Implementation of a Technical Rescue Response Plan for the Edina Fire Department

Executive Development

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Appendices E and F Not Included. Please visit the Learning Resource Center on the Web at http://www.lrc.dhs.gov/ to learn how to obtain this report in its entirety through Interlibrary Loan.

Abstract

The expanding roles and responsibilities of the fire service today are becoming a real challenge in meeting the resource needs necessary to safely respond. One area, new for many fire departments, is responding to technical rescues. The problem that prompted this research was that the Edina Fire Department did not have a response plan to efficiently and effectively access outside resource that would be necessary during a technical rescue.

The purpose of the research was to identify appropriate resources within the Southwest Mutual Aid Association (SMAA) that could be incorporated in the Edina Fire Department Technical Rescue Response Plan. Action research methodology was used to answer the research questions:

1. What are the NFPA 1670 disciplines that apply to the Edina Fire Department?
2. What resources are necessary for each of the disciplines identified by the Edina Fire Department?
3. What would be an acceptable response time for mutual aid departments?
4. What additional resources will be needed outside the typical services provided by the fire service?
5. What regional technical rescue resources are available?

A survey instruments was sent to all 15 fire departments within the SMAA to ascertain their level of response capability to technical rescue incidents. Additionally, 20 surveys were sent to departments outside the SMAA to get a better understanding of what other departments were doing to address this problem.

The results showed that 86% of all the SMAA respondents did not have a response plan in place for technical rescue incidents. Moreover, more than 74% of them utilized mutual aid

resources to assist in their technical rescue incidents. The survey showed that most of the departments within the SMAA had operations or technician level capabilities in vehicle/machinery and water rescue; however, there were only a few departments that had these levels of capability for rope, confined space, trench/excavation, and structural collapse.

The final recommendation was to proceed with the development and implementation of a technical rescue response plan because valuable resources exist within the SMAA that can provide the Edina Fire Department with an effective and efficient technical rescue operation.

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Introduction

The United States fire service has over 250 years in fire suppression activities and as a result has built a wealth of experience in response protocols. The approach to predetermined resource allocation has been fine-tuned to meet the needs of many jurisdictions with the primary purpose of ensuring that enough personnel and equipment arrive on the scene to provide for firefighter safety while undertaking the risky job of fire suppression. For the jurisdictions that have not built a response plan into their operations it has lead to inefficiencies and in some cases firefighter injuries and deaths. In the firefighter fatality investigations published by the National Institute for Occupational Safety and Health (NIOSH, 2002) inadequate on-scene resources are contributing factors to many firefighter many fatalities (Investigation Report F2001-27, 2002).

The concept of utilizing mutual aid resources is a common practice for many departments, especially for smaller departments that must rely on assistance from neighboring departments to provide the needed resources to ensure firefighters' safety. However, for many departments, particularly the larger metropolitan departments, the idea of requesting assistance from another jurisdiction is uncommon or historically not done. The unfortunate events of September 11, 2001, have taught the fire service many lessons in the ways we respond to emergency incidents and the necessity to make plans that address infrequent events. In addition to being tasked with increased responsibilities such as EMS, hazardous materials, weapons of mass destruction, and technical rescue, providing for the safety of firefighters continues to be an emergency scene priority. This has forced some departments to look at new ways of developing response plans to meet these responsibilities, resulting in new mutual aid agreements, auto aid agreements or simply practicing the agreements that have been on the shelf for years but never utilized.

Tye, (2001) says that fire, EMS, and law enforcement agencies will need to work together through a coordinated effort to meet the changing needs of the fire service. One of the responsibilities for many fire departments is responding to technical rescue incidents. For larger departments this has been a part of their general operations for several decades but for the smaller departments this has become a very challenging prospect, especially those departments that cannot rely on assistance from larger departments with technical rescue capability.

The National Fire Protection Association (NFPA) is the organization that writes fire service industry consensus standards. In many cases these standards are the only written documents providing operational guidelines. As a result they have been used as the standard of performance by which the fire service operates. For example, NFPA 1670, *Standard on Operations and Training for Technical Rescue Incidents*, 2004 Edition, affirms that a documented plan for the acquisition of external resources is a critical component for a technical rescue incident (NFPA, 2004). The Edina Fire Department recognized this fact and acknowledged that it did not have the internal capabilities to handle some types of technical rescues and would need to rely on external resources. The research problem is that the Edina Fire Department does not have a response plan for technical rescue incidents, resulting in our inefficient and ineffective use of mutual aid resources.

The purpose of this research was to identify mutual aid resource capabilities in order to develop a response plan that the Edina Communications Center and the fire officers of the Edina Fire Department could utilize during the rare events. The resulting procedure would be commensurate with the technical rescue disciplines outlined in the NFPA 1670 standard. This research project was accomplished utilizing the action research methodology to answer the following research questions:

- What are the NFPA 1670 disciplines that apply to the Edina Fire Department?
- What resources are necessary for each of the disciplines identified by the Edina Fire Department?
- What would be an acceptable response time for mutual aid departments?
- What additional resources will be needed outside the typical services provided by the fire service?
- What mutual aid technical rescue resources are available?

Background and Significance

The City of Edina is a first-ring suburb in Hennepin County located southwest of Minneapolis, Minnesota, with an approximate population of 48,000. Edina is predominately a bedroom community with several office and warehouse businesses, moderate industrial and manufacturing businesses, and strong shopping and medical services industries. There are two major freeway systems running through the city and two additional systems that border its south and west boundaries. There is a railway system running through the center of the city and a creek that traverses the northeast section of the city which can produce significant swift-water and flashflood concerns during the spring and early summer months. The Edina Fire Department covers the 16 square miles of the city daily from two fire stations with eight, full-time, 24-hour shift members. The overall workforce consists of 30 full-time staff and 15 paid-on-call staff. The fire department provides four primary services which include fire suppression; advanced life support treatment and transport ambulance service; fire inspections and code enforcement along with fire/injury prevention education activities; and finally, special operations to include tactical medical support for the city's police emergency response team and technical rescue response.

In April 1998 the Edina Fire Department implemented its special operations program after a report submitted by the Technical Rescue Subcommittee of the Southwest Mutual Aid Association (SMAA) revealed a lack of technical rescue capabilities within the Association. At that time, the association was not prepared to implement nor willing to support a regional team. Following this decision by the Association, and the results of a technical rescue hazard and risk analysis conducted during that period of time by the Edina Fire Department, it was decided to act independently and develop our own technical rescue capabilities.

As a member of the SMAA, which consists of 15 fire departments in the southwest metropolitan area covering an area of approximately 350 square miles and a population of over 700,000 people, Edina Fire Department felt the special operations program would be in a strategic position to assist other departments within the Association in technical rescue response.

The special operations program divides the department personnel into two primary categories: core team members and support members. The core team consists of 17 members within the department who receive extensive training in technical rescue operations while the remainder of the department personnel are trained in support role activities to augment the core team members' capabilities. Since 1998 the department has expended significant effort in the development of this program and has developed a good reputation within Hennepin County as a resource that can provide a high level of technical rescue response in the areas of rope rescue, confined space rescue, and trench rescue. Several fire departments within the SMAA have stated that the Edina Special Operations Team is their first call for assistance in the event of a technical rescue incident occurring within their jurisdiction. The team members have been working hard to achieve the technician level for structural collapse; however, some shortcomings exist in the areas of specialized equipment acquisition and advanced training. These shortcomings are

gradually being resolved with the recent federal grants designated and received for homeland security preparedness.

Unfortunately, since the program's inception the department has not developed a response plan related to technical rescues, unlike the successful alarm assignment response plan that is in place for fire suppression incidents. The problem with implementing our standard fire response plan for a technical rescue incident is that it will not provide the necessary resources to safely, efficiently and effectively mitigate these types of incidents. Our limited experience has shown that our standard fire auto aid and mutual aid response plans have not provided the department with the right people, training, and equipment for technical rescues. It is well documented (USFA, 1995) that most technical rescues are resource-intensive operations and the department understands that appropriate assistance will be needed during any significant event.

The significance of this research paper will identify the necessary resources that should be dispatched in the event of a technical rescue and identify where these resources can be obtained through our existing mutual aid agreement. The development of a technical rescue response plan utilizing the change model—analysis, planning, implementation and evaluation—as outlined in the student manual for the Executive Development course in November 2003, at the National Fire Academy, Executive Fire Officer Program (USFA, 2003) will provide the department with a proactive approach to technical rescue response resulting in safer, more efficient and effective operations for everyone involved.

Literature Review

The purpose of the literature review was to help provide answers to four of my five research questions: (1) What are the NFPA 1670 disciplines that apply to the Edina Fire Department? (2) What resources are necessary for each of the disciplines identified by the Edina Fire Department? (3) What would be an acceptable response time for mutual aid resources? (4) What additional resources will be needed outside the typical services provided by the fire service? (The fifth research question will be answered by the survey results.) There has been much written on the topic of technical rescue, from team development to keeping the team together; however, the literature was limited on information relating directly to pre-established technical rescue response plans. I found the 2004 edition of NFPA 1670, to be the best resource to begin this search.

(1) What are the NFPA 1670 disciplines that apply to the Edina Fire Department? In February 1999, NFPA 1670 was passed, recently revised, and became effective in February 2004. The standard identifies seven specific technical rescue disciplines and establishes organizational requirements for undertaking operations and training in these areas. The seven search and rescue disciplines are rope, confined space, structural collapse, vehicle and machinery, water, wilderness, and trench and excavation. The water search and rescue discipline is subdivided into dive rescue, ice rescue, surf rescue, and swift water rescue. The standard goes on to identify three operational levels—awareness, operations, technician—of response that a department may choose to perform at based on their needs. Awareness level represents the minimum capability of organizations that respond to technical rescues but they are generally not considered rescuers. According to Naum (2003, p. 17) awareness level training in all of the respective disciplines should be undertaken and will provide a higher level of safety. This is also

addressed in NFPA 1670 Standard (NFPA, 2004) where awareness level training in all disciplines is the minimum requirement for an organization. Operations level defines an organization with further training and equipment but usually operates under the supervision of technician level personnel. Technician level is the highest level of capability which can coordinate, perform and supervise technical search and rescues. A definition of the operational levels can be found in (Appendix A). Rhea (2002) says organizations should base their level of response on the information gathered from the jurisdiction's needs assessment, which outlines historical rescues and current hazards within that jurisdiction. As you can see many experts agree that the need for awareness level training in all seven disciplines is essential to a good rescue response plan.

(2) What resources are necessary for each of the disciplines identified by Edina Fire Department? The resources utilized in a technical rescue are numerous, but Captain Michael Brown (Brown, 1996) presented a paper at the 1996 North American Technical Rescue Symposium in Las Vegas, Nevada, asserting that a focus on a triad of special people, special training and special equipment is the key to a successful technical rescue incident.

A review of NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments*, 2001 Edition, states "if a higher level of emergency response is needed beyond the capability of the fire department for special operations, the fire department shall determine the availability of outside resources that deploy these capabilities" (NPFA 1710, 2001, section, 5.4.6). An article in Advanced Rescue Technology, Clem (2001, p.59) says that several agencies might have to develop plans with one another in order to bring together the necessary resources. To achieve efficiency and effectiveness during a technical rescue requires a

plan that provides for the right people with the right training and equipment: dispatching a hazardous materials team along with the confined space or trench rescue team can have great benefits to the overall outcome and safety of personnel.

(3) What would be an acceptable response time? The answer can be difficult to determine because of many variables such as topography, road conditions, weather, and traffic to name a few. One of the most commonly quoted response time criteria relating to rescue comes from the Occupational Safety and Health Administration (OSHA, 1993) Permit-required Confined Space Regulation, 29 Code of Federal Regulations (CFR) 1910.146, Appendix F, which recommends a response time of 10 – 15 minutes for victims injured by mechanical hazards, for example, broken bones, abrasions; however, in the event the victim could be injured in an immediately dangerous to life and health (IDLH) atmosphere, a standby rescue team should be readily available. This is also stated in OSHA Respiratory Protection Regulation, CFR 29 1910.134 (OSHA, 1997). NFPA 1670 (NFPA 1670, 2004, section A.7.1.3.8) states "the rescue service should have a goal of responding to these emergencies within 15 minutes of the time they receive information". Seddon (2002, p39) states "leaving an unconscious victim suspended on a rope can cause death in less than 10 minutes". The experts agree: the quicker a rescuer can extricate the victim from their entrapment and get them to a medical facility the better the survival chances will be for that victim.

(4) What additional resources will be needed outside the typical services provided by the fire service? Captain Doug McDonald wrote in an article of *Fire Chief Magazine* (McDonald, 2003, p. 66), "public works skills may prove invaluable at a rescue scene, as those crews use heavy equipment and tools every day". In an Executive Fire Officer Project, Battalion Chief Lane (Lane, 1999) advocates private industry should be considered as a prime resource along

with typical fire service mutual aid companies. In the book *Fire Service Rescue* (1996, p18) it states "The keys to successful rescue operations are adequate pre-incident planning before the emergency and dispatching a sufficient number of properly trained and equipped rescue personnel to the emergency when it occurs." To build a successful technical rescue response plan at Edina Fire Department will require us to look outside the fire service for some resources. This approach will allow the department to respond appropriately in an efficient manner to the emerging issues facing the department.

Procedures

The procedure used in preparing this paper began with a review of industry journals, periodicals, standards, and Internet websites. A literature search at the Learning Resource Center at the National Emergency Training Center was done in November 2003. The literature review began with an assessment of NFPA 1670 standard and identified the disciplines that directly affect the Edina Fire Department. The focus of the evaluation of NFPA 1670, mentioned earlier, was to help answer the first research question and to determine which of the seven rescue disciplines the department was functioning at for the operations and technician levels. Following the literature review an action research methodology was utilized to help provide answers to research questions 2 through 5 and with those answers I will develop a mutual aid technical rescue response plan.

A survey instrument was sent to each fire department within the SMAA and several fire departments throughout the greater metropolitan area (Appendix B). The survey began with several questions addressing the general demographics of each department's city and inquired about technical rescue call volume. The survey continued with questions about the department's familiarity with NFPA 1670 and how they utilized it in their operations. The next few questions

asked specifically how the departments were responding to technical rescues and what additional resources they were utilizing during these events. Lastly, the survey attempted to see what would be considered an acceptable response time for a mutual aid resource, and how far those resources should travel. The survey did not ask any questions relating to wilderness search and rescue nor surf search and rescue because they were determined to be nonexistent in the City of Edina. Additionally, dive search and rescue was not included because Hennepin County Sheriff's Department is the jurisdictional authority for all water related emergencies in Hennepin County.

The surveys were sent to the fire chief of 35 departments via e-mail on April 19, 2004, and were asked to respond within ten days (Appendix C). A cover letter was attached to the survey explaining the intent of the survey. Each respondent was asked to complete the survey and return it via e-mail or fax. The primary focus of the study was to evaluate mutual aid resource capabilities within the immediate area of Edina Fire Department; however, the purpose for sending surveys to departments well outside an acceptable response time was to gain a greater perspective for what other departments might be doing to address this issue.

A limitation to this project may be realized because I restricted the survey population to 35 departments and used specific data of the 15 departments in the SMAA. The reason for this is that I will develop Edina's Technical Rescue Response Plan from resources that already exist within the SMAA and from other public and private resources.

Results

Thirty-five surveys were sent to fire departments in the metropolitan and greater metropolitan area including all member departments of the SMAA. A total of 17 surveys were returned (49%) (Appendix D). The results were broken down into two categories, SMAA and

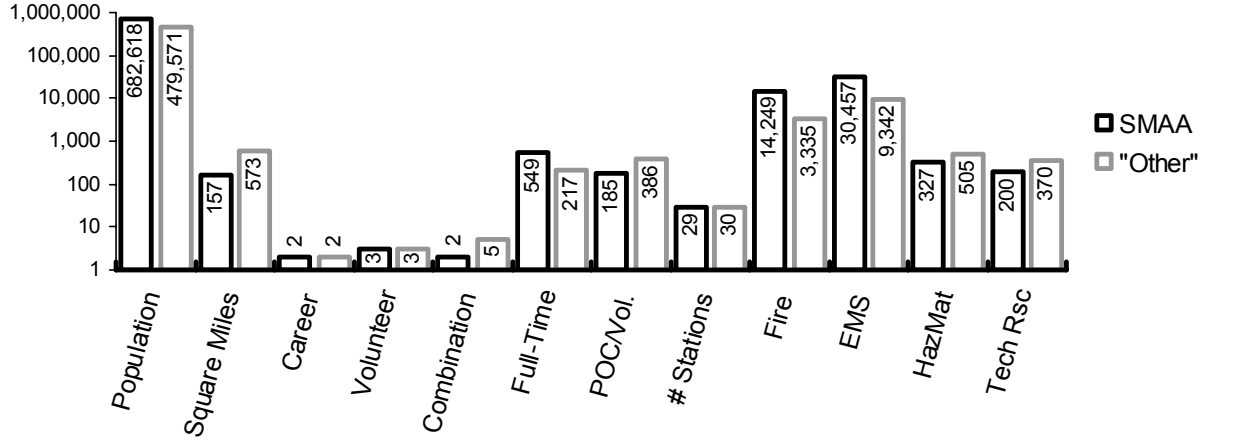
"Other". The first category grouped only the 15 departments from the SMAA because, again, the response plan will only include fire department resources from this group, and the second category, Other, were 20 departments outside the Association. The reason for the Other category was to widen the knowledge base and gain a greater understanding of what other departments in the area were doing. Seven departments from the SMAA returned the survey for a total return of 47%. Ten surveys (50%) were returned from Other departments. The overall survey results can be found in (Appendix E).

The aggregate results of the demographic data for the SMAA and the Other category are displayed in Figure 1. A summary of the seven SMAA departments follows: population – 682,618; square miles – 157; career departments – 2; volunteer departments – 3; combination departments – 2; career firefighters – 549; volunteer firefighters – 185; and stations – 29. The 2003 call volume follows: fire – 14,249; EMS – 30,457; hazardous material – 372; and technical rescue – 200.

A summary of the 10 Other departments follows: population served – 479,571: square miles – 573; career departments – 2; volunteer departments – 3; combination departments – 5; career firefighters – 217; volunteer firefighters – 386 and stations – 30. The 2003 call volume follows: fire – 3,335; EMS – 9,342; hazardous material – 505; and technical rescue – 370.

Figure 1

Demographic Comparison between the SMAA and Other Survey Groups



The first four research questions were intended to gain insight into the current technical rescue activity within the metropolitan and greater metropolitan area and to gauge the level of understanding these departments had of NFPA 1670. The seven surveys returned by SMAA indicate there were 200 technical rescues within their service area in 2003. By far, the majority were vehicle/machinery rescues, 158 (79%), followed by water related rescue, 29 (14.5%). The total number of rescues in the remaining disciplines (rope, confined space, trench/excavation, and structural collapse) was 13 (6.5%). The distribution and trend of technical rescue for the departments outside the SMAA were very similar: vehicle/machinery rescues (87%) were the most frequent, followed by water related rescue (6.7%), and the remaining disciplines made up the balance of 6.4%.

Most departments (59%) had a general understanding of NFPA 1670 while only two (12%) had an in-depth understanding; however, a large number (76%) of the departments stated they utilize NFPA 1670 as the document they use to guide their technical rescue program. In addition, 71% of the respondents stated they delegate people, training and equipment towards their technical rescue program. In *Managing in a Time of Great Change*, by Peter F. Drucker (1995, p240 – 248), Drucker reinforces this approach of special people with special knowledge and equipment to achieve successful outcomes. Michael Brown (Brown, 2000, p34) states "Eliminate or even compromise any of these elements and successful special rescue operations become prohibitively perilous."

The second and fifth questions served two primary purposes—first, to gain an understanding of each department's response capability, and second to begin to understand where the resources exist within the SMAA. This information will further be used to answer the research question of what regional technical rescue resources are available.

The survey continued with questions that assess each department's existing dispatch protocols or response plans. The results indicate that 76% of departments have protocols or plans fire calls; 59% for hazardous materials; and 53% for EMS. A pre-established dispatch protocol for technical rescues did not exist in 86% of the respondent SMAA departments. How the survey questions, literature review and research question relate is presented below.

(1) What are the NFPA 1670 disciplines that apply to the Edina Fire Department?

The extensive literature review of NFPA 1670 provided answers to this question. First, "the minimum training for an organization shall be at the awareness level." (NFPA 1670, 2004, section, 4.1.7.1.1). The Edina Fire Department has provided for awareness level training in all disciplines except for dive, surf, and wilderness search and rescue. The rationale for not conducting training in these areas is because Hennepin County is the responsible agency for dive rescue; the City of Edina does not have a surf risk; and the need for wilderness search and rescue training is extremely minimal in an urban/suburban area with no defined wilderness areas. Second, "the authority having jurisdiction shall conduct a hazard identification and risk assessment of the response area and shall determine the feasibility of conducting technical search and rescue operations." (NFPA 1670, 2004, section, 4.2.1). Following the hazard and risk analysis conducted by the Department in 1997 it was determined that rope, confined space, and trench rescue were necessary services the department should develop in addition to augmenting the vehicle/machinery, swift water, and ice rescue programs with better equipment and training. The effort to purchase the equipment and conduct training in these areas began in April, 1998. The department also set the goal of increasing its structural collapse capabilities but it also understood that it would take several years to achieve this goal because of the expensive equipment and the extensive training time involved in that discipline.

(2) What resources are necessary for each of the disciplines identified by the Edina Fire Department?

Survey question 9 was used to provide answers to this research question. The respondents felt that five of the six disciplines identified in the survey would require a regional technical rescue team (TRT). (Vehicle/machinery rescue was the only discipline which respondents felt did not require a regional TRT. However, no such technical rescue team exists within the boundaries of the SMAA. A close resemblance to this team approach is the Hennepin County Sheriff's Dive Team and some regional hazardous materials teams. Of the disciplines identified by the Edina Fire Department (rope, confined space, and trench) all respondents stated EMS and utility companies were an essential resource. All respondents stated a hazardous materials resource was necessary for confined space rescue along with a public works resource for trench/excavation rescues. For water-related emergencies a county/metro dive team was identified as a resource to have on hand.

(3) What would be an acceptable response time for a mutual aid department?

The response time is a critical component to the plan. It is essential that the right resources be on the scene of a technical rescue early to improve patient outcomes and enhance rescuer safety. It is well known that the concept of the "Golden Hour" is one by which the trauma patient's outcome is greatly improved if they can be delivered to a surgical unit within the first hour of an injury—the longer it takes for the right people, with the right training and equipment to arrive on the scene the prognosis for the patient is compromised. The survey clearly showed that nearly two-thirds of the departments feel a response time of 16 – 30 minutes was the most acceptable response time. Only four respondents (24%) felt that 31 – 45 minutes

was appropriate and one respondent (5.5%) in each of the 0 – 15 minutes and 46 – 60 minutes time frames felt they were acceptable response time.

The distance that an emergency response resource has to travel is closely tied to its ability to arrive on scene in a timely manner. Fifty-three percent stated that 20 miles or less was an acceptable distance to travel for mutual aid response. Twenty-nine percent felt that 40 miles was acceptable and 18% felt that 60 miles was an acceptable distance. None of the departments surveyed felt that a technical rescue mutual aid resource should travel more than 80 miles.

(4) What additional resources will be needed outside the typical services provided by the fire service?

This research question will help provide direction in the development of the response plan matrix and will lay a foundation for the services typically not used by the fire service. The survey attempted to capture this information in question 11. The respondents' replies can be found in Table 1.

Table 1

Minimum Necessary Resources for Technical Rescue Disciplines

Discipline	Necessary Resources
Rope	Regional Technical Rescue Team (TRT), EMS, Utility Companies
Confined Space	TRT, EMS, Private/Municipal Utility Companies, Hazardous Materials
Trench/Excavation	TRT, Municipal Utility Companies, Heavy Equipment, EMS, Shoring Teams, Hazardous Materials
Vehicle/Machinery	Heavy Equipment, EMS
Water	Dive Team, Sonar-side Scan Mapping, Search Dogs
Structural Collapse	TRT, Heavy Equipment, Search Dogs, DMAT/DMORT, Structural Engineer, Utilities, EMS, FEMA US&R Teams, Local Contractors, Specialty Detection Equipment, Hazardous Materials

The information gathered from this question showed that EMS was a common resource across all the disciplines. Private or municipal utility companies were found in 4 of the six disciplines (rope, confined space, trench/excavation and structural collapse) and hazardous materials response resource was common in confined space, trench/excavation and structural collapse incidents. Structural collapse had the most resource needs. This is consistent with the statement made in the book *Technical Rescue for Structural Collapse* (2003, p20) where it states "A structural collapse incident will likely require the assistance of a number of individuals outside the fire department who have specialized skills and knowledge."

(5) What regional technical rescue resources are available?

Survey question 5 was the essential beginning in the development of the technical rescue response plan. It would be necessary to know what capabilities existed within the SMAA to draw upon in the response plan development. All fire departments stated that they had a minimum of awareness level training in all disciplines. A further look at the operational levels specific to the SMAA revealed 43% had awareness level only, 24% had operational level, and 33% had technician level. A breakdown of the operational levels for each of the disciplines is displayed in Table 2.

Table 2

Southwest Mutual Aid Association Members' NFPA 1670 Operational Response Level

Operational Level	Rope	Confined Space	Trench & Excavation	Vehicle & Machinery	Water	Structural Collapse
Awareness	3	3	5	0	2	5
Operations	1	2	1	3	1	2
Technician	3	2	1	4	4	0

A closer look at the specific capabilities of each of the seven SMAA departments and comparing them to each of the six disciplines reveal the majority of the technician level capabilities were in the vehicle/machinery and water rescue disciplines. Edina Fire Department is the only department that functions at the technician level for trench/excavation rescues and Minneapolis Fire Department is the only agency responding at the operations level. No departments were capable of responding at the technician level for structural collapse rescue. Both Minneapolis and Edina were responding at the operations level, and both are currently working toward the technician level.

A further assessment of how the SMAA departments are addressing their current response needs was reflected in question 10. Only three (43%) of the departments were obtaining their rope rescue needs internally, 71% for confined space, 43% for trench/excavation, 100% for vehicle/machinery, 86% for water and only 29% for structural collapse. Internal resources include fire department and city-owned resources. Of the six disciplines surveyed and the seven surveys received from the SMAA, 74% of them utilize mutual aid to obtain some of the resources for technical rescue response. Vehicle/machinery had only two (29%) departments that utilized mutual aid assistance in addition to their internal capabilities. None of the SMAA respondents utilized private contractors or had memorandums of agreement with such organizations as part of their response plan. Only two of the departments in the Other group stated they used private contractors as part of their response plan during trench/excavation rescue. None of the departments surveyed had memorandums of agreement as part of their rescue plans.

The results provided enough information to develop the Edina Technical Rescue Response Plan. The final Plan matrix that was presented to the Edina Fire Departments

Operations Committee on June 30, 2004 for approval can be found in (Appendix F). The Plan was be forwarded to the Edina Communications Center for implementation and each agency listed in the Plan received a copy. The effectiveness of the Plan will be evaluated during the post incident analysis following a technical rescue, and any necessary changes will be made at that time.

Discussion

The obligations of the fire service are expanding everyday and the people we serve have come to expect that we will provide those services in a cost effective and efficient manner. They also assume we know what we are doing and that we will safely perform our work. These expectations during technical rescue incidents will challenge most fire departments if they do not have a response plan in place. "An organization can achieve its desired level of operational capability through the use of external resources that operate at that desired level." (NFPA 1670, 2004, section, A.1.2). Matching the right resources to a particular incident is a key component to a successful outcome. In the book *Technical Rescue for Structural Collapse* (2003, p13) it stresses this statement by saying "Such planning will be vital if a department is to quickly reach persons who have specialized training or suppliers of needed equipment." The survey provided this project with valuable information as to the capabilities within the SMAA and what is considered a reasonable response time for these resources.

Rhea (2002) stated that a department's capabilities should be based on a needs assessment, and the survey reflected this by showing departments had developed their capabilities based on the types and numbers of calls they respond to. The surveys showed that technical rescue incidents do occur within the SMAA, however, at an extremely low rate (200 out of 45,278 or 0.44% for 2003). This low percentage of technical rescues is a major

contributing factor why fire departments do not get involved in operations or technician level capabilities—cost vs. benefit—unless it is clearly justified. Comparing types of responses to how the departments have established their capabilities showed vehicle/machinery as being the most common technical rescue response followed by water related incidents. All of the departments that had statistically high responses in these disciplines have answered these incidents with higher levels of capability as shown in the survey: 57% had technician level, 29% had operations level, and only 14% had awareness level capabilities for vehicle/machinery and water incidents. Spending limited resources on emergency responses that are most likely to occur is a good balance between costs vs. benefit. Conversely, one third of the SMAA departments rely solely on mutual aid resources to assist them in their rope, confined space, trench/excavation, and structural collapse incidents. More importantly, 89% of the responding SMAA departments stated they will use mutual aid departments to assist them during the four previously mentioned disciplines. This raises a potential concern related to limited resources. Within the SMAA we have only three departments that can provide technician level capabilities for only three disciplines—rope, confined space, and trench/excavation. In addition, there are no departments within the SMAA that can respond at the technician level for structural collapse search and rescue.

The Hennepin County Fire Chief's Association is currently developing a Hennepin County Fire Mutual Aid Association. If successful, this would expand our response area throughout Hennepin County to serve 45 cities, more than 600 square miles, and greater than 1.1 million people. This expansion would include the SMAA and may or may not bring additional operations and technician level departments into the mix, and the concept of doing more with

less may become a bigger concern. If the expansion does not provide for advanced capabilities this could place increased responsibility on technician level departments.

The literature supported a response time of less than 15 minutes, however, the survey revealed a response time of 16 – 30 minutes as an acceptable timeframe for mutual aid response. This increase of 15 minutes is most likely taking into consideration the congested traffic situation within the metropolitan area and that most fire departments within the SMAA are volunteer or combination departments, which generally have a longer response time. Distance to travel is directly related to the time it takes to respond. 53% of the respondents stated that 20 miles or less was the farthest a mutual aid resource should travel to aid a neighboring department. The farthest fire station from Edina Fire Station 1 within the SMAA is the Maple Grove Fire Station 3 which is approximately 19.5 miles away with an average travel time of 25 minutes. Many factors can affect the time of travel such as time of day, road conditions, and weather, but this is still within the survey results of 16 – 30 minutes.

The Edina Fire Department responds to a wide range of emergency incidents throughout the year and like other departments has developed its operational capabilities to meet those needs. The development of rope, confined space, and trench search and rescue technician level response capabilities was based on our needs assessment in 1997. The department acknowledges that support from outside resources—public and private—will be essential for operations and technician level responses. The department also understands, as emphasized by Naum (2003), that while undertaking the task to attain operations or technician level capability we must build up from a solid foundation of awareness level training in the entire technical rescue disciplines as defined by NFPA 1670. The technical rescue response plan survey revealed that all 35 respondents had a least awareness level training in the disciplines outlined in the study; but, as

stated in NFPA 1670, awareness level responders have the minimum qualifications and generally are not considered rescuers. (NFPA 1670, 2004) In addition, operations level functions are usually carried out under the supervision of technician level personnel. Therefore a truly solid response plan would have a strong base of responders.

It would be necessary for Edina Fire Department to develop the response plan utilizing operations or preferably technician level resources. Operations and technician level resources do exist within the SMAA, however, not in great numbers. The SMAA is significantly short in the areas of rope, confined space, trench/excavation, and structural collapse search and rescue. In General Requirements (NFPA 1670, 2004, chap. 4) it says that operations level is intended as a support capability while technician level is intended as the highest level of response capability. The Edina Technical Rescue Response Plan will only utilize outside resources with comparable or better response capabilities. Edina Fire Department has attained technician level of rope, confined space, and trench/excavation search and rescue. Evaluating the distribution of mutual aid technician level capabilities within the SMAA in those rescue areas showed two departments (Minneapolis and St. Louis Park) have attained technician level capability for rope rescue; one department (Minneapolis) for confined space rescue; and no departments other than Edina Fire Department had technician level capabilities for trench/excavation rescue. Minneapolis Fire Department was the only operations level department trained in trench/excavation search and rescue. The close proximity of Minneapolis and St. Louis Park—both cities share city limits with Edina—and employment of career firefighters allow for a rapid response time with trained and well-equipped personnel.

It was essential to include the departments that were going to be a part of the Plan to agree with their role. All the departments and public and private agencies that were listed in the

Technical Rescue Response Plan are already listed in other response protocols established by the Department. All the departments have agreed to be included in the technical rescue response plan.

"What we need to realize is that we cannot always do all the work by ourselves and it is okay to ask for assistance" (Singletary, 2003). The implications of this project can provide the Edina Fire Department with a timely response plan that brings together mutual aid, public and private resources that will ensure that the right people with the right training and equipment arrive on the scene of a technical rescue to provide for a safe, efficient and effective operation.

Recommendations

The purpose for the project was to determine what resources were available within the Southwest Mutual Aid Association and to ascertain what additional resources should be included in a technical rescue response plan. The survey instrument along with the literature review provided valuable information that was used to develop the Edina Fire Department Technical Rescue Response Plan. This Plan will benefit the members of the Department by allowing the officers and dispatchers to be able to work from the same plan to ensure that the proper resources are dispatched to the scene of a technical rescue.

My short-term recommendation is to proceed with the immediate implementation of the Edina Fire Department Technical Rescue Response Plan. This will require the approval by the Edina Fire Department Operating Committee, which meets June 30, 2004. Approval is anticipated because I have been working throughout the project with the chief officer staff of the Department along with the departments that are listed in the plan. In addition, the Chief of the Department feels this is an essential part of our day-to-day operations. Following the approval it will be necessary to educate all affected members that include fire department personnel,

dispatchers, mutual aid departments, and public and private agencies that are listed on the plan. It will also be necessary to begin training with these mutual aid departments to ensure common communications and procedures. To promote this recommendation it will be advantageous to invite the mutual aid departments to monthly Edina Special Operations Team training.

A long-term recommendation would be to annually assess the resources within the SMAA to determine if technician level resources become available that may be beneficial to the response plan. In addition, the need to follow the work underway by the Hennepin County Fire Chiefs' Association to form a Hennepin County Mutual Aid Association could significantly influence our plan. Another long-term recommendation would be to have all 15 member departments of the SMAA complete the survey to ensure no valuable resources are being left out of the plan. Finally, I will recommend to the Hennepin Fire Chiefs' Association the importance for every fire department to develop a technical rescue response plan. This will ensure that every department knows what is or is not expected of them should a call for technical rescue assistance come in.

The change model of analysis, planning, implementation, and evaluation has provided the necessary steps to successfully address the research problem. The effectiveness of this plan will be evaluated during the post incident analysis following a technical rescue incident; however, it may take some time to make changes because technical rescue incidents are rare. Not every technical rescue response will require a call for help, but when it does this plan will prove invaluable to our Department and the citizens we serve.

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Appendix A

NFPA 1670 Operational Level Definitions

Awareness Level. This level represents the minimum capability of organizations that provide response to technical search and rescue incidents. This level can involve search, rescue, and recovery operations. Members of a team at this level are generally not considered rescuers.

Operations Level. This level represents the capability of organizations to respond to technical search and rescue incidents and to identify hazards, use equipment, and apply limited techniques specified in this standard to support and participate in technical search and rescue incidents. This level can involve search, rescue, and recovery operations, but usually operations are carried out under the supervision of technician-level personnel.

Technician Level. This level represents the capability of organizations to respond to technical search and rescue incidents, to identify hazards, use equipment, and apply advanced techniques specified in this standard necessary to coordinate, perform, and supervise technical search and rescue incidents.

APPENDIX B

Fire Departments that received the Technical Rescue Response Plan Survey

1. Airport Fire Department **
2. Bloomington Fire Department **
3. Brooklyn Center Fire Department
4. Brooklyn Park Fire Department
5. Burnsville Fire Department
6. Champlain Fire Department
7. Chanhassen Fire Department **
8. Coon Rapids Fire Department
9. Eagan Fire Department
10. Eden Prairie Fire Department **
11. Edina Fire Department **
12. Excelsior Fire District **
13. Golden Valley Fire Department **
14. Hastings Fire Department
15. Hopkins Fire Department **
16. Maple Grove Fire Department **
17. Maple Plain Fire Department
18. Medicine Lake Fire Department
19. Minneapolis Fire Department **
20. Minnetonka Fire Department **
21. Mound Fire Department
22. Oakdale Fire Department
23. Owatonna Fire Department
24. Plymouth Fire Department **
25. Richfield Fire Department **
26. Rochester Fire Department
27. Roseville Fire Department
28. Shakopee Fire Department
29. St. Anthony Fire Department
30. St. Cloud Fire Department
31. St. Louis Park Fire Department **
32. St. Paul Fire Department
33. Wayzata Fire Department **
34. West Metro Fire-Rescue District
35. West St. Paul Fire Department

** indicates Southwest Mutual Aid Association (SMAA) members

Appendix C

Tom M. Schmitz
Battalion Chief
Edina Fire Department
6250 Tracy Avenue
Edina, MN 55436

April 19, 2004

Dear Colleague:

I am asking for your assistance in completing a short survey to gain information for a research project for the Executive Fire Officer Program of the National Fire Academy. I am gathering information relating to pre-established technical rescue response plans. The information you provide in the survey will help me develop a response matrix that can be utilized during technical rescues to ensure that the proper resources are notified early in the incident.

The research will be done in the framework of NFPA 1670, *Standard on Operations and Training for Technical Rescue Incidents*, 2004 Edition, and will only focus on six of the seven technical rescue disciplines defined in this standard. I will be excluding an assessment of the wilderness search and rescue discipline because our risk/hazard assessment revealed this to be of very little concern for Edina Fire Department's jurisdiction. Please provide additional comments as necessary. If you already have a response plan in place would you please forward a copy to me?

I would like to thank you for your assistance in providing me with this information. If you would like a copy of the final paper, please indicate on the survey and include a mailing address or e-mail address.

Please return the survey at your earliest convenience via e-mail or fax to 952-826-0393.

Sincerely,

Tom M. Schmitz

Tom M. Schmitz
Battalion Chief
Edina Fire Department
tschmitz@ci.edina.mn.us

Appendix C

Technical Rescue Response Plan Survey

Name of Department: _____

Population Served: _____

Square Miles Served: _____

Type of Department: Career _____ Volunteer _____ Combination _____

Number of Personnel: Full-time _____ POC/Vol. _____

Number of Stations: _____

Total Calls in 2003: Fire _____ EMS _____ Haz Mat _____ Tech Rescue _____

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1. Number of Technical Rescue Calls in 2003.
    a. Rope Rescue _____
    b. Confined Space Rescue _____
    c. Trench/Excavation Rescue _____
    d. Vehicle/Machinery Rescue _____
    e. Water Rescue _____
    f. Structural Collapse Rescue _____

2. What level of understanding does your department have regarding NFPA 1670, *Standard on Operations and Training for Technical Rescue Incidents*?
   Unaware _____ General _____ Moderate _____ In Depth _____

3. Does your department utilize NFPA 1670 as a document to guide your technical rescue response program?
   Yes _____ No _____

4. Does your department delegate people, training and equipment towards a technical rescue program? Yes _____ No _____

5. Per NFPA 1670, what is the highest level of capability (training and equipment) your department/team can respond at for the following disciplines? (A = awareness, O = Operations, T = Technician) Rope ____ Confined Space _____ Trench/Excavation _____ Vehicle/Machinery _____ Water _____ Structural Collapse _____ Others: _____

6. If your department does not have a formal technical rescue program/team, how does your department obtain the necessary resources to mitigate these incidents?
   Regional Teams _____ Private Contractors _____ Other Jurisdictions _____
   Mutual Aid Agreements _____ Memorandums of Agreement _____

7. Does your department have a pre-established dispatch protocol (box alarm assignments) for fire, hazardous materials and EMS incidents?
   Fire: Yes _____ No _____ Haz Mat: Yes _____ No _____ EMS: Yes _____ No _____

8. Does your department have a pre-established dispatch protocol for technical rescue incidents?
   Yes _____ No _____ If Yes, please include a copy with this survey.

9. In general, what do you think should be the necessary regional resources available for response in each of the following disciplines? (i.e., HazMat, Tech Rescue Team, EMS)
   a. Rope _____
   b. Confined Space _____
   c. Trench _____
   d. Vehicle/Machinery _____
   e. Water _____
   f. Structural Collapse _____

10. Indicate how these resources are currently obtained within your department. Use the following index: I = Internal Department Resources, COR = City Owned Resources, RT = Regional Teams, ST = State Teams, MA = Mutual Aid Agreements, P = Private Contractors, MOA = Memos of Agreement
    a. Rope _____
    b. Confined Space _____
    c. Trench _____
    d. Vehicle/Machinery _____
    e. Water _____
    f. Structural Collapse _____

11. What outside resources do you think will be needed to fulfill NFPA 1670 in addition to the services provided by your fire department? (i.e., Search Dogs, Private Utility Companies, Heavy Equipment)
    a. Rope _____
    b. Confined Space _____
    c. Trench _____
    d. Vehicle/Machinery _____
    e. Water _____
    f. Structural Collapse _____

12. What do you think is an acceptable response time for outside resources?
    0 – 15 minutes _____ 16 – 30 minutes _____ 31 – 45 minutes _____ 46 – 60 minutes _____

13. How far from city center would you deem is an acceptable distance for technical rescue mutual aid resources to travel?
    20 mile radius _____ 40 mile radius _____ 60 mile radius _____ 80 mile radius _____

14. Do you want a copy of the final research project?
    Yes _____ No _____

Name of person completing survey:_____
May I contact you if I have further questions? Yes _____ No _____
Contact information _____

Appendix D

Fire Departments that returned the Technical Rescue Response Plan Survey

Southwest Mutual Aid Association Members

Airport Fire Department
Chanhassen Fire Department
Edina Fire Department
Hopkins Fire Department
Minneapolis Fire Department
Plymouth Fire Department
St. Louis Park Fire Department

"Other" Fire Departments

Coon Rapids Fire Department
Eagan Fire Department
Oakdale Fire Department
Owatonna Fire Department
Rochester Fire Department
Roseville Fire Department
Shakopee Fire Department
St. Cloud Fire Department
West Metro Fire-Rescue District
West St. Paul Fire Department