Establishing Operational Policy for Firefighter Live-Burn Training Facility

Mark P. Wholey

Nashua Fire Rescue

Nashua, New Hampshire

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 used the language, ideas, expression, or writings of another.

Signed: _____

Mark P. Wholey

Abstract

In 2015, Nashua Fire Rescue was awarded an Assistance to Firefighters Grant to construct a new live fire training building, replacing a nearly 35-year old training building. The problem is Nashua Fire Rescue has not established operational policies and procedures for the new live-burn training building. The lack of such policies and procedures could result in facility damage and firefighter's injuries and/or deaths. The purpose was to provide Nashua Fire Rescue administration with draft policies and procedures to ensure safe and effective operations within the new live-fire training building. Action research was used to answer the following research questions: a) What are the training benefits of the new Fire Training Structures training building? b) What consent standards should be considered when adopting operational policies and procedures? c) What are the costs associated with operating and maintaining the training facility? d) What systems should be considered to allocate funds to support the operations and maintenance of the training facility? A detailed literature of related topics and associated consent standards was completed. Several established policies, procedures, and operating guidelines from external departments were reviewed. Lastly, several interviews, with external fire departments that operate live-burn training buildings, were conducted to gain first-hand experiences. The research and associated work supports the establishment of comprehensive policies and procedures centered on the content of NFPA 1403 which shall include building operations, firefighter safety, and a user fee schedule to ensure safe and efficient operations of the new live fire training building.

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Introduction

Fire training must not only continue throughout a firefighter's career, but it must also include up-to-date innovations and/or techniques as they are introduced into the fire service (Padgett, 2008). Nashua Fire Rescue (NFR) has always been proactive in supporting the training needs of its members by investing in required infrastructure. NFR operated with a two-and-a-half story concrete training building at the department's training center located at 840 West Hollis Street since the early 1980s. After thirty-years of service the building was declassified for live-fire training and placed out-of-service. In 2014, NFR applied for an Assistance to Firefighters Grant (AFG) for a regional fire training building. The awarding of the Grant was announced by the Federal Emergency Management Agency (FEMA) in October 2014. In May 2015, the new Fire Training Structures (FTS) training building was constructed and placed in-service. The problem is NFR has not established operational policies and procedures for its new regional training building. The lack of policies and procedures could result in injuries to firefighters and damage to the facility.

The purpose of this action research was to provide draft documents to NFR administration that outlines the safe and effective operations of the new regional training building. This research paper will answer the following questions: A) What are the training benefits of the new training building? B) What consent standards should be considered when adopting operational policies and procedures? C) What are the costs associated with operating and maintaining the training facility? D) What systems should be considered to allocate funds to support the operations and maintenance of the training building?

Background and Significance

Nashua Fire Rescue, a career municipal fire department, provides fire suppression, emergency medical services, hazardous materials mitigation, SCUBA rescue, fire prevention, life safety code enforcement, training, dispatch, and mechanical repair services for the City of Nashua, New Hampshire. The City of Nashua is located in southern New Hampshire; bordering the Commonwealth of Massachusetts, located about 45 miles northwest of the City of Boston, Massachusetts. Nashua has a population of 87,259 according to the 2010 United States Census (Nashua, 2015).

Nashua Fire Rescue is comprised consists of 176 career members operating out of eight facilities; six fire stations, a dispatch center and a training site. With a command structure of one Chief, one Assistant Chief, four Deputy Chiefs, seven Captains, twenty nine Lieutenants, and 112 Fire Fighters. The department operates under the discretion of a municipally elected five-member Board of Fire Commission (BFC). The day-to-day operations are managed by the Chief of Department under the discretion of the BFC. The department is divided into an Emergency Services Division and a Support Services division. The suppression division includes six engine companies, three ladder companies, and an incident management team (shift commander and shift management technician). The support services division includes the Fire Alarm Division, Fire Marshals Office, Training/Safety Division, and Mechanical Division. The labor body is represented by the International Association of Firefighters Local 789.

In the early 1980s, NFR built a two-and-a-half story concrete live-fire training building at a parcel of land located adjacent to the Four Hills Landfill at 840 West Hollis Street. The concrete training facility was the centerpiece of live-fire training within NFR for over thirty-five years and was often used by neighboring fire departments for both continuing education and

various regional firefighting certification programs. Over the life of the building, the structure was upgraded on several occasions, however, each rehabilitation effort was widely considered to be a short-term fix. Funding for a large-scale reconstruction or replacement building was limited as the project never rose high enough on the City's capital project ranking list.

As with many municipal fire service organizations, NFR continues to operate under constrained financial resources. As a result, NFR actively pursued outside funding sources that include the FEMA AFG program for fire service training structures. In October 2014, NFR was awarded an AFG Regional Grant from FEMA to purchase and construct a regional live-fire training simulation building. In order to be awarded this type of funding, NFR, as the lead agency was required to use statistical data from other area fire departments during the application process. NFR chose six grant partners; Hudson, NH Fire Department, Merrimack, NH Fire Department, Dunstable, MA Fire Department, Tyngsboro, MA Fire Department, Pepperell, MA Fire Department, and Townsend, MA Fire Department. These departments served vital roles in supporting NFRs justification for the grant award. After being awarded the AFG, NFR placed the project out to bid and awarded the contract to Fire Training Structures (FTS), LLC, which is located in Phoenix, Arizona. NFR placed an order for the East Providence structure which was priced at $500,000. The facility was erected at the existing NFR training facility located at 840 West Hollis Street in Nashua, NH.

In April 2015, construction was completed on NFR's new FTS East Providence training structure. The 2-story structure is comprised of (2) 48-foot conex-style containers, (1) 40-foot conex-style container, (1) 20-foot coned-style container with two primary burn rooms, one Class "A" and one combination Class "A" and Liquefied Propane Gas (LPG). The structure also includes props for roof ventilation, standpipe and sprinkler operations, and various self-contained

breathing apparatus courses, rappelling and confined space training as well as several rapid intervention training props (Appendix A).

The major issue as this research began is that no operational policies or procedures have been drafted to support the use of the new FTS live-fire training structure. The lack of these policies and procedures could lead to incorrect use of the building leading to damage to the structure or the possibility of firefighter injuries and/or death.

This applied research will identify appropriate policies and procedures and provide draft documents to NFR Administration that outlines the safe and effective operations of the new regional training facility. This research related directly to the terminal objective in Executive Leadership Student Manual, Unit 2: Given and Using Feedback, which states; “Students will be able to illustrate the benefits to professional development that can be gained from feedback from others, self-abasement, and reflection” (United States Department of Homeland Security, 2015 p. SM2-1). Additionally, the research supports the United States Fire Administration’s Strategic Goals of improving the professional status for fire and emergency services by ensuring NFR firefighters are as prepared as possible to perform their job functions in the most efficient means possible.

Literature Review

This literature review focuses on a series of fire service outlets that ensures a quantitative and qualitative research approach to ensure the topics are reviewed as thoroughly as possible. Research was focused on various fire service training forums, personal interviews were conducted and surveys were sent to external parties with interest on the topic. Additionally, the research included reviewing operational procedures of several fire service organizations that operate similar live fire training facilities. For decades, the fire service has sanctioned behavior

that has endangered the lives of many when it comes to live fire training (Fisher, 2015). The overall intent of this research is to emphasize the removal of this behavior when NFR and outside agencies use the new FTS live-fire training structure.

Question 1- What are the training benefits of the new FTS East Providence training structure?

The FTS East Providence training structure provides extensive training benefits to firefighters. The building's multi-use design allows firefighters to train on skills in both controlled, non-hazardous environments and hazardous environments including those involving live-fire. The structure is designed with conex-style portable storage containers which will allow fire departments to expand the building to achieve additional training benefits as future budgetary perimeters allow. All FTS training structures meet the requirements established in NFPA 1402, *Guide to Building Fire Service Training Centers*, 2012 ed. which states: the purpose of the live fire training structure is to provide a location for training firefighters safely in mentors of interior fire suppression.

According to FTS, there are several benefits of live-fire training that should be considered as a training building is designed. Each should be considered as part of the overall goal of increasing firefighter safety and preparedness:

- Reduce the number of injuries and deaths
- Reduce property damage
- Increase fire department efficiency
- Advance training ability
- Reduce firefighter loss time as a result of on-the-job injuries

In 2014, NFR responded to 8,889 incidents, of those 8,889 incidents, only 39 (0.4%) involved fire suppression by responding crews (NFR, 2015). The reduction in fire suppression

activities is not isolated to Nashua. In fact, the trend of a reduction in fire suppression activities has been part of the fire service for several years. In 2008, approximately 55% of all Emergency 911 calls nationwide were for medical emergencies while less than 10% of the total calls required fire suppression (Padgett, 2008). The reduction in active fire suppression duties of the modern fire service has continued. For example, San Francisco, CA Engine 1 was named the 2014 “Busiest Fire Company in America” according to the Wall Street Journal. In 2014, the San Francisco Engine Company responded to over 10,000 calls, with only 1.5% of those responses being for fires (Nir, 2015).

With the reductions in suppression activities nationally, the risk associated with fire suppression has not gone away; in-fact, some argue that the reduction in the frequency of performing fire suppression has increased the risk to firefighters, and requires fire departments to become a more inclusively prepared profession (Cline, 2014). This thought process highlights the importance of continued live-fire training and advanced the strategic value of live fire training buildings.

Due to the reduction in fire suppression activities and the associated risk increase to firefighters, one of the most important aspects of the new regional training building is the ability to conduct live-fire training involving Class A combustibles. This training is important to firefighters because of its ability to rectify one of the most frequently cited contributing factors in the National Firefighter Near-Miss Reporting System; lack of situational awareness and decision making (Pegram, S 2008). In the live-fire training environment, these critical skills are crucial to the success of the operation and can be repeatedly practiced and fine-tuned (Padgett, 2008). Structural firefighting is a culmination of our basic skills that we must exercise consistently to a level of high proficiency. We must be able to react in a routine way that will allow us to operate

safely, efficiently, and effectively (van der Feyst, 2011). The reduction in on-the-job experience needs to be replaced by the development of education and practically applied knowledge, skills, and abilities.

Another critical training topic that firefighters need to perfect is rapid intervention team (RIT) drills. These drills practice the skills needed to rescue downed firefighters on the fire ground. There is not one drill that covers every possible rescue technique, however; there are several drills that have become common for firefighters to practice. These drills came as a result of departments who faced challenging rescues and in most cases the downed firefighters did not survive.

The Denver Drill was the result of a fire that occurred in Denver, Colorado, killing Firefighter Marc Langvart after he became trapped in a commercial building when the ceiling collapsed (Kiurski, 2010). During the rescue efforts, Firefighter Langvart was located just inside a window on the second floor. He was found lying face down, between two large objects that created a twenty-eight inch space. His body laid forty-two inches below the window sill. The RIT was able to quickly locate Firefighter Langvart, ground ladders were thrown to the window, firefighters attempted to pull Firefighter Langvart up through the window so he could be carried down the ladder to safety. However simple these takes seemed, the rescue proved impossible to complete (Soler, 2013). For a variety of reasons, including many involving basic physics, the RIT was unable to remove Firefighter Langvart before he died.

Another tragic day for the fire service occurred in Columbus, OH when a firefighter fell through the floor during a fire in a commercial structure. Firefighter John Nance, a 27-year veteran fell into a hole in the floor and into the basement becoming trapped (Norman, 2009). Firefighter Nance was quickly located by other firefighters, he was alert, talking to his rescuers

and breathing air from his self-contained breathing apparatus. Initial crews reached into the hole and made contact with Firefighter Nance's outstretched arms. They pulled his arms but could not lift the 162-pound Nance to safety. Several attempts were made with ladders and ropes but the trapped firefighter could not manage to assist in his rescue after being overcome by the injuries sustained during the fall. After Firefighter Nance became unresponsive, rescue team members were lowered into the hole to perform a final rescue, but due to deteriorating conditions, all rescue efforts proved unsuccessful. Firefighter Nance died at the scene, in the very spot where his rescue team had located him.

As a result of these deaths, the Denver Drill and the Columbus Drill have become RIT drills that every firefighter becomes familiar with, and dedicates themselves to mastery. They are considered by some as the foundation for other firefighter RIT drills have that have been developed.

Question 2- What consent standards should be considered when adopting policies and procedures?

NFPA standards do not carry the force of law (unless specifically adopted by a state), so it is not necessarily illegal to conduct a house burn that fails to comply with every part of the standard. They certainly serve as a valuable point of reference for a jury to use in judging whether a fire department's activities are reasonable or reckless (Blackistone, 2002). NFR assumed the responsibility of being the Authority Having Jurisdiction (AHJ) over all training evolutions held at the training facility as it was the lead agency in securing the AFG for the new FTS training building. Due to a lack of internal SOPs for NFRs thirty-five year-old live-fire training building, the literature review regarding policy and procedures focused on industry consent standards and outside organizations. The most notable consent standard regarding live-

fire training is NFPA 1403, *Standard on Live Fire Training Evolutions* which states: the purpose of this standard shall be to provide a process for conducting live fire training evolutions to ensure that they are conducted in safe facilities and that the exposure to health and safety hazards for the firefighters receiving the training is minimized. Additionally, all live fire training shall only be conducted using standard operating procedures (SOPs) developed by the AHJ in compliance with this standard (NFPA, 2012).

NFPA 1403 breaks-down the types of structures into two broad categories, acquired structures and live fire training structures:

- Chapter 3.3.24.1 defines *Acquired Structures* as any building or structure acquired by the AHJ from a property owner for the purpose of conducting live-fire training.
- Chapter 3.3.24.2- defines *Live Fire Training Structures* as any structure specifically designed for conducting live fire training evolutions on a repetitive basis.

NFPA classifies the type of fire training evolutions into the following four groups:

- Acquired Structures
- Gas-Fired Live Fire Training Structures
- Non-Gas-Fired Live Fire Training Structures
- Exterior Live Fire Training Props

NFPA 1403 breaks-down each type of facility listed above, the types of fuel used for training, and outlines the roles of: Command, Safety Officer, Ignition Officer, Instructor-in-charge, and Propane Prop Operator (when applicable).

NFPA 1403, Section 4.3, calls for the students to meet the job performance requirements of NFPA 1001, *Standard for Fire Fighter Professional Qualifications,* as they relate to the following subject areas: firefighter safety, fire behavior, portable extinguishers, personal

protective equipment (PPE), ladders, fire hose, appliances and streams, overhaul, water supply, ventilation, forcible entry, and building construction. To some, the priorities of NFPA 1001 requirements may differ, but hose, ladders, and breathing apparatus skills typically make or break most fire situations whether on calls or in training (Fisher, 2015).

While reviewing departments that utilize similar live-fire training buildings to that of NFRs new FTS live-fire training building, three departments were considered, Worcester, Massachusetts; Gilford, New Hampshire; and East Providence, Rhode Island.

The Worcester Fire Department (WFD) in Worcester, Massachusetts operates a 4-story corrugated metal; paginate protected, Class A live-fire training building. The building is situated at the rear of Fire Headquarters located on Grove Street in Worcester. WFD has adopted a *Live Fire Training Policy* (Appendix B) which applies to all live-fire training exercises conducted by and/or sponsored by the WFD in the burn building owned by the City of Worcester. The policy identifies what protective clothing and equipment are required during training exercises. WFD identifies the importance of a dedicated Safety Officer and the roles that position is responsible for. A policy also includes a listing of the minimum prerequisite training levels for all training exercise participants which are in-accordance with NFPA 1001, *Standard for Firefighter Professional Qualifications*. The WFD policy identifies the types of acceptable fuels that may be used during burning operations.

Outside agency use of the WFD burn building is permitted. Outside agencies must comply with all operational aspects of the adopted WFD policy. In addition, a liability waiver compliance form must be completed by the respective agency. This form outlines the minimum training requirements as outlined in NFPA 1001 that all outside agency participants must poses prior to training in the burn building (Appendix B).

The Gilford Fire Rescue (GFR) in Gilford, New Hampshire operates a 2-story, department built, Conex container style Class A building. The building is located on Kimbell Road in Gilford. GFD has adopted a Standard Operating Policy/Procedure which establishes safe guidelines for use of the Gilford Fire Rescue Training Facility (Appendix C). GFR policy states the requirement of two staffed positions: Safety Officer and Instructor-in-charge as outlined in NFPA 1403. GFR requires all safety officers and control officers involved in live-fire training to be by authorized by GFR Deputy Chief of Operations and Training prior to being placed in positions of authority for training evolutions.

The policy further identifies the prerequisite training requirements for all students prior to participating in live-fire training within the training facility in accordance with NFPA 1001, *Standard for Firefighter Professional Qualifications*. Outside agency use of the GFR burn building is permitted. Outside agencies must comply with all operational aspects of the adopted GFR Standard Operating Policy/Procedure. GFR may require, when determined by the GFR administration, written documentation that all pre-requisite training requirements have been met by any participants involved in live-fire training.

The East Providence Fire Department (EPFD) in East Providence, Rhode Island operates an FTS custom fabricated conex container style dual-fuel Class A/Class B burn building located on Commercial Way. EPFD has adopted Standard Operating Guideline (SOG) #24, Fire Training Facility (FTF), which establishes written procedures for all operations within the department's FTF (Appendix D).

EPFD establishes the prerequisite requirements for any person involved in live-fire training as those stated in NFPA 1001. EPFD provides an expanded breakdown of the responsibilities, those persons filling the roles of Command, Safety Officer, Ignition Officer,

Instructor-in-Charge, and Propane Operator (when applicable). EPFD also expands on the specific tasks that each position is responsible for during a live-fire evolution. All requirements outlined in the EPFD SOG are supported by NFPA 1403, *Standard for Live Fire Evolutions*.

As previously discussed, NFPA 1403 outlines several key positions that must be filled while conducting live fire training evolutions; Command, Safety Officer, Ignition Officer, instructor-in-charge and Propane Prop Operator. The International Society of Fire Service Instructors (ISFSI) created a three-tiered credential-based program for fire service instructors who function within these positions as a live-fire training instructor. The first credential, titled "Live Fire Instructor; Fixed Facilities," is designed for instructors who will function as an instructor at live-fire training events at fixed facilities (e.g., burn buildings or burn towers) using Class A or gas-type fuels. The course features an online delivery of the classroom material based on the text, Live Fire Training Principles and Practices, and the curriculum produced by Jones and Bartlett Learning in partnership with the ISFSI. The basis of the program is a blended-learning course delivery program, beginning with more than 20 hours of online learning using the text and course resources. Students will also complete a written examination on NFPA 1403 once enrolled in the class (Reeder, 2013).

The ISFSI course includes an online portion which is completed prior to attending a three-day, hands-on class held at various locations based on need and sponsorship. The hands-on class places the student in various roles as instructor and student during a series of live-fire exercises. The course reviews the various forms and documents required to conduct a compliant live-fire exercise, and will execute and review their planning and delivery through peer- and instructor-led evaluations. Additional resources, reading assignments, case studies and ISFSI model forms and templates complement the state-of-the-art delivery methods used by our staff of

expert and experienced instructors. Some highlights of the areas reviewed during the course are: creation and implementation of pre-burn plans, emergency planning for live fire exercise emergencies, review and analyzing relevant case studies, fuel characteristics and safe fuel set loading, hands-on application of the duties of ignition officer, safety officer and instructor-in-charge (Reeder, 2013).

Question #3 What are the costs associated with operating and maintaining the new regional training building?

The long-term operations of the FTS live-fire training structure should be developed with accurate expectations and considered as part of a comprehensive departmental operating expense. Failure to consider the new FTS training building as critical infrastructure could result in the long-term failure of the training benefits that the new building is intended to bring.

Any type of training structure is going to require preventative maintenance and use repairs. The ability to predict the cost associated with a training structure is unique and is often difficult to project; expenses might include things such as fuel for simulators, inserts for entry and/or ventilation training, hay or straw and pallets for Class A training, etc. (Booth, 2006). A solid operational plan assesses current and future needs, identifies costs and ensures a clear funding program.

The Interact Business Group (IBG), which specializes in training center business plans for public safety agencies and industry, offers a plan for funding sources which, while geared more toward the initial phases of construction of training centers, offers a good foundation for long-term planning, establishing a solid business plan for the training center. The seven-step IBG plan is commonly used for training building projects. The seven steps of the plan are:

1. Conduct a needs assessment

2. Develop a comprehensive operations plan
3. Establish facility needs assessment
4. Understand the site requirements of the project
5. Evaluate all fiscal considerations
6. Complete a cost benefit analysis
7. Ensure a proper funding strategy

A comprehensive business plan takes all seven steps into account and presents them in a clear, concise manner. As a result, your department can avoid unplanned and/or unanticipated expenses about what you need and come together with a cohesive plan for the future. The planning process is critical (Booth, 2006). Understanding the associated costs in operating a training center will be a trial process for most departments, since the variables of use are so vast.

Question 4- What systems should be considered to allocate funds to support the operations and maintenance of the training facility?

While AFG funding has provided a tremendous asset for NFR, the task of operating and maintaining the facility remains solely within the NFR operating budget or Nashua's ability to generate alternative funding sources to support the facility. Supporting the on-going operating costs are just as important as the procurement process of obtaining the burn building and will likely take considerable cooperation as each training center is uniquely specific to the organizations using it (Booth, 2006).

Fire departments are funded under a variety of fiscal systems. Regardless of the type of budgeting system used, there are two areas within the municipal budget that is relevant for the long-term management of a training building; Capital improvement spending and operating budgets.

Capital budgeting is used for most major nonrecurring expenditures that are generally planned for over an extended period of time. Capital planning and purchasing varies by municipality but they often fund infrastructure projects such as road improvements, construction of schools, police and fire stations as well as major equipment and vehicle purchases. Capital improvement projects are often defined by municipal definition and while they may be a good funding avenue for initial procurement of a new training building, capital funding is likely not a good municipal funding source for long-term maintenance of such projects.

An operating budget is what most people consider the “budget” for a municipality. The budget is better explained as an inclusive funding program in-which all funding needs to operate communities are grouped together. Within the encompassing budget is the operating budget for fire departments. This may include utility fees, cleaning supplies, vehicle fuel, gear and equipment, and much more depending on specific municipal structure.

In order for the new FTS live fire training structure to maintain its current and future requirements at minimal cost to NFR, the department should establish relationship with community-based organizations that focus on community service needs. The Boy Scouts of America are one of the nation’s largest and most prominent values-based youth development organizations. This organization provides two avenues of support; the Eagle Scout Program and the Fire Explorer Program.

The Eagle Scout program challenges its participants to plan, develop, and give leadership to others in a service project helpful to any religious institution, any school, or your community (Ray, 2012). These projects have long been revealed as tremendous impacts on communities. Often the projects get partnered with local fire service organizations.

The Shirley, Massachusetts Fire Department joined with a local boy scout to help fulfill the requirements of his Eagle Scout Leadership Service Project. The service project included the design and construction of a training pavilion at the Shirley Firefighter's Training Facility. The Shirley Fire Department was in need of improvements at its existing training facility to provide state of the art training for its members. The addition of the training pavilion provides much needed space for lectures, classroom demonstrations, and also serves as a break area between training evolutions (Collins, 2010).

The Daniel Webster Council oversees all New Hampshire Fire Service Exploring Posts. Exploring posts allow youth aged 14-21 an opportunity to be exposed to the fire service through a monitored training program hosted by various fire departments, and is described as a co-ed career education program. One such organization is the Hudson, NH Fire Department (HFD) Fire Explorer Post 551. HFD Post 551 has been supported by NFR by allowing the Post to use the former training building for Post events. In return, Post members have offered volunteer sessions to assist NFR for general clean-up days or by assisting at the dedication and opening of the FTS live-fire training session (Robinson, 2015).

Procedures

Process

A seven-step process was used to complete this action research project.

First, the problem statement, purpose statement, and research questions were formulated to ensure they were clear and supported the goal of the project.

Second, a comprehensive literature review was conducted. Research started at the Learning Research Center at the National Fire Academy in August 2015.The literature review continued with extensive internet searching on the related topics by utilizing a Google search

engine. Topics reviewed for the research included: fire department training buildings, fire department regional training needs, live-fire training, fire department training fee schedules, NFPA 1401, NFPA 1402, and NFPA 1403. A review of Nashua Fire Rescue Standard Operating Procedures and Training Bulletins was also completed.

Third, a survey (Appendix E) was created using Survey Monkey at www.surveymonkey.com. The survey was created using the basic survey package on the Survey Monkey website. The survey contained seven questions intended to gauge how the regional departments would be interested in using the new regional training building. The surveys were sent to the mutual aid partners of NFR. The survey was e-mailed to Deputy Fire Chief Sean Mamone of the Mont Vernon (NH) Fire Department who forwarded the survey to the members of the Souhegan Mutual Aid Association. It was also e-mailed to Fire Chief Robert M. Buxton of the Hudson (NH) Fire Department who forwarded the survey to the members of the Border Area Mutual Aid Association. The survey was sent to the recipients on October 16, 2015 and closed on November 15, 2015. Statistical calculations of results were automatically calculated by Survey Monkey.

Fourth, a series of known fire department organizations which utilize similar live fire training buildings were contacted by e-mail and in-person in order to obtain a copy of current documents relative to the operations of their live-fire training facilities. These departments included; Gilford Fire Rescue in Gilford, New Hampshire, Worcester, Massachusetts Fire Department, and the East Providence, Rhode Island Fire Department.

Fifth, a personal interview was conducted with Captain John Kelaham of the East Providence, Rhode Island Fire Department (Appendix F). Captain Kelaham was selected based on the fact that the East Providence Fire Department operates the same FTS training facility.

Captain Kelaham was assigned as the Captain of the Division of Training at the time of the interview.

Sixth, a personal interview was conducted with Chief of Department Stephen Carrier of the Gilford, New Hampshire Fire Department (Appendix G). Chief Carrier was selected based on the fact that the Gilford Fire Rescue operates a similar conex-style training facility.

Seventh, a personal interview was conducted with Phil Butler of the FTS Training Structures Company (Appendix H). Mr. Butler was selected based on the fact that he represents the FTS Company which sold the East Providence Training structure to NFR.

Definitions

Instructor: “An individual qualified by the authority having jurisdiction to deliver firefighter training, who has the training and experience to supervise students during live-fire training evolution” (NFPA 1403, sec. 3.313

Instructor-in-charge: “An individual qualified as an instructor and designated by the authority having jurisdiction to be in charge of the live-fire training evolution” (NFPA 1403, sec. 3.3.14)

Safety Officer: “An individual appointed by the authority having jurisdiction as qualified to maintain a safe working environment at all live-fire training evolutions” (NFPA 1403, sec.3.3.22)

Acquired Structure” “A building or structure acquired by the authority having jurisdiction from a property owner for the purpose of conducting live-fire training evolutions” (NFPA 1403, sec. 3.3.24.1)

Live Fire Training Structure: “A structure specifically designed for conducting live-fire training evolutions on a repetitive basis” (NFPA 1403, sec. 3.3.24.2)

Limitations

There were several limitations that should be considered. The literature review was restricted by the low volume of published materials regarding fire department training facility use after installation of said structure. The lack of previously established Standard Operating Procedures and/or Training bulletins within NFR also proved limiting.

Organizations used for comparison review of established documentation on their respective live-fire training structures were limited by the scope of the various buildings in-service and the operational models of the organizations when compared to the operations of NFR.

Results

This research was designed to provide both quantitative and qualitative data to NFR's senior management, training division, and officer ranks relative to establishing operational procedures of the FTS training structure. Quantitatively, data was collected and analyzed to provide supporting industry norms regarding the benefits of using a modern training structure. Qualitatively, consent standard reviews, interviews, and surveys were conducted to gain perspective on realistic use of the FTS training structure by NFR and our partner communities. The development of an operational SOG and enhanced training procedures are all developments that are possible based on this research.

The training benefits of the live-fire training structure are expansive and will ensure firefighters continue to evolve in their mission to perform at the highest levels possible when mitigating hazardous incidents. Research shows that simulation drills and repetitive training are critical to the effectiveness of training programs. The major benefits of the live-fire training

structure are: reduction in number of injuries and deaths, increase in fire department efficiency, and increasing the advanced training capabilities of the department.

Nationally and locally there continues to be a reduction in the number of structural fire responses that require firefighters to engage in fire suppression efforts. For example, the reduction of fire suppression activities in Nashua represents less than 1% of the nearly 9,000 emergency responses in 2014.

Nashua Fire Rescue lacked operational policies related to the operations of its former live-fire training structure. The new FTS live-fire training structure opened in May 2015 with no new formal policies being adopted.

The current edition of NFPA 1403, *Standard on Live Fire Training Evolutions,* was issued by the Standards Council on December 13, 2011, with an effective date of January 2, 2012, and supersedes all previous editions. This standard shall serve as the foundation for all training evolutions conducted at the live-fire training structure. The purpose of NFPA 1403, *Standard on Live Fire Training Evolutions,* is to provide a process for conducting live-fire training evolutions to ensure that they are conducted in safe facilities and that the exposure of health and safety hazards to firefighters receiving the training in minimized.

NFPA 1403 is an expansive Standard which outlines the two categories of live-fire training; acquired structures and live-fire training structures. In addition, 1403 identifies four various training groups that involve live-fire. The Standard establishes the needs for critical operational positions such as: Command, Safety Officer, Instructor-in-Charge, Ignition Officer, and Propane Prop Operator when applicable and the roles and responsibilities of each.

The costs associated with operating and maintaining the live-fire training structure will vary greatly depending on use and types of training conducted at the facility. There is

considerable support available for fire departments that are purchasing or constructing new live-fire training buildings, however little information or data exists with regards to operations, and maintenance or repair costs of such building.

The Interact Business Group offers a comprehensive vision in regards to public safety facilities that is applicable to ownership of a live-fire training structure. Part of the IBC plan is to ensure departments plan ahead and ensure avoidance of unplanned and/or unanticipated impacts. IBD suggests the use of a comprehensive business plan which is focused on proper funding strategies.

The limiting factor in establishing funding methods for supporting the operations and maintenance of the live-fire training structure will be the creativity of the NFR, as there are endless ways of utilizing the live-fire training building to not only as an NFR asset but also to various other community partners.

Since the NFR live-fire training structure was purchased from funds obtained through the 2013 AFG process based on a “regional” training need, a survey was sent to mutual aid departments that NFR partners with in order to understand what external interest and existed for using the live-fire training structure. Twenty-five surveys were sent to NFR mutual aid partners, twelve organizations participated in the seven question survey. There was a participation rate of 42% from the 25 departments asked to participate in the survey. The results of the questions relative to the training needs and interest are listed below.

The first question was intended on gauging what area departments were aware the new live-fire training structure had been constructed and was now in operation on the NFR Training Grounds. There was an overwhelming knowledge of the new building as expressed in figure 1.

Are you aware that Nashua Fire Rescue was awarded a 2014 AFG Grant for a new Regional Training Building, which has been constructed and is open for use adjacent to the older concrete burn building?	
Yes	11 (91.67%)
No	1 (8.33%)

Figure 1. Awareness of NFR Live-Burn Training Structure.

When asked when departments would have interest in using the building, nine of the departments expressed an interest in using the facility on nights or weekends while only three of the departments had an interest in weekday training. This is likely due to the majority of the departments in the area being on-call and/or volunteer organizations. This is important due to the fact that NFR Training Division is staffed during regular business hours only (Figure 2).

If you used Nashua's new Regional Training Building, when would you be more likely to use the building?	
M-F 8am-4pm	3 (25%)
M-F 6pm-10pm	2 (16.67%)
Weekends	7 (58.33%)

Figure 2. Use of NFR Training Building

There needs to be a way to establish a fund to support the cost of ownership of the building. The ability to allow outside users to pay for use seems to be a common option for departments interviewed. The survey provided a few fee schedule options for participants to consider. Over 66% of the survey participants were in favor of some variation of an hourly fee which was then split into a fee including NFR certified and approved instructors verse each outside department providing their own certified and approved instructors (figure 3).

In order to cover the cost of operating and maintaining Nashua's new Regional Training Building, which of the following user fee schedules would you most likely participate in?	
Yearly Membership Fee Assessment	1 (8.33%)
Hourly rate w/ Nashua Fire Rescue providing certified and approved instructors	4 (33.33%)
Hourly Rate w/ visiting department providing their own certified and approved instructors	4 (33.33%)
My department would be unlikely to use the Regional Training Building if fees existed	0 (0.0%)
Learn as you go (self-taught)	3 (25%)

Figure 3. What user fee schedule would you likely support.

How many NFPA 1403 qualified Fire Instructors do you have in your department? *Note: NFPA 1403 requires Instructors to be certified FFI, FFII, and Instructor 1. (list your specific number below)
1 Certified Members
4 Certified members
6 Certified members
12 Certified members
24 Certified members
25 Certified members

Figure 4. Number of 1403 Instructors on your department.

Of course, the ability for a department to provide their own certified and approved instructors is dependent on having officers that meet the NFPA 1403 requirements to fill the various roles needed. As outlined in 1403, qualified instructors are required to be FFI, FFII, and Instructor I certified. The range of available people to fit these requirements ranged greatly, from a few survey participants indicating they only had 1 member which met the requirements to a

department that indicated they had over 25 members which would meet the requirements (Figure 4).

As a follow-up to Question 6, the survey participants where asked if they would be interested in a train-the-trainer program in which NFPA 1403 compliant Instructors would be trained by NFR to operate independently at the live-fire training structure, the majority indicated that would be supported (Figure 5).

Would you be interested in a "train-the-trainer" program in-which your compliant NFPA 1403 Instructors are trained by Nashua Fire Rescue Training/Safety Division and approved to operate Nashua's new Regional Training Building specifically for your department's use?	
Yes	11(91.67%)
No	1 (8.33%)

Figure 5. Interest in a Train-the-trainer program.

A series of interviews were conducted to gain feedback from both the manufacture of the FTS Structure as well as other departments who have operated live-fire buildings. These interviews were utilized to understand experiences both from an operational perspective as well as a maintenance perspective.

Phil Bulter, FTS Operations Manager, was interviewed and provided great history of FTS as a company and how the East Providence Training Structure was designed. Mr. Bulter indicated that it was a research and development program that made the East Providence Training Building become a realization. The FTS design team worked extensively with the EPFD to build a building that would meet the many training needs that the fire department requires. Mr. Butler stressed that all FTS buildings exceeded the requirements in NFPA 1402, *Guide to Building Fire Service Training Centers* as well as the common structural expectations

in the *International Building Code.* At the time of the interview, FST has delivered four East Providence Training Structures in the New England region.

Considerable time was spent discussing the long-term expectations that an FTS customer should anticipate. Mr. Bulter highlighted that one of the important design theories that sets FTS above other manufacturers of live-fire training structures was the removal of the need for paginate panels, a common thermal insulation part of live-fire training facilities. The paginate panels become brittle after lengthy thermal exposure and require replacement which is extremely expensive. What FTS did was create a thermal insulation gap between the external shell of the Conex container and that of the actual Conex sleeve where burning takes place. This allows the thermal insulation gap to absorb the high thermal impact, thus protecting the actual structure from thermal damage. Long-term, says Butler, the internal burn sleeve can be removed and a new burn sleeve can be installed. However, in 20-years, FTS has not replaced one sleeve due to thermal degradation.

In regards to long-term preventative maintenance and use damage, Butler says FTS has experienced few required repairs. FTS strongly suggests all departments conduct an annual structural integrity review which he says is outlined in NFPA 1403. FTS provides this service and inspection which includes rust repairs, painting and other such minor upgrades but states that the department is best to complete the inspections themselves, as they know the building and they have an understanding of what is changing and requires attention.

Two fire departments that have similar type live fire training structures were interviewed to gain an understanding of what each has seen with-regards to operations and preventive maintenance. EPFD utilizes the prototype FTS live-fire training building that NFR now operates, while GFR trains with a department manufactured Conex-style live fire training structure.

An interview with Captain John Kelahan of the EPFD Division of Training was conducted to gain a perspective on what EPFD has encountered since it began to operate its FTS live-fire training structure in 2011. Captain Kelahan gave an overview on what types of training the building has been used for and the frequency of use. A few mutual aid departments have used the building but user fees have not been collected. EPFD allows all of its mutual aid departments to use the building and considers that part of conducting business.

EPFD established an operational policy when the building opened. The department administration' in conjunction with the firefighter's union, determined that all operations conducted in the live-fire training structure would be conducted based on the parameters of NFPA 1403. In the four years the building has been operational; EPFD has had little use damage or need for extensive repairs or maintenance. The department has submitted a $5,000 budget request for FY17 to develop a preventative maintenance program which will include a third party structural evaluation, rust repairs, painting, and other site work as identified through the inspection process.

An interview with Chief of Department Steven Carrier of GFR was conducted to gain a perspective on what GFR has encountered since it began to operate its conex-style live-fire training structure in 2011. Chief Carrier noted that he was not a member of the department when the live-fire training structure was built and as a result was not part of the design team. The structure was built by department members and was designed and manufactured in accordance in NFPA 1402.

Chief Carrier provided an overview of how the building was used and the frequency of use. GFR does not use the building as often as it would like due to staffing and emergency response requirements, noting that GFR is staffed by three on-duty firefighters. The bulk of the

building use is focused on training that does not include Class A live-fire training. Another factor is the labor intensive process of readying the building for live-fire training. The building has seven dedicated burn rooms, which are all stick-framed and sheet-rocked. After a few fires, the rooms are placed out-of-service and need to be stripped and rebuilt. The annual operating budget has a line-item for supporting structure maintenance, which in FY16 was $2,500. Most of this money is spent on screws, lumber, and sheet-rock to prep the building for live-fire training.

A user-fee program is in place and charges departments various rates depending on a department's involvement in the initial construction of the structure and the type of training being performed. The fee for a live-fire training day is $400, which covers the cost of construction materials needed and the salary of an approved GFR member to be present. Chief Carrier stated that the building gets a few departments each year to use the building but the fee has not been charged.

Lastly, a review of the IFSI Live Fire Training Instructor Credentialing Program was completed. The program is an intensive training program which focuses on Live Fire Instructor; Fixed Faculties. The program includes pre-course requirements that are an on-line platform, live-fire practical training, and curriculum developed by Jones and Bartlett. The program is geared toward the persons responsible for managing live-fire training programs. There are additional programs available that focus on the detailed responsibilities of the "Instructor-in-charge" as well as coordinating live-fire training in acquired buildings. These programs provide educational opportunities needed to achieve increased knowledge to NFR members.

Discussion

Literature review and research on the topic of live fire training at NFR's FTS live-fire training structure support the need for NFR to establish procedures to ensure that all live-fire

training evolutions are completed in compliance with NFPA 1403, 2012 edition. Additionally, NFR should explore funding options that will support the long-term maintenance and operation of the live-fire training structure.

The first research question asked was what the training benefits of the new FTS East Providence live-fire training structure are. The FTS East Providence live-fire training structure is a multi-use training facility which will enable NFR to train on both Class A and Class B live-fire evolutions thus increasing firefighter safety and preparedness (FTS, 2015). FTS designed the East Providence training structure based on recommendations set-forth in NFPA 1402 and building construction requirements from the IBC (Butler, 2015). Live-fire training has been identified as a tremendous tactical benefit in changing the lack of situational awareness that modern firefighters are lacking due to a reduction in required fire suppression activities (Pegram, 2008).

Over the past decade, the fire service has seen a reduction in the frequency that firefighters are required to perform basic fire suppression. In 2014, Nashua firefighters responded to over 8,889 incidents and suppressed fire 0.44% of the time (Nashua, 2015). Nationally, the busiest fire company in America responded to over 10,000 calls yet only performed fire suppression less than 1% of the time (Nir, 2015). Firefighters must be able to react in expected ways allowing safe, efficient, and effective operations (van der Feyst, 2011).

The second research question asked what standards should be considered when adopting operational policies and procedures for the live-fire training structure. With NFR being the AHJ for the FTS live-burn training building it falls under their responsibility to establish operational policy. NFPA standards are consent standards and not legally enforceable, although they should be considered as an available point of reference when conducting live-fire training (Blackistone,

2002). The foundation for development of an operational policy for the live-fire training structure is NFPA 1403, 2012 edition which defines live-fire training structures as any structure designed for conducting live-fire training evolutions on a repetitive basis. NFPA 1403 outlines what staff functions should be filled and what types of fuels which should be burned. The requirements set-forth in NFPA 1403 are adopted in the WFD Live-Fire Training Policy, the GFR SOP on Training Facility Use, and in the EPFD SOG on the Fire Training Facility.

One of the more important topics covered by NFPA 1403, is the establishment of who may participate in live-fire training. NFPA 1403 specifically highlights the requirements set-forth in NFPA 1001 as the baseline level of training that any person involved in live-fire training should obtain prior to training beginning. The importance of the NFPA 1001 requirements may differ for some who put an emphasis on the basic firefighter skills such as hose, ladders, and breathing apparatus (Fisher, 2015). However, the NFPA 1001 requirements are adopted in the WFD Live-Fire Training Policy, the GFR SOP on Training Facility Use, and in the EPFD SOG on the Fire Training Facility. This is especially true for outside organization use.

When conducting an NFPA 1403 live-burn, it is critical that that the following positions are staffed to ensure firefighter safety; command, safety officer, ignition officer, instructor-in-charge, and propane prop operator (when applicable). NFPA 1403 further states that each position much is minimally certified as FFI, FFII, and Instructor I. These requirements are all outlined in various degrees in the WFD Live-Fire Training Policy, the GFR SOP on Training Facility Use, and in the EPFD SOG on the Fire Training Facility.

The third and fourth research questions were closely related as they asked about the costs associated with operating and maintaining the live-fire training structure and how funds would be allocated to support the facility. This proved to be one of the largest variables that NFR will

face in operating the live-fire training structure, appropriately funding a preventative maintenance and repair program to ensure long-term functionality. This was an interesting aspect of the research as it is not a topic that is widely published. In order to gain understanding, the topic was discussed in-depth with GFR Chief Stephen Carrier and EFPD Captain John Kelahan. Both departments operate similar training buildings to the FTS structure and have done so since 2011. During the interviews, both stated they have experienced very little in need for preventative maintenance on their respective buildings. As far as covering the costs, both have established areas within their budgets to help cover the expenses. GFR has a $2,500 budget allocation, which is mostly expended on materials that are specific to their style of building. EPFD opted for a single $5,000 capital project request after 5-years of building ownership.

The final research question focused on what systems would support the costs identified in question three. An external survey was used to identify what interest, if any, there was from mutual aid departments in using the live-fire training structure and specifically, what funding mechanisms would be most advantageous for the interested parties. Of the twelve departments that participated in the survey, it was concluded that there is significant interest in Class A fire training by outside departments and that there was considerable split on what fee schedule would be supported.

After establishing a comprehensive operating policy for the live-fire training structure, NFR should advance the Training Division's understanding and implementation of NFPA 1403, by enrolling selected personal into the ISFSI Live Fire Instructor; Fixed Facilities program. This program will allow NFR to commit to a long-term safety-based live-fire training program.

In summary, through preparedness, training, and education NFR can achieve an advanced level of tactical awareness that is realized with a comprehensive live-fire training program. With

the proper policies drafted coupled with training of the membership, NFR will advance its mission by promoting the wellness, training and preparedness of its members in a safe and efficient manner.

Recommendations

Nashua Fire Rescue has a lengthy history of live-fire training which for years has been the foundation of the operational success the department has become synonymous with. Based upon the results of the research, coupled with feedback from personal interviews and survey findings, it is recommended that NFR draft a comprehensive SOP for all operations conducted within the live-fire training building. The development of an SOP should be heavily weighted with the recommendations found in NFPA 1403 *Standard on Live Fire Training Evolutions*. NFR should also consider the interest of its mutual aid partners when drafting policy to establish user opportunities that are mutually beneficial to all agencies involved.

The following recommendations are made to the administration of NFR in regards to adoption of policy and procedures for the regional training building:

1. Ensure all live-fire operations conducted in the regional training building are in compliance with NFPA 1403 as outlined in the Appendix I.
2. Implement a training reporting system that is inclusive of the requirements of NFPA 1403 which ensure a plan is prepared and utilized throughout the training evolution.
3. Ensure all students, instructors, safety personnel, and other personal operating within the live-fire training building wear all protective clothing and equipment in accordance with manufacture’s recommendations whenever they are involved in any aspect of live fire training.
4. Ensure dedicated basic life support (BLS) EMS is available on site to handle injuries.

5. Ensure only wood products are used for fuel during any Class A training evolution (Note* Pressure-treated wood, rubber, plastic, polyurethane foam, upholstered furniture, and chemically treated or pesticide-treated hay shall not be used).
6. Establish a user fee schedule for both non-fire training as well as live-fire training with revenue collected being dedicated toward a preventative maintenance program and long-term investments in the FTS training structure.
7. Review the implementation of the proposed SOG at regular intervals and as *NFPA 140* are adopted.

The development and adoption of an SOP will ensure a safe and efficient training environment for all participants involved in training at the new live-fire training building. Any relative SOP adoption should be reviewed periodically to ensure the use of the live-fire training building is commenced with the sole focus being on firefighter safety. Future readers of this ARP should be sure to focus their research for SOP development on the specific use of their respective building and that of their organization.

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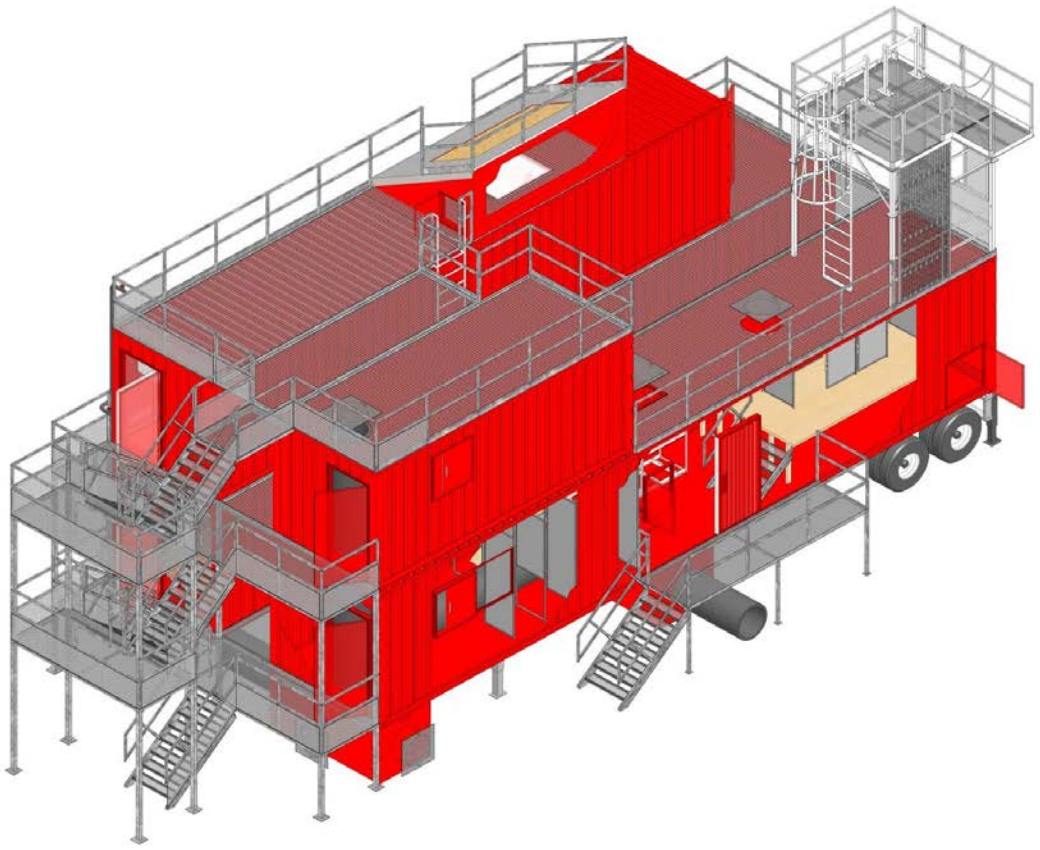
Appendix A (East Providence Training Structure)



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Appendix B (Worcester, MA Live Fire Training Policy)

A copy of the Worcester, MA Live Fire Training Policy may be obtained by contacting:

Worcester Fire Department

Training Division

141 Grove Street

Worcester, MA 01605

Appendix C (Gilford, NH Training Facility Policy)

A copy of the Gilford, NH Training Facility Policy may be obtained by contacting:

Gilford Fire Rescue

39 Cherry Valley Highway

Gilford, NH 03249

Appendix D (East Providence, RI Fire Training Facility SOG)

A copy of the East Providence Fire Department Fire Training Facility may be obtained by contacting:

East Providence Fire Department

Division of Training and Safety

913 Broadway

East Providence, RI 02914

Appendix E (Survey Money Questions)

Created on www.surveymonkey.com
Created in October 2015

1. Has your department utilized the Nashua Fire Rescue's training ground to conduct fire and/or rescue training?

_Yes
_No

2. Are you aware that Nashua Fire Rescue was awarded an AFG Grant for a new Regional Training Building, which has been constructed and is open for use adjacent to the older concrete burn building?

_Yes
_No

3. Prioritize the types of training you would be most interested in if you use Nashua Fire Rescue's new regional training building.

_Class A Live Fire
_Class B Live Fire
_SCBA Skills
_RIT Drills
_Ventilation
_Rope Rescue Skills
_Thermal Imaging Practices

4. If you used Nashua's new regional training building, when would you be more likely to use the building?

_Monday-Friday 8am-4pm
_Monday-Friday 4pm-10pm
_Weekends

5. In order to cover the costs of operating and maintaining Nashua's new regional training building, which of the following user fee schedules would you most likely participate in?

_Yearly Membership Fee Assessment
_Hourly rate with Nashua Fire Rescue providing certified and approved instructors
_Hourly rate with visiting department providing their own certified/approved instructors
_My department would be unlikely to use the regional training building if fees existed

6. How many NFPA 1403 qualified fire instructors do you have in your department? *NOTE* NFPA 1403 requires instructors to be certified FFI, FFI, and Instructor I.

7. Would you be interested in a “train-the-trainer” program, in-which, your compliant NFPA 1403 Instructors are training by Nashua Fire Rescue Training/Safety Division and approved to operate Nashua’s new regional training building specifically for your department’s use?

_Yes
_No
_NA

Appendix F (Captain Kelaham Interview)

East Providence Fire Department Interview Notes
Interview DOT Captain John Kelahan
Conducted on December 9, 2015

1. What is your overall feedback on how the building has performed? How long have you had it? How often are you using it for Class A/Class B fires? How often are you using it for SCBA? Repelling, ECT?

> Basically we got the building February 2012 from an AFG Grant. We opened the building for use shortly after construction was complete. We have used it for two recent recruit academies and trained 31 new firefighters. As far as use, it's hard to put companies OOS with only 5E, 2L, and the Rescues to cover the city and other duties. Companies can request training at the building as needed through DOT. Downtown companies use it more as just a company-level drills due to hoe close they are to the facility. We did host a hi-rise drill for 120 guys; it took about 2-months. EPFD follow 1403 to a tee, no companies allowed to burn without all 1403 staffed positions. This was something that Admin and Union worked collaboratively on. We have hired back for training academy only but not for any department drills. Department wide burns require grant funding to pull-off (outside funding source). EPFD has already used two grants already used (FF Safety based training). EPFD has found that the building is ideal for entry-level FF training.

2. What have you see for maintenance (both use repairs and preventative)?

> The building has held-up very well. We have seen limited repairs. We have budgeted money this year to have FTS come and complete a building review ($6-7K). This has been eliminated from budget previous FY but we are moving forward this year. FTS will repair a few small areas of rusting that need sanding and re-painting and there are a few burn-side areas have hold water. But, it's all pretty minor.

3. How are you funding the repairs and PM? Operating budget expense? Special revenue account?

> Our repairs are coming from a line request in the budget. A few years back, FST added deck off the side 3 area with railings for access for rescue training ops which was funded through operating expense related to the original grant award, we also added a 1000 gallon propane tank that was not originally installed, again, this was funded from original Grant award.

4. Do you have a "user" fee for outside agency use? How is that working? Is covering operating costs?

We do have an established user fee schedule which is part of the operating plan for the facility but have never been charged. In theory, it covered the Captain Salary at 1.5 times rate which would also include all material used are being covered by the $54 rate. But the building has only been used a few limited times by outside departments.

5. What partnerships are you using, if any, to help with costs?

No outside partnerships explored yet.

Appendix G (Chief Carrier Interview)

Gilford Fire Rescue Interview Notes-
Chief of Department Steve Carrier
Conducted on December 11, 2015

1. What is your overall feedback on how the Gilford building has performed? How long have you had it? How often are you using it for Class A/Class B fires? How often are you using it for SCBA. Repelling, ECT?

The building opened in 2011 under the direction of than Chief John Beland. It has held-up well considering how is has been used. We only burn A materials in the building, no B fires at all. There are a total of 7 rooms to burn which is nice, you can change evolutions as needed. We are more likely to use the area for other training topics other than burning days, SCBA, Vehicle extraction, things like that.

2. What have you see for maintenance (both repairs and preventative)?

All the burn rooms are stick built with sheetrock and mud finish on the walls, which has proven to be a maintenance nightmare. We typically get a few burns in the rooms before the rock is impacted by the fires and we need to move-on. We really monitor the exposure to the structure, windows, and roof assembly. When a room has been burnt, we essentially strip it down and rebuilt it. Most of these efforts are done by the duty crews, or a few core guys who have an interest in the building. GFD has a line in our operational budget for maintenance of the building, it was originally around $5,000 before I was Chief and now its around $2,500. The town supports it but it's a line-item then needs to be budgeted and justified each year. The core group of people who had the vision of the building and the departments that help get the building built have moved on for a variety of reasons.

3. What are the associated costs with the above matters?

Most of our expenses are for screws, mud, tape, framing members, and sheetrock. We have been able to get some of these items donated from various locations that have scraps or second quality rock board left.

4. How are you funding the repairs and PM? Operating budget expense? Special revenue account?

As I said before, we have the line-item if needed, but we really have not had any major repairs needed to-date. The roof assembly is something we need to watch, its frame built with shingles. There is a void space-up there because we have one Conex containing stacked above the two main operational floors so; this is something we have to watch when we burn…so far it's been good.

5. Do you have a "user" fee for outside agency use? How is that working? Is is covering operating costs?

> We list a charge of $400 per day to use the facility, which covers the cost of the Gilford personal that are required to allow burning. We don't typically charge the any fees, we had Hampton, Exeter, and Derry use the building and a few local departments but, we have actually did not charge the fee.

6. What partnerships are you using, if any, to help with costs?

> None really, if departments want to use the building we accommodate. We really have not looked for pitied help other than maybe trying to acquire some donations for materials from building centers in the area.

7. What do you think the biggest limitation is of using the training building for live-fire training more often is?

> Our biggest limitation is our workforce requirements. We staff the town with 3 firefighters. Our call volume take most of the day and it’s hard to get involved in a live-burn training with everything else we have to do. It’s something I wish we had more time to do but the reality of our work really drives that part.

Appendix H (Mr. Butler Interview)

Interview Notes for interview with FTS
Phil Butler, Ops Manager
Conducted via phone on December 15, 2015

Background as Professional Engineer, MPA
6-years with FTS
Various manufacture industry positions

1. Can you provide me with some history of your company? How many FTS structures have been manufactured? Specifically, information on the "East Providence" structure?

> FTS has been in container industry for 20-years, parent company for many years before that. Many, many container solution applications. FTS Fire-side since 2005. The East Providence design came from extensive work with EPFD intending to meet their needs. The East Providence building rally came from their vision and FTS presented the model to them. FTS offers that building to many locations now.
>
> East Providence delivered in 2013. Additional structures in the area delivered to
> -Nashua, NH
> -Warwick, RI (within the past month)
> -New Bedford, MA (very limited version)
>
> Designed off 1402 theory and basic building theories that are common as part of the International Building Codes…

2. What is your deign theory on the FTS structures from a maintenance standpoint?

> Roughly for 8-years, FTS has used modular insulted insert approach. It is inserted into the main container and that is the burn room. Prior to that, it was a paginate system. The challenge with paginate is that they are brittle and the long-term expense was daunting. Physical damage, thermal impact shock loss. The new system used a spacial gap with a thermal blanket between the burn sleeve and the exterior structure. The intention is that the sleeve will hold-up much longer that the thermal blanket. FTS has not actually replaced a sleeve in 7-8 years.

3. After initial installation, what repair situations has FTS experienced?

> Limited wear and tear on buildings, too many variables. 1403 lists "sample" parodic inspections that should be completed. There is a check-list that is included and that's what FTS suggests.

4. What preventative maintenance systems do you recommend to your customers?

FTS encourages 1403 compliance and supports the recommendations established in each including the documentation aspects on maintenance. Standard warranty coverage is 1-year on all workmanship and materials.

Long-term- 1403 recommends a periodic inspection be performed by AHJ. This is a wide-open interpretation as far as who is the AHJ on completing the inspection. FTS is willing to complete an inspection but this is not happening often, most people are completing it themselves.

5. What is the life expectancy of your buildings, obviously, use and care will be variables, but given normal wear and tear, how long should NFR consider the building as a functioning asset?

The ability to add onto the FTS structures continues to be a key talking point for FTS customers. Initially purchases are either AFG and/or Capital. Customers have not really taken advantage of adding onto what is delivered. Typically not seen.

Appendix I (Draft Operational SOP)

City of Nashua Fire Rescue

Nashua, New Hampshire

Standard Operating Guideline

S.O.G. PENDING	**Effective Date**: NA
Function: Training Division	**Revision Date:** NA
Subject: Live Fire Training Building	**Authorizing Signature:** Lt Wholey

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Scope: This policy shall apply to all live fire training exercises conducted and/or sponsored by the Nashua Fire Rescue in the training structure owned by Nashua Fire Rescue

Purpose: To establish minimum requirements for all Chief Officers, Company Officers, Firefighters, and associated personal while participating in live-fire training, using the recommendation from NFPA 1403, *Standard on Live Fire Training Evolutions*, 2012 Edition.

Overview:

The Nashua Fire Rescue training structure is located on the grounds of the Four Hills Landfill located at 880 West Hollis Street. The training structure was purchased with funds secured through the 2013 Assistance to Firefighters Grant program. The structure was designed and manufactured by Fire Training Structures LLC located in Phoenix, Arizona following the requirements set forth in NFPA 1402, *Building Fire Service Training Centers*, 2012 Edition. The training structure was constructed in May 2015 and officially opened in October 2015.

The training structure is constructed from Conex-style containers which are custom fabricated and configured to ensure the support of multi-purpose training needs of Nashua Fire Rescue. The training structure is derived into two sides, non-burn side and live-burn side. The live-burn side is further broken into a Class A combustible room and a Class B Liquid Propane Gas (LPG) simulator.

The training building has a three-level exterior stairway, including a full-level standpipe, three-story rappelling tower, and an enclosed peaked roof/ventilation prop. The non-burn areas are equipped with moveable partitions which are intended to aid Self-Contained Breathing Apparatus (SCBA) training evolutions as well as various Rapid Intervention training evolutions.

Requirements:

All participants involved in live-fire training shall meet the requirements set-forth in NFPA 1403, *Live Fire Training Evolution, Chapter 4.3,* 2012 Edition. Any outside agency training in live-fire training shall produce to the Nashua Fire Rescue Training Division written evidence of all required training requirements.

The Instructor-in-Charge shall be staffed during all live-fire training evolutions. The person filling this position must meet the requirements established in NFPA 1041 *Standard for Fire Service Instructor Professional Qualifications,* 2012 Edition. The Instructor-in-Charge shall be responsible that all live-fire training evolutions comply fully with NFPA 1403.

The Safety Officer shall be staffed during all live-fire training evolutions. The Safety Officer, regardless of rank, shall have the authority to intervene and control any aspect of the operations when in his/her judgement a potentially hazardous or dangerous condition exists.

The Ignition Officer shall be staffed during all live-fire training evolutions. The Ignition Officer is responsible to ignite, maintain, and control all materials being burned. Only Class A materials shall be used for live fires ignited in the designated Class A training Conex as outlined in NFPA 1403, Chapter 4.12.
NOTE* Pressure-treated flammable liquids, wood, rubber, plastic, polyurethane foam, upholstered furniture, and chemically treated or pesticide-treated straw or hay shall not be used to ignite or maintain any fires.

All participants involved in live-fire training shall be equipped with compliant personal protective clothing and equipment as outlined in NFPA 1971, *Standard on Protective Ensembles for Structural Firefighting and Proximity Firefighting,* 2013 Edition and NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Emergency Services,* 2013 Edition.

Water Supply shall be stablished based on the scope/extent of the live-fire training evolution but at no time shall the supplied water supply be below 95 GPM. It shall be the responsibility of the Instructor-in-Charge to determine the rate and duration of water flow required for each individual live-fire training evolution.

Basic Life Support (BLS) emergency medical services shall be designated and located in a ready location during all live-fire training evolutions. BLS equipment on-site including an AED, airway management equipment, and approved Nashua Fire Rescue medical bag shall be staged for deployment. Additionally, the Instructor-in-Charge shall ensure the Advance Life Support (ALS) transport unit is notified that live-fire training evolutions are being conducted.

Communications shall be coordinated by the Instructor-in-Charge prior to live-burn evolutions beginning. The designated Nashua Fire Rescue Training channel shall be used for all Nashua Fire Rescue live-fire training evolutions. Prior to the first ignition, the Instructor-in-Charge shall ensure notification of the following; Nashua Fire Rescue Dispatch, On-Duty Deputy Fire Chief, and the Supervisor of the Four Hills Landfill.

Visitors and volunteers are permitted but must remain outside the immediate training area during live-fire evolutions and at no time should a non-authorized participant be allowed to enter the training structure.

Use of the Training Structure:

The Instructor-in-Charge or his/her designee shall conduct an inspection of the training structure prior to live-burn evolutions and at the conclusion of the day. Any damage should be documented on the Nashua Fire Rescue Live-Burn Training Form and contact with the Nashua Fire Rescue Training Division shall be made. Any damage deemed serious enough to question the operational use of the training structure shall require termination of all training evolutions.

Prior to all training evolutions, all doors, window, ventilations aides, standpipes, and other structural components shall be checked to ensure proper operations. All windows and doors shall remain unlocked prior to each live-burn evolution.

The Instructor-in-Charge shall conduct a walk-through of the training structure prior to any live-fire training evolutions. During this walk-through all participants shall be notified of egress points throughout the building.

The intent of 1403 live-fire training is to provide the safest and best experience possible under both realistic and controlled circumstances. Ignition of fires shall be limited to the designated fire areas as outlined in the Standard Operating Procedure. The safety of the participants shall be the main concern when considering the appropriate fuel load for fire ignition. Additionally, the following fire ignition factors shall be followed: No fires shall be ignited in the hallways, stairways, or in a manner that blocks a primary egress point or windows. At no point shall a live person be used as a victim while live-fire evolutions are being conducted.

Pre-burn Briefing:

- The instructor-in-charge shall conduct a pre-burn briefing with all participants, covering the following information:
- Personnel assignments
- Identification of fire locations

- Potential for victims

(No live firefighters shall be victims; no mannequins should be dressed as firefighters to avoid confusion of an actual “firefighter down”.

- Walk through of the building
- Identification of all egress points
- Door and window operation overview
- Evacuation signals and procedures
- Communications plan
- Location of EMS

Class B/LPG Burn Evolutions:

The Propane Prop Operator position shall be staffed during all Class B live-burn evolutions.

Class B fires use Liquefied Propane Gas (LPG) as the combustible fuel source. Class B fires shall be conducted using the LPG fuel provided in the fixed 1000 gallon LPG tank on-site. Class B live-fire evolutions shall only be conducted in the lower-level Conex room.

The Propane Prop Operator shall be stationed at the LPG Control panel located on the exterior of side 1 of the training structure.

No person shall serve as the Propane Prop Operator unless he/she has been formally trained on the operations of the LPG Control Panel as outlined in the FTS Operations and Maintenance Manual and such training has been confirmed by the Nashua Fire Rescue Training Division.

NOTE At no time shall a Class A fire be ignited while a Class B live-fire training evolution is being conducted.

Elevated Roof Ventilation Simulator:

The pitched roof ventilation simulator is designed to allow roof cutting/ventilation training exercises. The actual cutting hole incorporates a full 4’ X 8’ sheet of plywood. All participants involved in training evolutions conducted on the Elevated Roof Ventilation Simulator must be properly secured to the available anchor points.