

**RAPID INTERVENTION TEAMS AT
STRUCTURE FIRES.**

**MANAGING
CHANGE**

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ABSTRACT

During this decade, there were five structure fires where Philadelphia firefighters became lost or trapped, and at these five incidents there were seven firefighter deaths and forty-five firefighter injuries. The purpose of this evaluative and action research paper is to: (a) predict the likelihood of firefighters, in the future, becoming disoriented, lost or trapped while fighting a structure fire; (b) evaluate the Philadelphia Fire Department's (PFD's) existing procedures for responding to a lost or trapped firefighter; and (c) evaluate and recommend technology and/or procedures to improve the PFD's response to lost or trapped firefighters. For this research we analyzed ten years of fire incidence data to predict future fire incidence. We reviewed the PFD's operational procedures on structural firefighting, reviewed reports on five structure fires where Philadelphia firefighters were lost or trapped and surveyed the existing literature on response to lost or trapped firefighters. The analysis concludes: (a) in the future we should anticipate that Philadelphia firefighter's may be lost or trapped at a structure fire; (b) the PFD does not have a written operational procedure for a responding to a lost or trapped firefighter; and (c) fire departments that train and

routinely dispatch a Rapid Intervention Team (RIT) to structure fires, and require the use of an integral personal activated safety system, improve their capability to respond to lost or trapped firefighters. This report provides an operational procedure for a RIT and recommends that the Philadelphia Fire Department adopt this operational procedure and dispatch a RIT to all structure fires.

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INTRODUCTION

Firefighters respond to a wide variety of emergency scenes with the purpose of controlling the incident and mitigating its adverse effect on the community.

Occasionally, there is an unexpected catastrophic event such as an explosion, flashover or structural collapse that traps the firefighters working to control the incident. At other times, firefighters working in a dangerous atmosphere inside a structure become disoriented and are unable to find their way out.

During this decade, there have been five such incidents in Philadelphia that have resulted in seven firefighter deaths and forty-five firefighter injuries. At three of these incidents, firefighters became disoriented and lost inside a building. At each of these three incidents, two or more firefighters lost their lives. At two of the fires, the team of rescuers, organized to locate the missing firefighters, almost became victims as well.

At two other incidents, there was a structural collapse that trapped firefighters beneath burning rubble. It was nothing short of miraculous that no one was killed, however, two firefighters were seriously injured.

The purpose of this research is to evaluate the potential for future structure fires that may trap

firefighters, evaluate the Philadelphia Fire Department's (PFD's) present capability to respond to this situation, and make recommendations that will improve the PFD's capabilities in this area. Specifically, this evaluative and action research project asks the following questions:

- 1) Is it reasonable to expect that Philadelphia firefighters, in the future, may become disoriented, lost or trapped while involved in structural firefighting?
- 2) Does the PFD have a procedure in place to quickly and effectively respond to a lost or trapped firefighter?
- 3) What technology and/or procedures are available to improve the Philadelphia Fire Department's (PFD's) response to a lost or trapped firefighter?

BACKGROUND AND SIGNIFICANCE

During this decade, seven Philadelphia firefighters died as the result of being lost or trapped while fighting a structure fire. In 1991 while fighting a fire in the Meridian high-rise building, Engine 11 moved above the fire raging on the twenty-second floor. Their assignment was to ventilate a smokey stairwell. At 2230 hours, the Captain with two firefighters reported that they were on the 30th floor and running out of air. Rescue teams were organized and dispatched to locate the missing firefighters. At 0215 a rescue team located the three missing firefighters, dead

on the 28th floor. During the rescue effort one of the rescue teams became trapped as well. (Phila. Fire Department, 1991).

In January of 1994, firefighters responded to a report of a fire at the Rising Sun Baptist Church on South Broad Street. There was little evidence from the exterior that this response would be anything other than routine. It was daylight, there was light smoke discharging out of the chimney and the church Deacon was at the front doors to meet the firefighters. Before they extinguished this fire, the church was destroyed and six firefighters were trapped inside. Two of the six trapped firefighters died, thirteen firefighters were injured and two members of the rescue team, working to remove an unconscious firefighter from the basement, required hospitalization (Phila. Fire Department, 1994).

In 1997, Engine 63 responded to a report of burning electrical service wires on 68th Avenue. While Engine 63 waited at the scene for the arrival of the utility company, the occupant of a nearby home informed Engine 63 that he saw smoke inside his home. The officer and firefighters from Engine 63 went inside to investigate and then stretched two hand lines (booster line and 1 3/4 inch) to the interior of the structure. The officer of Engine 63

never called for help. When the driver/pump operator did not hear from his comrades, he radioed for assistance. The arriving companies found the officer and a rookie firefighter dead on the first floor (PFD, 1998).

In each of these three incidents, firefighters became lost or disoriented while fighting a structure fire and died before the rescue team could locate them. In two of these fires, the rescuers almost became victims as well.

In May 1993, Philadelphia firefighters responded to a fire in a vacant three-story dwelling on American Street. Firefighters stretched in hose lines as others raised portable ladders. Suddenly, the front wall collapsed trapping three firefighters beneath hot bricks and burning wood. The fire attack halted as firefighters worked to rescue their comrades. Firefighters extricated all three trapped firefighters, but not quickly enough to prevent serious burns to two of the firefighters (Philadelphia Fire Department [video],1993).

On April 5, 1997, the Fire Communications Center (FCC) dispatched a full box assignment to a reported fire in a three-story multiple occupancy dwelling in West Philadelphia. The building, located at 718 N. 42nd Street, was occupied and frequented by crack cocaine users. Arriving firefighters encountered deadly smoke conditions,

a rapidly developing fire, and people trapped inside. Firefighters knocked down the bulk of the fire and began to play a fog stream out the third floor front window. Suddenly there was a loud noise and the structure collapsed, trapping the Battalion Chief and five firefighters under the still burning structure. The Incident Commander requested a second alarm and organized a rescue effort. No one was killed and most of those trapped reported for duty the next evening (American Heat, 1997).

In these two instances, there was a sudden structural failure that trapped firefighters under a burning building. In both cases the buildings were not properly maintained, one structure was vacant and the other had several pending citations for building and fire code violations. During 1997, Philadelphia firefighters fought almost 3,000 structure fires. There are thousands of vacant buildings in the City of Philadelphia (Yant, 1998), and during 1997 the PFD averaged over one fire per day in a vacant structure (PFD, 1997). With this level of fire incidence in Philadelphia, there appears to be ample opportunity for firefighters again to become lost or trapped fighting a structure fire. Table 1, compiled from ten years of annual reports produced by the PFD, provides a breakdown on structure fire for the last ten years.

Table 1.

Structure Fires In Philadelphia 1988-1997.

	1988	89	90	91	92	93	94	95	96	97
Occupied	4711	4200	3797	3511	3516	3143	2573	2551	2628	2574
Vacant	532	492	542	550	527	638	618	435	353	410
Dwellings	2717	2457	2153	2021	1991	1706	1561	1470	1550	1550
M.O.D.	1199	981	962	821	837	719	589	573	561	579
Total	5243	4692	4339	4061	4043	3781	3191	2986	2981	2984

M.O.D. refers to Multiple Occupancy Dwellings.

Considering the structure fire incidence, the number of fires in vacant structures, and the number of deaths and injuries that occurred during the last ten years when firefighters became lost or trapped, there appears to be sufficient justification to evaluate the PFD's ability to respond to lost or trapped firefighters. In this paper we will analyze the PFD's ability to effectively respond to a lost or trapped firefighter and, if necessary, use the change management model from the Strategic Management of Change course to plan and implement the appropriate organizational change.

LITERATURE REVIEW

There are over 27,000 vacant structures in Philadelphia. The Department of Licenses and Inspections (L & I) has decided that 19,000 of these vacant structures

are beyond repair and should be torn down. L & I has identified over 2,000 dangerously unstable buildings and several thousand moderately unstable structures (Yant, 1998).

Over half the home owners in Philadelphia are over age sixty. Frequently the owner dies, no one is willing to accept responsibility for the home and the structure remains vacant. With an aging population and decreasing real estate values, this is happening more and more (Yant, 1998). Over the past ten years, the number of structure fires in Philadelphia decreased dramatically, but the number of fires in vacant structures has remained about the same.

Fires in residential occupancies and in vacant structures are dangerous fires for career firefighters. According to the National Fire Protection Association (NFPA) fires in residential occupancies or vacant structures accounted for 10 of the 15 career firefighter deaths in 1997 (Washburn, Le Blanc & Fahy, 1998).

In this same report the NFPA produced a ten year analysis of firefighter fatalities while wearing a Personal Alert Safety Systems (PASS). Of the 35 firefighters that died, 13 became lost inside a structure, 12 were caught or trapped in a collapse, 7 were trapped by rapid fire

progress 1 fell through a hole, 1 became trapped inside an elevator and 1 suffered an aneurysm. In only 4 cases can the investigators confirm the PASS devices were turned on. The report concludes that firefighters, working at structure fires, do not routinely turn on their PASS (Washburn, et al, 1998).

At the Meridian fire and the Rising Sun Baptist Church fire the rescuers almost became victims attempting to locate their lost comrades. This is not inconsistent with what researchers found in an analysis of similar rescue attempts. The Department of Occupational Safety and Health (OSHA) concluded, after a review of confined space rescues, that the majority of victims died trying to make a rescue (Malek, 1994).

The concept of having a standby rescue team nearby for individuals working in a dangerous situations is required in certain situations. According to O'Neil (1996) OSHA requires standby personnel anytime someone wearing Self Contained Breathing Apparatus (SCBA) enters an atmosphere that is immediately dangerous to life and health (IDLH). This regulation, OSHA's 2-in/2-out, may apply as well to the fire service. Hal Bruno, in a 1998 article for Firehouse magazine, believes this regulation applies to structural firefighting if firefighters are using hose line

larger than booster line and wearing SCBA.

Battalion Chief Robert Cobb (1998), of the Jersey City Fire Department, believes that firefighters are killed or seriously injured during the early stages of a structure fire attack. This contradicts a different and older school of thought that predicts injuries during the final stages of a fire attack when fatigue is a factor. Cobb cites light-weight construction, energy efficient windows, older buildings, and lack of survival training as contributing factors. Coincidentally in his 1998 Firehouse Magazine article Cobb uses a photo of Philadelphia firefighters rappelling off the roof of a four story apartment building because fire unexpectedly cut them off from their means of egress.

Retired Fire Chief Donald Loeb (1997) believes that fire departments should use a Rapid Intervention Team(RIT) when involved in structural firefighting. He argues that although incidents involving lost or trapped firefighters do not occur often, they occur frequently enough to justify a fire department to prepare for just such an event. Loeb believes that the idea of using a RIT is becoming widespread throughout the fire service.

Harry Eisner, editor-in-chief of Firehouse, argues in a 1997 editorial that the fire service should require a RIT

or Firefighter Assist and Safety Team (FAST) crew at every fire. To quote Eisner, "the time to call for a team is not when things start to go wrong. A three, four or ten minute response time is no good when help is needed in seconds". The value of trained, fresh firefighters ready to assist trapped firefighters was clearly demonstrated at the American Street collapse, which was captured on video. The Heavy Rescue Unit responded on the initial alarm and had just begun forcible entry when the wall collapsed. The officer and members of the Heavy Rescue Unit were able to quickly locate and remove the trapped firefighters.

Thomas Lambert (1997), writing about RIT in his applied research project, argues that every fire department should have an operational procedure or RIT in place. Greg Main (1996) agrees that the fire service should embrace the RIT concept. Main reports that ten percent of all firefighters killed while operating at structures between 1980-1989 died as the result of some sort of rapid fire development. Main argues that because of the potential for rapid fire development, a RIT is needed standing by to assist. He also believes that NFPA 1500, a national standard addressing firefighter safety, requires a fire department to provide a RIT for the rescue of its members.

The opinions and observations of the authors on this

topic are clear. Retired Deputy Chief Robert Murgallis in his 1998 article provides an summary of these opinions. Chief Murgallis argues that with structural firefighting there is a significant risk. Because of this risk, fire departments are required to make provisions to assist firefighters and/or other emergency personnel who are in jeopardy. Murgallis believes the RIT is an effective mechanism to offset this risk. These opinions on the benefit of using a RIT influenced me to request my Operations Committee to evaluate how the PFD might utilize this technology. The attached operational procedure (Appendix) is our suggestions for RIT policy and procedures for the PFD.

A fire in January 1999 in Cincinnati, Ohio, substantiates Chief Murgallis' theory. After working to rescue the trapped occupants of an apartment building, two Cincinnati firefighters were trapped by the fire. The fire in this structure was fed by the building's natural gas line, yet despite this difficult and dangerous fire, a RIT located and rescued the trapped firefighters (Zomparo,1999)

PROCEDURES

For this evaluative and action research paper, we first wanted to evaluate the likelihood that Philadelphia firefighters might become disoriented, lost or trapped

while fighting fires in the future. To do this, we examined ten years of data on Philadelphia structure fire incidence to predict the occurrence of similar fires.

To evaluate the capability of the PFD to respond to lost or trapped firefighters, we reviewed the written reports or video documentation of five fires where firefighters were lost or trapped. Specifically, we determined the type of structure involved in fire, the time it took to locate and remove the trapped firefighters, and the number of victims that survived. In addition we reviewed PFD operational procedures to determine if there is an existing operational procedure for response to lost or trapped firefighters.

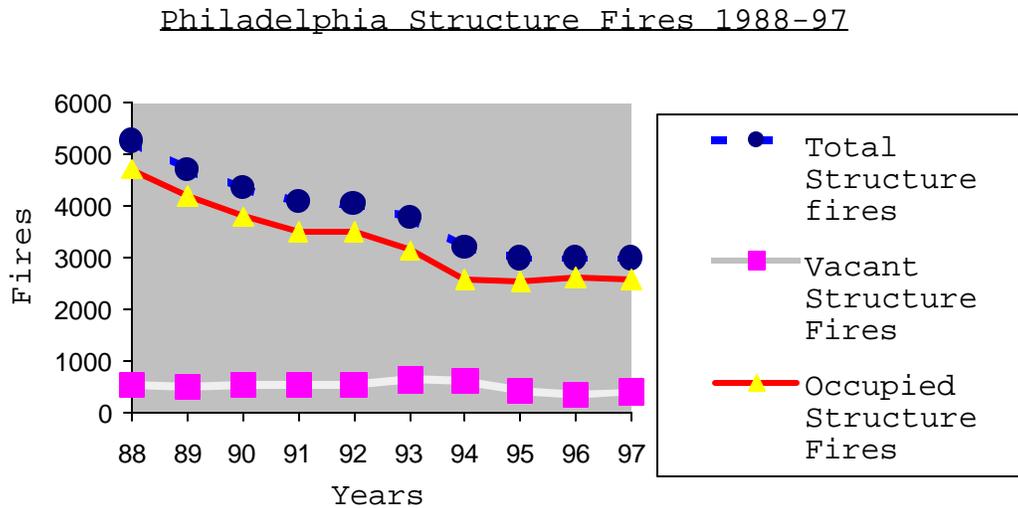
If in these five cases we believe the PFD response to lost or trapped firefighters needs improvement, we will identify a procedure and/or technology to improve the PFD's response to lost or trapped firefighters.

RESULTS

The data on structure fire incidence in Philadelphia indicates a decline in structure fires over the past ten year period. The structure fire data indicates that the annual number of structure fires has leveled off at approximately 3,000. When we look at the sub-categories of structure fires, the decline in vacant structure fires is

not nearly as dramatic as is the decrease in occupied structure fires. Figure 1 below graphically depicts the structure fire data for the last ten years.

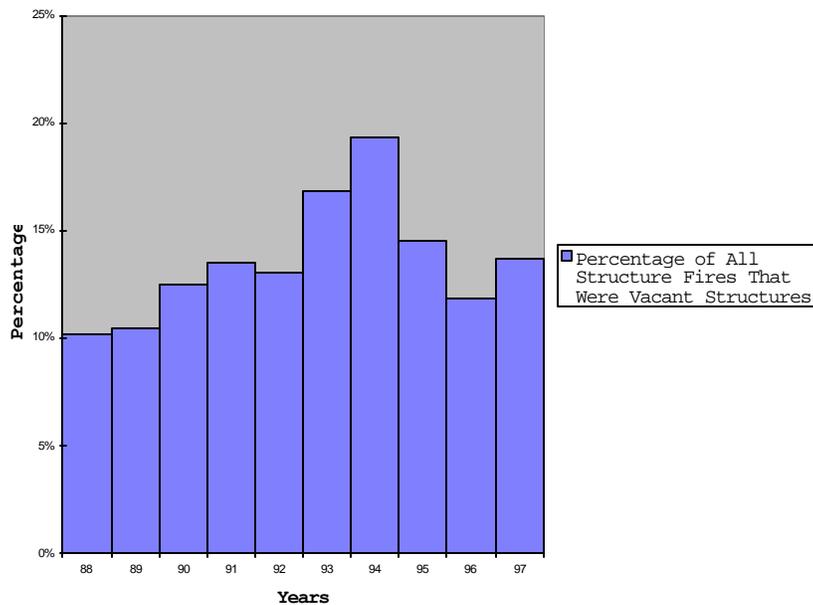
Figure 1.



Between 1988 and 1997, as occupied structure fires decreased, the number of vacant structure fires remained about the same. As a result, the number of vacant structure fires, relative to the number of all structure fires, has increased. Today, despite the decline in annual structure fires, firefighters face a greater chance of the next structure fire being in a vacant structure than they did in 1988. Figure 2 shows this increased risk as the increase in the percentage of all structure fires that are vacant structures.

Figure 2.

Percentage of All Structure Fires That Involved
Vacant Structures For The Years 1988-97.



To answer research question one, in the future, Philadelphia firefighters are likely to fight several thousand structure fires each year, with an increasing percentage of those fire occurring in vacant, dilapidated properties. With an aging population and decreasing real estate values, it is likely that the number of vacant dwellings will increase. As a result, firefighters will continue to have the opportunity to become lost or trapped while fighting structure fires.

Regarding research question two, although all

firefighters are trained in structure firefighting search and rescue, there is no operational procedure specific to the response to a lost or trapped firefighter. The PFD does not routinely dispatch a RIT to structure fires. None of the investigative reports or videos of the five fires discussed mentioned of a dedicated group of firefighters standing by, ready to respond to lost or trapped comrades.

Furthermore, in the three cases where firefighters became lost or disoriented while fighting a structure fire, there were seven deaths. At the Rising Sun Baptist Church fire, four of the six trapped firefighters were rescued; however, at this fire and at the Meridian fire, the rescue teams almost became victims as well. At none of the five fires reviewed for this report did a PASS device assist rescue teams in locating missing firefighters.

At both fires where the buildings collapsed, all the trapped firefighters were quickly located and removed alive. However, at the Meridian high-rise fire, it took three hours and forty five minutes to locate the missing firefighters (PFD, 1991). At the church fire, it took almost 15 minutes find a missing firefighter and an additional 45 minutes to remove the firefighter from the basement (PFD, 1994). It appears that there is the opportunity to improve the PFD's response to lost or

trapped firefighters.

In response to research question number three, there is almost unanimous agreement in the literature that training and deploying a RIT at structure fires will improve a fire department's response to a firefighter in distress, and the use of a RIT is consistent with national standards on firefighter safety such as NFPA 1500, which requires the establishment of one dedicated RIT team as members arrive on the scene (Foley, 1999).

The NFPA points out a well known but rarely acknowledged reality for career firefighters. Most firefighters wear PASS, but few activate this device. The PASS helps search teams locate missing firefighters. A PASS that automatically activates when a firefighter turns on his/her SCBA will dramatically increase the chances of the PASS activating when it is needed.

DISCUSSION

The analysis of data on structure fire incidence in Philadelphia allows one to estimate that there will be over 20,000 structure fires and approximately 4,000 fires in vacant properties during the next ten years. It is likely that firefighters, fighting these fires, will again become lost or trapped and require assistance. To prevent further loss of life, the PFD should have a procedure in place to

quickly locate and remove lost or trapped firefighters. The findings of this research are consistent with the findings and opinions of other writers: fire departments should utilize a RIT at all structure fires. This is such a common sense solution that it would seem unlikely that anyone could disagree.

There is good reason for this acceptance of the RIT. More firefighters die in residential occupancies than in any other type of structure fire (Washburn, et al 1998). Residential occupancies are typically the most common structure fire that firefighters encounter. Both the NFPA and OSHA have requirements for some type of RIT at structure fires (Cobb, 1998). The OSHA 2-in/2-out regulation requiring two firefighters outside in full protective gear standing by, while two firefighters work in a hazardous environment, is the result of a series of incidents where firefighters became lost or disoriented while fighting a structure fire without rescue teams standing by (Bruno, 1998).

Because Pennsylvania is not an OSHA state, there may not be a legal requirement to comply with this regulation (International Society of Fire Service Instructors [ISFSI], 1998). But O'Neil (1996) and Main (1996) both argue that NFPA 1500 requires fire departments to use a RIT at

structure fires. Irregardless of the law, the literature unanimously concludes the use of an RIT at structure fires is inexpensive procedure that can save lives.

The tools and technology associated with the RIT are typically the same as those found in the fire department's general inventory (Spaulding, 1997). Two special tools are the rescue rope and the emergency breathing support system (EBSS). The EBSS permits a rescue team to provide air to a trapped firefighter. The rescue rope is a tool that enables the rescue team to find their way out of a structure. Just as at any structure fire, the list of RIT tools to be used should match the construction of the building involved in fire (International Society of Fire Service Instructors [ISFSI], 1998).

Sophisticated tools, such as infrared cameras, are already available to Philadelphia firefighters. Most fire departments could outfit their RIT with some modifications to existing equipment (Spaulding, 1997). The cost for the PFD would be minimal and the potential benefit considerable. The PFD is presently committed to new SCBA with an integral PASS device and EBSS capability. This equipment is scheduled to be placed in service this month. The only additional expense would be rescue ropes and training. Ropes presently used by the PFD as guidelines

could be replaced with rescue ropes.

The ISFSI has a three-part training guide for the RIT (ISFSI, 1998 Issues 4-6). This document could serve as a lesson plan for the training, eliminating research and curriculum development associated with implementing a new training program. Kolomay and Hoff in their 1998 article provide a useful RIT checklist for the RIT officer.

RECOMMENDATIONS

During this decade several instances have occurred where Philadelphia firefighters were trapped while fighting a structure fire and required immediate assistance. The frequency of structure fires, new lightweight construction, and the number of vacant structures in Philadelphia would lead one to the logical conclusion that this will happen again.

To prepare for similar catastrophic situations in the future, the PFD should adopt the attached operational procedure (Appendix), and train all firefighters in RIT operations. The PFD should dispatch a ladder company as a RIT to all reported structure fires, at reduced speed. Should the first-due-in company report an actual structure fire, the RIT should respond at emergency speed.

To equip the RIT, the PFD should purchase rescue ropes and additional hand tools such as metal snips and cutting

tools. With the addition of new SCBA with an integral PASS device and EBSS, the PFD will be far better prepared to respond to lost or trapped firefighters in need of assistance.

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PHILADELPHIA FIRE DEPARTMENT

OPERATIONAL

PROCEDURE # 38

FEBRUARY, 1999

SUBJECT: RAPID INTERVENTION TEAM (RIT).**1. PURPOSE.**

The purpose of this Operational Procedure is to define the responsibilities of a RIT, and provide guidelines and procedures for RIT dispatch and RIT operations.

2. DEFINITIONS.**2.1 RAPID INTERVENTION TEAM.**

The RIT will be the third due-in ladder company dispatched on a Tactical Box or Box assignment. The RIT will be the fourth due-in ladder company dispatched to a high-rise building. The sole purpose of the RIT is to locate and remove lost or trapped emergency personnel.

2.2 RIT EQUIPMENT.

Firefighters in ladder companies will be assigned RIT tools in addition to the regularly assigned tools. A RIT tool kit will be carried in each Battalion Chief's car. This tool kit will augment the tools already carried by the ladder company. The RIT should be prepared to quickly go into service with the following equipment; life belts, hand tools for cutting, rescue rope, portable radios, forcible entry tools such as halligan and ax, saw with multi-purpose blade, rabbit tool, hand lights, wire basket, first-responder bag with resuscitator, additional SCBA and bottles for the emergency breathing support system EBSS). The Haz-Mat Unit, Heavy Rescue and Police Helicopter have infra-red cameras that can assist the RIT.

3 RESPONSIBILITIES**3.1 ALL MEMBERS**

It will be the responsibility of each member to exercise the appropriate control dictated by his/her rank in the implementation of this Operational Procedure. The RIT should be prepared to go into service at a moments notice. RIT activity at the emergency scene should be consistent with their mission: locating and removing lost or trapped emergency personnel.

3.2 SUPERVISOR, FIRE COMMUNICATIONS CENTER (FCC)

When notified by the Incident Commander (IC) that a RIT is in service, the FCC Supervisor will notify the appropriate Deputy Chief.

3.4 INCIDENT COMMANDER (IC)

The IC will identify the location of the Command Post (CP) and decide when the RIT goes into service.

3.5 FIRE TRAINING ACADEMY (FTA)

The FTA will be responsible for the training of all members in the proper procedures relating to the implementation of the RIT.

3.6 RIT COMPANY OFFICER

3.6.1 The RIT Officer will insure that all members of the company are familiar with the duties of the RIT.

3.6.2 The officer or acting officer in charge of the RIT, immediately upon arrival at the incident, will survey the scene. The officer will take full advantage of all information about the structure available in Vital Building Information (VBI) forms and Pre-Fire Plans. The officer will monitor the fireground radio frequency, note the location of all fire companies, evaluate portable and main ladder placement for firefighter egress, alert the safety officer or IC to unusual structural features and locate all access points to all sectors of the emergency scene.

3.6.3 At roll call the RIT Officer will assign RIT tools to each member of the RIT.

4. RIT PROCEDURES

4.1 DISPATCH

4.1.1 FCC will dispatch an additional ladder company at reduced speed, as a RIT, on all tactical box and full box assignments for a reported structure fire.

4.1.2 The RIT will respond at emergency speed when the first-in company confirms an actual structure fire or at the request of the IC.

4.2 EMERGENCY SCENE

4.2.1 Upon arrival at the incident the RIT officer will contact the IC and request the location of the CP. The RIT officer will survey the scene while the RIT members assemble RIT equipment. The RIT officer will then report, with his/her team and equipment, to the IC. Once assembled the RIT will remain in the vicinity of the command post, prepared to go into service.

4.2.2 In the event the IC receives a report of a trapped or missing personnel, the IC will order the RIT into service. The RIT will continue search and rescue operations until; the missing or trapped firefighter(s) is (are) located and removed, the RIT is relieved or the RIT is ordered to abandon the operation.

4.2.3 The RIT will operate on the designated emergency scene frequency. The RIT officer will monitor the emergency scene frequency to anticipate any situation where their services will be needed.

5. REFERENCES

- 5.1 Operational Procedure # 19 Philadelphia Incident Command System.
- 5.2 Operational Procedure # 42 Fire Department Communications.
- 5.3 Directive # 39 Fire Communication center Initial Dispatch