

NEW JERSEY DIVISION OF FIRE SAFETY

Firefighter Fatality and Serious Injury Report Series

Two Firefighters Burned While Conducting a Search During a Structure Fire

**Somerset, New Jersey
February 9, 2003**

***Report Released
April 28, 2006***



**STATE OF NEW JERSEY
Jon S. Corzine, Governor**



**DEPARTMENT OF COMMUNITY AFFAIRS
Susan Bass Levin, Commissioner**



**DIVISION OF FIRE SAFETY
Lawrence Petrillo, Director**

TABLE OF CONTENTS

INTRODUCTION..... Page 2

EXECUTIVE SUMMARY..... Page 3

INVESTIGATION..... Page 6

ANALYSIS..... Page 10

LESSONS LEARNED..... Page 17

CONCLUSION..... Page 23

REFERENCES..... Page 24

INTRODUCTION

The investigation of this incident was conducted by the New Jersey Division of Fire Safety. This report was prepared in accordance with N.J.S.A. 52:27D – 25d, Duties of the Division.

The purpose of firefighter casualty investigations is to report the causes of serious firefighter injuries or deaths and identify those measures which may be required to prevent the future occurrence of deaths and serious injuries under similar circumstances. New information may be developed or old lessons reinforced that could protect the lives of firefighters and civilians from future tragedy.

Comments and/or inquiries concerning this report may be addressed to the address listed below:

New Jersey Department of
Community Affairs
Division of Fire Safety
101 South Broad Street
PO Box 809
Trenton, NJ 08625-0809

EXECUTIVE SUMMARY

On February 9, 2003, at 1310 hours the East Franklin and Community Fire Companies responded to a working structural fire at a private residence located at 116 Frank St., in Somerset. The first arriving units observed fire venting from a window on the first floor of the structure. Hose and search teams entered the building. The two member search team proceeded to the second floor believing that there might be victims trapped there. The fire suddenly extended up the stairs to the second floor as the hose crew encountered difficulties charging the hose line. The search team was quickly overrun by the fire conditions. Attempting to seek refuge inside a room, they found that all the doors were locked, trapping them in the hallway. Although separated, they both eventually jumped through a window at the end of the second floor hallway. They were transported to a burn center for treatment.

The origin and cause investigation for this incident was conducted by the Franklin Township Fire Prevention Department. The cause of the fire has not been unequivocally determined. However, it is presumed that the fire began in the 1st floor master bedroom. This room had only one electrical outlet that powered a fused multi-plug power strip. Multiple items and other extension cords were plugged into this strip. It was suspected that a failure in one of these electrical components caused the fire, which was accelerated by oil lamps that were found under debris.

In order to minimize the risk of similar incidents, the New Jersey Division of Fire Safety identified key issues that must be addressed and remedies that should be implemented within all departments.

1. **FACTOR:** An inadequate amount of hose crew members resulted in problems with the water supply due to kinks in the hose which in turn prevented the initial hose line from operating properly.

REMEDY: *A typical hose crew assignment consists of an officer, nozzle firefighter, backup firefighter & control firefighter (this position is typically responsible for laying out and chasing kinks). Therefore prior to entering the structure, hose lines should be properly stretched out, fully charged and the nozzle should be opened to ensure an adequate water supply.*

2. **FACTOR:** The search and rescue crew was operating on the 2nd floor (above the fire) when the hose crew lost water in the attack line.

REMEDY: *A hose crew with a fully charged hose line should be in place to control the fire prior to personnel operating above the fire. Further, communication must be maintained between these personnel, reporting their status, progress, and observations.*

3. **FACTOR:** A personal accountability system (PAS) was not utilized during initial operations.

REMEDY: *Departments shall utilize a PAS compliant with NJ regulations under N.J.A.C. 5:75.*

4. **FACTOR:** A firefighter removed his gloves to replace some of his equipment that had become dislodged, causing severe hand burns.

REMEDY: *Firefighters must be able to don and doff equipment with gloved hands.*

5. **FACTOR:** Thermal imaging cameras (TICs) were not utilized during the size-up, initial rescue, or fire suppression operations.

REMEDY: *Fire departments possessing TICs should routinely employ them during various structural firefighting operations.*

6. **FACTOR:** Although both of the distressed firefighters were equipped with integrated Personal Alert Safety System (PASS) devices, neither one activated their alarm.

REMEDY: *Upon becoming distressed, firefighters should immediately activate their PASS alarm to assist rescuers in locating them.*

7. **FACTOR:** Neither a Rapid Intervention Team (RIT) or Firefighter Assist and Search Team (FAST) were designated during initial operations or when the firefighters became distressed.

REMEDY: *Departments should utilize RIT / FAST to supplement compliance with the 2-in / 2-out regulations under N.J.A.C. 5:75.*

8. **FACTOR:** An emergency evacuation signal was not sounded once the firefighters became distressed and the Incident Commander removed the 1st floor crews.

REMEDY: *Departments should utilize an emergency evacuation signal to alert all firefighters of an imminently hazardous situation that warrants a rapid retreat.*

9. **FACTOR:** The building characteristics contributed to the spread of fire.

REMEDY: *Firefighters should recognize and anticipate how building characteristics will affect the spread of smoke, heat, and flame.*

INVESTIGATION

The Structure

The house at 116 Frank Street in Somerset was a single family residence built in 1960. The structure was a Cape Cod style, measuring approximately 30' x 34' in area and 1 ½ stories in height. It was constructed of block walls and wood framing members. It had an unfinished basement that contained all utilities. There was an attached garage with a storage area above, and two exterior porch areas.

Aluminum siding covered the concrete block exterior walls. The roof was asphalt shingles over wood framing. The interior walls and ceilings were predominantly gypsum board over wood framing, although there were substantial areas of wooden paneling on the walls, including in the hallways and stairway areas. Some of this paneling was even nailed directly to the wooden wall framing.

The first floor contained the living areas and a master bedroom. The second floor contained additional sleeping areas. All bedrooms had keyed locks on the doors.

The Incident

On February 9, 2003 at 1310 hours, the Community Fire Department (CFD) and the East Franklin Fire Department (EFFD) were dispatched to a structural fire at 116 Frank Street. Local police soon arrived on the scene and reported a working fire with people possibly trapped inside. Immediately following dispatch, EFFD Chief Daniel Krushinski radioed he was responding. At 1312 hours, two minutes after the initial dispatch Assistant Chief Brian Hoiberg (EFFD) radioed that he was responding and EFFD Engine (E) 272 radioed it was "awaiting crew". At 1314 hours, Assistant Chief Chris Calvo (CFD) radioed that he was responding. At 1315 hours, five minutes after the initial dispatch, CFD Ladder (L) 25 radioed it was responding, which was immediately followed by Chief Krushinski's arrival on scene. He reported heavy fire venting from a 1st floor window on the Division B side.

NOTE: To provide for uniform identification of locations and operational forces within an incident scene, the scene is divided geographically into smaller parts which are designated as divisions. Specific areas of the incident scene are to be designated as follows:

- Sides of incident scenes shall be identified as letters of the alphabet beginning with the letter "A."
- The side of the incident scene that bears the postal address of the location shall be designated as Division "A" by the Incident Commander. Where the incident scene has no postal address, the Incident Commander shall select any side to designate Division "A"
- Continuing in a clockwise rotation, the side adjacent to the Division "A" side shall be designated as Division "B."
- Continuing in a clockwise rotation, the side adjacent to the Division "B" side shall be designated as Division "C."
- Continuing in a clockwise rotation, the side adjacent to the Division "C" side shall be designated as Division "D."

Chief Krushinski designated himself as the Incident Commander (IC) and requested mutual aid. Several bystanders advised him that someone was still inside the structure.

At 1316 hours, six minutes after the initial dispatch, E-272 radioed the IC that they had 2 firefighters and were still waiting for additional personnel. The IC told them to respond anyway since other officers would soon be arriving on scene. At this time, L-25 arrived on scene with three FFs, followed immediately by AC Hoiberg, who donned his turnout gear to assist with operations.

The IC instructed L-25 to search the structure. The L-25 crew had trouble donning their Self-Contained Breathing Apparatus (SCBA). FF Lewis Pinnella, the operator of L-25, felt that the crew was not experienced enough to perform the search, so he alone went in with A.C. Hoiberg. They entered the structure through the Division D door and searched the first floor area, locating the room of fire origin.

During this time, CFD E-253 radioed it was responding, and E-272 arrived dropping a 5" supply hose to a FF waiting at a municipal hydrant and laying hose into the scene. Firefighters stretched a 1.75" hose line from E-272 through the Division A door of the structure for an interior fire attack, meeting FF Pinnella and AC Hoiberg inside. Upon showing the hose crew the location of the fire, FF Pinnella and AC Hoiberg proceeded to the 2nd floor to continue their interior search.

The search crew encountered little smoke or heat on the 2nd floor; visibility was good. They proceeded searching down the hallway and found that all room doors were locked from the outside. At 1321 hours, twenty-one minutes after the initial dispatch, AC Hoiberg radioed the IC to have personnel put a ground ladder up to the 2nd floor since they were searching above the fire. E-253 had just arrived, and their crew placed a ladder at the Division A / B corner.

FF Pinnella hit his head on the low ceiling, knocking off his helmet and SCBA mask. He removed his gloves to replace his equipment. Suddenly, the fire extended up the stairway into the 2nd floor hallway above the heads of the search crew. Conditions on the 2nd floor rapidly deteriorated, with heavy fire, heat, and smoke banking down on top of FF Pinnella and AC Hoiberg. In an attempt to seek refuge, the two became separated, but maintained voice contact. At 1322 hours, twenty-two minutes after the initial dispatch, AC Hoiberg's portable radio microphone got stuck in the open position, broadcasting their screams over the fireground radio channel for approximately 2 minutes.

At this point, other responding units had arrived. The IC removed the interior hose team from the structure. They were redirected to the Division D door, the entry point of the search team. The original hose line did not reach. A second hose line had to be stretched.

FF Pinnella, still in the hall on the second floor, located a window at the end of the hallway near the stairs. The window was made of plastic. Without hand tools, FF Pinnella could not break it. He ran toward it, breaking it as he dove out, hanging on to the sill. He fell into the arms of a firefighter below and was immediately transported by medical personnel to the hospital.

AC Hoiberg eventually stumbled through a door into a small room. He could not hear FF Pinnella anymore, so he exited the room in an attempt to locate FF Pinnella. Back in the hallway, he found the broken window. At 1326 hours, twenty-six minutes after the initial dispatch, AC Hoiberg radioed that he was jumping out the window. At this time, the original ground ladder was repositioned and raised to the window. He proceeded to dive out of the window onto the ladder which was not yet fully raised. AC Hoiberg was also immediately transported to the hospital.

Following the emergency egress of FF Pinnella and AC Hoiberg, the incoming mutual aid units took over the primary firefighting duties. The fire was soon brought under control.

FF Pinnella's helmet and SCBA mask were knocked off by the low ceiling. As he removed his gloves to replace his equipment, he was overcome by sudden, intense fire conditions extending up the stairway and into the hallway. The two men attempted to find refuge inside a bedroom but all the doors they came across seemed to be locked. They were separated when AC Hoiberg became disoriented and stumbled into a small room. FF Pinnella was still in the hallway, where he attempted to break a window. It was made of plastic and would not break. He then ran toward it, breaking it as he dove out, hanging on to the sill. He fell into the arms of a firefighter below. AC Hoiberg soon got back into the hallway, where he also found the window and dove out of it onto a ladder that was being raised to assist him.

The Casualties

Assistant Chief Brian Hoiberg, who was 27 at the time, was a member of the East Franklin Fire Company with 9 years of firefighting experience. He sustained burns to several areas of his body, and was transported to St. Barnabas Burn Center in Livingston, NJ for treatment.

Firefighter Lewis Pinnella, then 47, was a member of the Community Fire Company with approximately 15 years of firefighting experience. He sustained burns to several areas of his body, including second and third degree burns to both hands. He was also transported to St. Barnabas, where he remained for an extended period of time, receiving skin grafts on both hands.

This incident resulted in two other minor injuries:

Chief James Greene (34) and Assistant Chief Christopher Calvo (30), of the Community Fire Company both experienced chest pains. They were transported to Robert Wood Johnson Hospital in New Brunswick, NJ for observation. Both were released the next day.

ANALYSIS

Risk / Benefit Analysis

The basic principle of firefighting is that human life shall take precedence over all other concerns. However, the risk of an action must be weighed against the benefit that may be reasonably and realistically expected. All operations should undergo this analysis in order not to place undue risk on firefighters if there is no possible chance for a viable rescue.

During this incident, the IC received multiple reports that someone was trapped inside the structure. During his initial size-up, residents arrived home and reported that someone had been on the 2nd floor when they left for church. Faced with this account, he determined that the initial operation was going to be search and rescue.

The early fire conditions supported the viability of a rescue on the 2nd floor; the fire appeared to be confined to one room on the 1st floor, and had already self-vented out of a window, removing most of the heat and smoke from within the structure. Given the circumstances, all indications showed that the search and rescue crew would not be subjected to any undue risk, and a rescue effort was realistic and reasonable. This sentiment was expressed by both FF Pinnella and AC Hoiberg during the interview process of this investigation.

In fact, no one was home and there was never anyone trapped.

Apparatus Response

The EFFD and the CFD respond together to all calls, 24 hours a day. The policy shared by the two Departments is that an engine from either the EFFD or the CFD must respond prior to the CFD ladder responding, as it carries no water or hose lines.

During the early stages of this incident, FF Pinnella stated that he believed E-272 was already responding, therefore, he responded with L-25. It is believed that this miscommunication arose when E-272 radioed it was "awaiting crew". This was in fact not the case, which made L-25 first to arrive on scene. Therefore, once L-25 arrived on scene, the IC requested E-272 to respond with their 2 FFs, as additional officers and personnel were already on scene and/or responding.

Interviews revealed that L-25 and E-272 responded with minimum personnel. Although the drivers of both L-25 and E-272 were experienced, their crews consisted of newer members who had only a few years of firefighting experience between them. For this reason, FF Pinnella felt that he should go inside to

perform search and rescue. This prevented the aerial ladder of L-25 from being utilized, as the driver/operator was now committed to performing an assignment.

It should be noted that the 2nd responding apparatus from both the CFD and the EFFD had a full compliment of personnel.

Initial Hoseline Operations

The first hoseline off of E-272 was a 200' straight bore 1.75" cross-lay. It was stretched to the Division A door by the FF from E-272, along with the remaining crew from L-25. This crew was going to perform an aggressive interior fire attack so as to prevent any fire from extending to the 2nd floor where the search and rescue crew was operating.

It was reported that this hose crew experienced problems with their water supply. The operator of E-272 reported that for an unknown reason, he could not immediately charge the hoseline despite all indications that the apparatus was "ready to pump". It was stated that this problem lasted about 20 seconds. Once the hoseline was charged, it was not fully stretched out and immediately got kinked in bushes that were alongside the apparatus. The IC and driver of E-272 unkinked the hoseline, which then provided water to the waiting hose crew.

Upon entering the structure, the hose crew reported that they could see into the fire room. It is not known if the door to the room was open or if it had burned through. The delay in water from the kinked hose allowed the fire to extend out into the hallway, intensely burning up the stairway alongside the fire room. It is believed that if the hoseline had been arranged and operating properly, the fire would not have reached the crew on the 2nd floor.

Searching Above Fire Floor

It is characteristic of a spreading fire for smoke, heat, and flames to travel upward. It is, therefore, a very hazardous environment for personnel operating above a fire.

After searching the 1st floor, and knowing that the hose crew was in place to extinguish the fire, AC Hoiberg and FF Pinnella proceeded to the 2nd floor of the structure. Upon reaching the 2nd floor, AC Hoiberg called for a ground ladder to be placed to the 2nd floor for emergency egress.

AC Hoiberg later stated that he remembered seeing water flowing from the nozzle. The water flow he saw quickly ceased due to the kinks in the hoseline but he and FF Pinnella had ascended the stairs prior to the problem with the water supply to the hoseline.

AC Hoiberg later stated that as the fire burned up the stairway he dropped a hand tool he was carrying, possibly a “Halligan” bar. This left the search crew with no hand tools, as AC Hoiberg could not retrieve the tool he dropped and FF Pinnella did not bring a hand tool into the structure. Finally, the ground ladder that was originally placed had to be relocated to assist with their emergency egress.

NJ Personal Accountability System (NJPAS)

An accountability system provides the IC with an improved means of tracking the location, function, and time of personnel operating at the incident scene.

The EFFD and CFD used a 2-tag accountability system in which the first tag is clipped on a ring in the apparatus and the second tag is clipped to a “marker” that is placed outside of the main entrance door. This “marker” is basically a traffic cone that has a ring on it for the tags to be clipped to. This device is utilized until an accountability officer is designated to take the tags and monitor the situation as the incident progresses.

An Incident Management System (IMS) shall be utilized by all firefighting personnel during all responses. Under this IMS, the IC may choose to retain the accountability function or delegate it to a subordinate. At the commencement of this incident, the IC served as the accountability officer because only a few personnel were operating on scene. Accounts of the incident indicate that the IC did not receive tags from the initial search or suppression crews and that the accountability “marker” was not in place. The IC later stated that he still knew exactly who was inside the structure at the time of the distress.

Non-Use of Thermal Imaging Cameras (TICs)

A TIC is a device that translates a thermal picture into an electrical picture and then a visual image for the human eye. The TIC relies on the thermal energy emitted by all objects and not on reflected visible light, providing vision capability even with no light present. Thermal energy is characterized by its long wavelength and fortunately for firefighters, the nature of this long wave thermal energy allows it to travel through smoke. The TIC generates a true black and white image; hotter objects appear white and cooler objects appear black to gray. It is this image that allows firefighters to “see” through the smoke, providing a more rapid means of locating victims or hidden areas of fire.

Although TICs were located both on L-25 and E-272, neither TIC was used during the size-up, initial rescue, or fire suppression operations. Accounts differed as to whether one TIC was out of service. Notwithstanding the status of the TIC, personnel maintained that they did not have enough time to grab a TIC

prior to entry into the structure. If the 2nd floor search crew had a TIC, it may have helped them to maintain visual contact with each other and more easily recognize rooms for refuge and/or windows to escape.

Personal Alert Safety System (PASS)

A PASS device is designed to assist rescuers in locating a downed or disoriented firefighter. It is worn on the SCBA or turnout coat and must be turned “on” prior to entering an atmosphere considered IDLH (immediately dangerous to life and health). Turning “on” the PASS is done manually on older models, however, newer integrated models are automatically activated. Should the firefighter collapse or remain motionless for approximately 30 seconds, the PASS will emit a loud, pulsating shriek. The alarm can also be sounded manually if the firefighter needs assistance. Rescuers will follow the sound to locate the firefighter. PEOSH regulations under N.J.A.C. 12:100-10 et seq. mandate that all firefighters and rescuers be equipped with the PASS device.

During this incident, both FF Pinnella and AC Hoiberg were wearing SCBA that contained integrated PASS devices. This means that once the SCBA air supply is turned “on”, the PASS is automatically turned “on” also (provided that the batteries in the PASS are maintained). Following this incident, both men stated that their PASS devices were properly operating that day. However, neither manually sounded his PASS alarm to alert others of a need for assistance.

Personal Protective Equipment (PPE)

PPE is protective equipment designed to cover all exposed skin surfaces to shield them from the products of combustion, including smoke, heat, and direct flame.

During this incident, although both FF Pinnella and AC Hoiberg entered the structure wearing full PPE, FF Pinnella removed his gloves to replace his SCBA mask and helmet. He did not get his gloves back on before he was overcome by the advancing fire. As a result, FF Pinnella received severe burns to his hands. It is believed that the PPE saved both men from more severe burn injuries.

Rapid Intervention Team (RIT) / Firefighter Assist & Search Team (FAST)

In accordance with IMS regulations under N.J.A.C. 5:75, which implements the National Fire Protection Association (NFPA) Standard 1561, fire departments are required to provide at least two firefighters outside of an IDLH atmosphere. Should the need arise, these firefighters can search for and rescue lost or trapped firefighters. It is recommended that this concept be taken to a higher

level with the establishment of Rapid Intervention Teams (RIT) or Firefighter Assist and Search Teams (FAST).

During this incident, operations were in compliance with the 2-in / 2-out regulations which state:

- *At least two employees enter the immediately dangerous to life or health (IDLH) atmosphere and remain in visual or voice contact with one another at all times;*
- *At least two employees are located outside the IDLH atmosphere; and*
- *Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere;*
- *The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;*
- *One of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.*

Since the distress occurred during initial operations, and although the IC immediately called for mutual aid while still en route to the scene, additional units had not yet arrived at the time of the distress. Thus, there was no dedicated RIT / FAST ready to immediately intervene once FF Pinnella and AC Hoiberg became entrapped.

Evacuation Signal

An emergency evacuation signal is designed to alert all firefighters of an imminently hazardous condition that warrants the rapid removal of personnel from a structure. During this incident, an evacuation signal was not sounded although the search crew was in peril. It was later learned that AC Hoiberg's portable radio was in the transmit mode preventing the IC from transmitting the evacuation radio signal. An air horn signal was not sounded either. However, the IC repositioned the suppression crew from the Division A door to a door on the Division D side, as it was believed that this would be a better location to help the 2nd floor crew. However, additional problems with the hoseline prevented them from being of immediate assistance.

Building Characteristics

Building characteristics can play a significant role in fire spread and personnel safety. In this incident, some building characteristics contributed to the fire spread and / or injuries as follows:

- Interior finish – Wall finish for the stairway and hallway was wooden paneling. This type of untreated paneling is considered extremely combustible, with very high flame and smoke spread characteristics, causing areas containing this paneling to reach total flame involvement very quickly.
- Open stairway – As is the case with most private dwellings, this structure had an open interior stairway, which allowed for the unimpeded movement of heat, smoke, and fire onto the 2nd floor.
- Low ceiling height – This structure was a “Cape Cod” style, meaning that the 2nd floor has lower, sloped ceilings. This is because the sloped roof rafters also serve as ceiling joists for the 2nd floor. The lower ceiling height allows heat and smoke to reach floor level faster than a traditional full-height ceiling.
- Window openings – Window openings are often the fastest means of emergency egress, although particular types can require increased effort. Although not typical, a window made of plastic or “Plexi-glass” is very difficult to break, as was the case in this incident. Newer windows, constructed of vinyl framing and insulated double panes of glass can also prove very tough to break and/or remove the sashes.

Additionally, a common obstacle encountered by FFs is locked doors. Locked doors, as were found on the 2nd floor of this structure, can interfere with the operations of FFs that do not possess the proper forcible entry equipment. This can not only prevent a thorough search from being performed, but can also hinder FFs during a rapid retreat or in seeking a place of refuge.

Critical Incident Stress Debriefing (CISD)

The purpose of a CISD team is to provide individual counseling, group sessions and, if necessary, referrals to members of an emergency response organization involved in traumatic events. These events include death or serious injury of a co-worker, multiple deaths or the death of a child. CISD teams are made up of specially trained fire, police and EMS personnel, along with mental health professionals who provide training and guidance to the responders at debriefing sessions. The assistance provided by a CISD team helps to sensitize the firefighters to the possibility of stress reactions, to understand the range of normal reactions and provide a way to deal with the incident and its after- effects hopefully avoiding future stress related problems. CISD teams are regionalized in New Jersey and are part of a statewide network.

The use of a CISD team after a fire where there has been loss of life or serious injuries is not a sign of weakness on the part of emergency personnel. Failure to deal completely with the emotional stress of such a traumatic occurrence can negatively affect both the professional and personal lives of those involved.

State Agency Investigation

Following this incident, although there was an investigation performed by the NJ Division of Fire Safety, there was no formal investigation performed by the NJ Department of Labor.

LESSONS LEARNED

Apparatus Response

Low staffing levels are commonplace in many volunteer fire departments. The number of volunteers available to respond to emergencies can vary significantly according to the day and time. This, in turn can have a significant impact on the amount of training and experience that responding crews possess.

Tests conducted with the Dallas, Texas Fire Department indicated that staffing below a crew size of four can overtax the operating force and lead to higher losses. Likewise, an inexperienced crew might not be able to successfully perform the critical fireground operations that are expected of them.

It is for these reasons that most fire departments utilize some form of mutual or automatic aid from surrounding communities. Neighboring fire departments not only supplement local staff, but often provide specialized services such as RIT / FAST that are required during structural firefighting.

Initial Hoseline Operations

The successful operation of the initial hoseline often governs the overall success of the firefighting operation, as many fires can be suppressed using only this initial hoseline. The hoseline must be fully stretched out to prevent kinking when charged. The nozzle must be opened to bleed out any air in the hoseline and to ensure adequate water flow prior to entering the structure.

The hose crew should consist of at least four firefighters; one on the nozzle, one as a back-up with forcible entry hand tools, one to help stretch the hose into the structure and around corners, and an officer who guides the crew, monitors conditions and progress and radios messages to the IC. If the crew size is reduced or consists of inexperienced firefighters, the fire suppression operation can be hindered.

Searching Above Fire Floor

As previously noted, fire will cause smoke, heat, and flames to spread upward and outward from their source. This creates a hazard for anyone operating above a fire and should be avoided unless at least one ground ladder is placed to upper windows for emergency egress, a crew with a fully charged hoseline is in place to control the fire, and personnel are ready to perform ventilation to remove the smoke and heat. Rescue, suppression, and ventilation operations must be strictly coordinated by the IC or Operations officer, and communication must be maintained with personnel reporting their status, progress, and observations. Any changes in fire conditions or problems encountered while conducting these vital operations must be conveyed immediately to all those operating in the fire building. Failure to keep all members informed of changing conditions can, and often does, result in firefighter injuries and deaths.

Search team staff should be equipped with hand tools that can be used for forcible entry and tools that can extend a firefighter's reach. These tools will allow even a limited number of personnel to conduct an efficient search.

Firefighter Survival Techniques

No matter how cautious firefighters are, fires are dynamic and conditions can deteriorate rapidly. It is imperative that firefighters be prepared for dire situations. Fire departments need to train firefighters to deal with the possibility of becoming lost or trapped. While it is difficult to simulate a training scenario in which a firefighter actually feels his/her life is threatened, creative, realistic and safe training exercises can be developed to help prepare firefighters for dire situations.

Through repetitive training, firefighters can learn such emergency survival techniques as "skip-breathing" to conserve precious air supply, entrapment self-extrication techniques, wall breaching techniques, ladder escape "bail-out" methods and so forth. It is also important that firefighters be equipped with small items such as wire cutters, personal flashlights and personal lengths of rope or nylon webbing.

Above all, firefighters must be conditioned to respond to individual emergencies calmly in order to make reasoned decisions. Firefighters must be taught that if they become lost or trapped the most important thing they can do is notify others of their plight and location as best they can. For this reason, every interior crew member should have a portable radio equipped with a sufficient number of operational frequencies and a dedicated command frequency. Further, they should use a pre-determined emergency term such as "May-Day" to notify the incident commander of their situation. Finally, firefighters need to immediately activate their PASS devices manually so that rescue crews can locate them quickly.

NJ Personal Accountability System (NJPAS)

The New Jersey Personal Accountability System (NJPAS) under N.J.A.C. 5:75 require that fire departments utilize a two-tag accountability system. The first tag is placed by the FF on the responding apparatus. The second tag is given to a designated accountability officer prior to entering the IDLH. This system includes the use of PARs (Personal Accountability Reports) or roll-call sheets, all within the framework of the IMS that is required to be utilized at all incidents.

The NJPAS also requires communication between crews working inside the structure or hazardous area, company officers and the IC. Interior crews must keep company officers apprised of general conditions, what they are doing and where they are. At the same time, company officers responsible for crews must solicit information from their crews and pass it along to the IC or planning chief. With proper two-way communication, everyone on the incident scene is cognizant of what each team is doing and generally has a sufficient idea of where they are, lessening the chance of firefighters freelancing.

Non-Use of Thermal Imaging Cameras (TICs)

The State supplied all New Jersey fire departments with one or more Thermal Imaging Cameras (TICs). Both the EFFC and the CFC were the recipients of these cameras.

Fire department should routinely employ the TICs during various structural firefighting operations. TICs can be a valuable tool during initial and on-going scene size-up, especially when dealing with fires in wood frame structures. In these instances, the IC can gain valuable insight from the exterior as to the fire's location, size, and advancement through the structure. This activity should be performed before firefighters enter the structure to alert them of hazards and reduce risks.

TICs can also play a vital role during fire suppression operations. The TIC can reduce the time needed for interior crews to locate and extinguish the seat of the fire. The TIC can provide a means of identifying hidden areas of fire spread and aid in the recognition of deteriorated structural conditions.

The TIC must be an integral part of search and rescue operations for lost or trapped civilians and firefighters. The camera can help RIT / FASTs save precious time in locating and removing victims. While TICs must not replace time-honored skills, they are an important tool to make operations more efficient, resulting in a higher level of safety for firefighters.

Just as firefighters equip themselves with a set of hand tools and flashlight, they must include the TIC in their cadre of tools every time they enter a situation where visibility is reduced. Fire departments must realize that the TIC is a versatile tool, and continually train utilizing their TIC in various situations and operations. Practice will enhance firefighters' proficiency with the camera, allowing them to interpret the images it displays and to fully understand its capabilities and limitations.

Personal Alert Safety System (PASS)

PASS devices can save lives. Many departments still rely on PASS devices that must be activated manually, although newer technology automatically turns "on" an integrated PASS device upon turning-on an SCBA. The manually activated devices are acceptable by NFPA standards, but place a burden on the firefighter to remember to turn "on" the PASS device. Adding the human factor increases the chance for error. Fire departments should strongly consider upgrading their SCBA to those with automatic PASS devices. In any event, they must be provided, used, and maintained in accordance with PEOSH regulations under N.J.A.C. 12:100-10 et seq.

Tests conducted by the Mesa, Arizona Fire Department yielded the following recommendations regarding the use of PASS devices:

- *Test the PASS at least weekly, and maintain it in accordance with manufacturer's instructions;*
- *Conduct practical training with the PASS under realistic conditions;*
- *Check the PASS device calibration during training, and return units for recalibration if necessary;*
- *Retrain every six months with PASS devices;*
- *Train firefighters to always turn on and test the PASS before entering a hazardous atmosphere;*
- *Train rescuers to listen for the distress sound by stopping in unison, controlling breathing, and lifting hood or earflaps away from ears;*
- *When a downed firefighter is located, turn off the PASS device or communications will be impossible.*

Personal Protective Equipment (PPE)

Although PPE is designed to protect the firefighter from the products of combustion, the physical characteristics of the PPE cause it to lessen the mobility and dexterity of the firefighter. This is especially the case with firefighting gloves. They greatly interfere with the ability to perform fine-motor-skill tasks such as fastening buttons, clips, straps, and the like. Therefore, firefighters must be able to don / doff equipment with gloved hands.

Rapid Intervention Team (RIT) / Firefighter Assist & Search Team (FAST)

IMS regulations under N.J.A.C. 5:75 require that fire departments have a minimum of two fully equipped personnel ready to rescue distressed firefighters when operating in an IDLH atmosphere.

A RIT or FAST can be composed of departmental or mutual aid personnel. It is important for the IC to request the RIT or FAST as soon as possible after dispatch to allow for the team to arrive quickly. Some fire departments have refined their response plans to dispatch a RIT or FAST automatically upon report of a working fire.

These teams are specially trained and equipped to deal with rescuing firefighters under the worst possible conditions. If this concept is adopted by the fire department, it is crucial that the members of the RIT or FAST obtain all necessary training and equipment. Other fire department members also need to be well versed in the duties, responsibilities and operations of the RIT or FAST and they must know what fire crews must do to support the team.

Evacuation Signal

The NJ Fire Safety Commission is working toward approving a model emergency evacuation signal guideline as developed by the NJ Firefighter Safety and Health Advisory Council and the NJ Division of Fire Safety. It is anticipated that this guideline will become regulation in order to achieve statewide uniformity. It should be noted that the approved model is similar, if not identical, to that already utilized by most departments.

Building Characteristics

Fires that occur in one and two family residences can be some of the most hazardous for firefighters to battle, as many homes contain items or conditions that can be dangerous. Some homeowners store a wide variety of hazardous materials in their homes, from chemicals to ammunition. Some also perform "illegal" structural alterations, such as adding bedrooms and knocking out walls. Homes do not possess the same life safety or construction design features as commercial structures, nor are they subject to any regular inspections after occupancy. Firefighters must anticipate problems when responding to private residences.

Critical Incident Stress Debriefing (CISD)

The Division of Fire Safety recommends the notification and use of CISD teams when CISD trigger events are found to be present. Such significant events may include:

- *line of duty death of a co-worker*
- *mass casualty incidents*
- *death of a child*
- *death occurring after prolonged rescue efforts*
- *when a victim reminds an emergency worker of a loved one*
- *during highly dangerous or highly visible events*
- *when the emergency worker influences death or injury*
- *co-worker suicides*
- *any other unspecified highly traumatic event*

Emergency contact numbers for activation of a CISD team are as follows:

The Statewide CISD Network – (609) 394-3600

The NJ Fire & EMS Lifeline – (866) 653-3367

Proper Treatment of Burn Injuries

In accordance with American Burn Association recommended guidelines, which were followed in this incident, all individuals meeting the following criteria should be referred to the nearest certified burn center:

- *All Partial thickness (2 degree) burns $\geq 10\%$ TBSA*
- *All Full thickness (3 degree) burns, regardless of size*
- *All chemical, inhalation and electrical burns*
- *Any burns to the face, feet, joints or genitalia*
- *Patients with pre-existing medical disorders compromising outcome*
- *Patients with burns and concomitant trauma (follow regional medical control and triage protocols)*
- *Patients requiring extensive social, emotional or long-term rehabilitation*
- *Pediatric burns without qualified personnel or equipment*

In New Jersey, consult with The Burn Center at St. Barnabas Hospital directly at (973) 322-5920.

State Agency Investigation

All fire departments are subject to the *mandatory* reporting requirements under N.J.S.A. 34:6A-25 et seq., and PEOSHA regulations at N.J.A.C. 12:110-5.8. All work-related public employee (career *or* volunteer firefighter) fatalities or in-patient hospitalizations shall be reported *within 8 hours* of occurrence to the NJ Department of Labor 24-hour hotline at (800) 624-1644.

In addition, the NJ Division of Fire Safety shall be notified of any firefighter fatality or serious injury *within 4 hours* at 1-877-NJ-FIRES (1-877-653-4737). Investigations conducted pursuant to such reports shall be accomplished independently but coordinated as necessary.

CONCLUSION

The burn injuries sustained by AC Hoiberg and FF Pinnella can be attributed to the cumulative effect of several factors:

The initial hoseline was not stretched out causing the hose crew to experience problems with the water supply. The delayed application of water onto the fire allowed the fire to extend into the stairway and 2nd floor hallway.

The building design and materials significantly contributed to the injuries received. The highly combustible wooden paneling that covered the walls of the open interior stairway and hallways, along with the low ceiling height on the 2nd floor, caused these areas to reach total flame involvement very quickly.

As a result, AC Hoiberg and FF Pinnella, the search crew, were overrun by intense fire conditions while conducting a search in the 2nd floor hallway. A key factor in the severity of the burns to FF Pinnella's hands was that he removed his firefighting gloves to replace some dislodged equipment just prior to the sudden deterioration in conditions. This resulted in high heat and/or direct flame contact to his hands for an extended period of time.

After losing their only hand tool, locked doors and "Plexi-glass" windows prevented the search crew from gaining immediate refuge from the fire.

REFERENCES

Fire Investigation Report: Franklin Twp. Fire Prevention Department.
Investigation performed by Inspector Anthony Panchery. Report dated
2/3/04.

Dispatch Tape of Fireground Frequency – Somerset County Communications.

“Standard Operating Procedures – Thermal Imaging Camera”. Issued by the NJ
Division of Fire Safety. <<http://www/nj.gov/dca/dfs/sops.htm>>

Essentials of Fire Fighting - Fourth Edition. International Fire Service Training
Association (IFSTA). Oklahoma State University, 1998.

Firefighter’s Handbook. Delmar / Thompson Learning, 2000.

Fire Officer’s Handbook of Tactics. John Norman. Fire Engineering: PennWell
Publishing, 1991.

N.J.A.C. 5:75 – Fire Department Incident Management System. NJ adoption of
NFPA 1561 – Standard on Fire Department Incident Management
System, 1995 edition.

NFPA Standard 1500 - “Fire Department Occupational Safety and Health
Program”. 1997 Edition.