department or agency within their jurisdiction or county did not have standardized damage assessment criteria. At first glance this appears to indicate that all those that have experienced a disaster-type incident had developed standardized damage assessment criteria. However, when these two questions are cross tabulated against each other the data reveals that of the 38 respondents that indicated their community had experienced a disaster-type incident within the last 20 years only 23 or 60% responded that they had or another department or agency within their jurisdiction or county had standardized damage assessment criteria while 15 or 48% responded they or another department or agency within their jurisdiction or county did not have standardized damage assessment criteria.
When asked what the respondent’s damage assessment criteria was based on, 36 respondents or 97% indicated their damage assessment criteria was based on the actual damage observed and only one respondent indicated their damage assessment criteria was based on some other system. In this case the respondent indicated their damage assessment criteria was based upon a locally adopted building code. One respondent that reported their damage assessment criteria was based on the actual damage observed reported their damage assessment criteria was also based on a numerical grading system. Another respondent that reported their damage assessment criteria was based on the actual damage observed reported their damage assessment criteria was also based on the usability of the structure. A third respondent that reported their damage assessment criteria was based on the actual damage observed reported their damage assessment criteria was also based on both a numerical grading system and the usability of the structure.

When asked how many separate categories the respondent’s damage assessment criteria contains, 68% reported their damage assessment criteria had less than five categories and 32% reported their damage assessment criteria had five to ten categories. No respondent reported having more than 10 categories for their damage assessment criteria. When asked if the respondent’s damage assessment criteria included descriptions of the evaluation criteria, 76% responded yes and 24% responded no. When asked if the respondent’s damage assessment criteria included sample pictures 41% responded yes and 59% responded no.

Based on the results discussed above, a standard set of damage assessment evaluation criteria, based on the actual damage observed by damage assessment evaluators was developed and is included as Appendix B to this report. This damage assessment criteria will be introduced as part of the fire department’s 2008 hurricane awareness training to be conducted in June of
2008. The damage assessment criteria set developed as part of this research consists of four separate and distinct categories. Those categories are affected, minor damage, major damage, and destroyed. A fifth category, inaccessible, is also included to allow evaluators to report areas in which access could not be gained and as such damage assessment could not be performed. Guidance descriptions are provided for each damage category to assist evaluators in accurately categorizing observed damage.

Discussion

As stated earlier in this report the purpose of this research is to establish standardized evaluation criteria which TWFD could use to conduct post incident rapid damage assessments. This researcher was surprised to find no published, or unpublished, literature sources that even remotely considered the importance of developing standardized damage assessment evaluation criteria. While several documents were located that described or listed the evaluation criteria that was utilized for that a specific purpose, the actual process or thought process used to develop the evaluation criteria or the reason the particular damage assessment criteria was selected by the various authors and researchers was never discussed.

When examining the reasons for establishing and utilizing standardized evaluation criteria for conducting post incident rapid damage assessments, writings examining the United States Military’s battle damage assessment process proved to be most insightful. According to Diehl and Sloan (2005), battle damage assessments conducted during Operations Enduring Freedom and Iraqi Freedom had significant problems that resulted from a lack of standardization. This lack of standardization led the United Sates Military to develop standardized combat damage assessment reporting formats.
The American Fire Service has also learned the importance of standardization. A majority of survey respondents, 87%, reported utilizing standardization frequently or extensively. On 13% reported only occasionally using standardization and no respondent reported never using standardization. This leads this researcher to conclude standardization has become a normal practice for fire service personnel. The most common reason for using standardization cited by survey respondents is the safety of personnel (91%), efficiency of emergency operations (87%), and consistency (77%). Roberti (2004) cited predictability and ease of doing business as reasons for utilizing standardization in business and commerce. While the wording used by survey respondents and Roberti to describe the reasons for utilizing standardization differ slightly, it can be concluded that the reasons are centered around efficiency which essentially led to all the other reasons cited for utilizing standardization.

While no literature sources were located that described the process used to develop or select one damage assessment criteria set over another, several applied research projects, whose purpose was to develop damage assessment processes, were located and did offer some insight into the various types of damage assessment criteria sets being included in fire service damage assessment processes. Three of the four applied research papers examined as part of this research project utilized less than five separate and distinct categories of damage. Barksdale (2007), Hard (2007), and Wohlever (2007) all utilized less than five categories of damage in the damage assessment processes developed and documented in their applied research projects. This closely corresponds with the 68% of survey respondents that answered their particular damage assessment process utilized less than five categories of damage. Three of the four applied research papers cited in the literature review, Barksdale (2007), Hoecherl (2002), and Hard (2007) all provided definitions or descriptions of the damage categories adopted as part of these
Based on the overall findings of this research project, this researcher concludes that standardized damage assessment criteria are important for the efficiency of conducting rapid damage assessments and evaluation criteria should be both comprehensive and concise at the same time. A majority of the fire departments surveyed utilized less than five categories to make up their damage assessment evaluation criteria and as such the evaluation criteria develop for TWFD as part of this research project contain less that five damage categories. Establishing and adopting this standardized damage assessment criteria will allow TWFD to prepare for and respond to disaster type emergencies with a higher level of efficiency than ever before.

Recommendations

The problem examined by this research was TWFD did not have standardized criteria established to perform rapid damage assessments following an incident. The purpose of this research project was to establish standardized evaluation criteria that TWFD could use to conduct post incident rapid damage assessments. Such criteria are developed and in place at this time. However, in order to build upon the simple development of damage assessment evaluation criteria the following recommendations are offered.

The first recommendation is to conduct training on the newly developed and adopted damage assessment criteria during the 2008 annual fire department hurricane preparedness training. This will ensure all personnel are fully aware of the established assessment criteria and have been informed as to their meaning and use.
The second recommendation is to share the damage assessment criteria developed for TWFD with other county agencies responsible for conducting damage assessments and encourage their adoption of these damage assessment criteria. This recommendation will help ensure consistency among damage assessment reporting information.

The third recommendation is to develop a standardized damage assessment procedure that incorporates the newly created damage assessment evaluation criteria as the standard for evaluating and reporting damage.

The fourth and final recommendation is to share the standardized damage assessment procedure, as called for in recommendation three, with other county agencies responsible for conducting damage assessment and encourage their adoption of the procedure.
References


Damage Assessment Survey

1. To what degree does your department utilize standardization (operating procedure/guidelines, fire ground tactics, apparatus and equipment, etc.)?
   - Extensively
   - Frequently
   - Occasionally
   - Never

2. What are the reasons your department utilizes standardization (select all that apply)?
   - Simplified business practices
   - Efficiency of emergency operation
   - Efficiently of training
   - Safety of personnel
   - Consistency
   - Predictability
   - Other, please specify

3. Has the community you service experienced a disaster type incident within the last 20 years resulting in significant damage to the community?
   - Yes
   - No

4. Does your department (or another department/agency within your jurisdiction or county) have standardized criteria that your personnel would use to rapidly evaluate and report damage resulting from a disaster type incident?
   - Yes
   - No

If you answered No to question #4, you are asked not to answer nay additional questions. Thank you for your participation.

5. Is your damage assessment evaluation criteria based on:
   - A numerical grading system (i.e. 0, 1, 2, 3)
   - The usability of the structure (i.e. unaffected, affected, unusable)
   - The actual damage observed (i.e. undamaged, limited damage, significant damage, destroyed)
• Another system, please describe

6. How many separate categories does your damage assessment evaluation criteria have:

• Less than five categories
• Five to ten categories
• More than ten categories

7. Does your damage assessment evaluation criteria include descriptions of the evaluation criteria?

• Yes
• No

8. Does your damage assessment evaluation criteria include sample pictures of the evaluation criteria?

• Yes
• No
Appendix B

The Woodlands Fire Department
Damage Assessment Criteria

Affected

Evaluators should classify a property as “Affected” if the incident has resulted in minor damage to the property, including tree damage, fence damage, mailbox damage, but without actual visible damage to any structures on the property.

Minor Damage

Evaluators should classify a property as sustaining “Minor damage” if any permanent structures on the property have sustained damage such as the minimal loss of roof coverings, broken windows, missing siding, damage to or the loss of chimneys, or the damage to or the lose of structural fixtures such as porches, awnings, outbuildings, or carports.

Major Damage

Evaluators should classify a property as sustaining “Major Damage” if the primary structure on the property has sustain structural damage including damaged to or the loss of structural components of the roof, floors, or walls.

Destroyed

Evaluators should classify a property as being “Destroyed” if the primary structure on the property has sustained significant structural damage and in the opinion of the evaluator is not repairable.

Inaccessible

Evaluators should classify a property or area as “Inaccessible” if the evaluator is not able to access the property to conduct a rapid evaluation.