NEW JERSEY DIVISION OF FIRE SAFETY

Firefighter Fatality and Serious Injury Report Series

Firefighter Runs Out of Air and Loses Consciousness While Operating at a Structure Fire

Englewood, New Jersey
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STATE OF NEW JERSEY
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INTRODUCTION

The investigation of this incident was conducted by the New Jersey Division of Fire Safety / Office of the State Fire Marshal in conjunction with the New Jersey Department of Labor. This report was prepared in accordance with N.J.S.A. 52:27D – 25d, Duties of the Division. The purpose of these 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. In some cases new information may be developed, or old lessons reinforced, in an effort to prevent similar events in the future.

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EXECUTIVE SUMMARY

On December 12, 2003 at 0003 hours, the Englewood Fire Department (EFD) responded to a working structure fire at 396 W. Hudson Ave. Upon arrival, initial companies found smoke billowing from a 1.5 story wood-frame residence, with local police reporting a working fire in the basement. As crews entered the structure for search and suppression operations, a second alarm was requested. Firefighters initiated an interior fire attack by stretching a 2" hoseline to the basement via an unprotected interior stairwell. Upon reaching the bottom of the stairs, firefighters encountered moderate heat and heavy smoke. They could not immediately locate the seat of the fire, as the layout of the basement prevented them from advancing the hoseline. Shortly thereafter, Firefighter (FF) Michael Sternesky realized that his air supply was running low, and he needed to leave the basement. He proceeded up the stairs, at which point conditions throughout the structure rapidly deteriorated, causing FF Sternesky to become disoriented. He issued a "Mayday" request on his portable radio, and all personnel were ordered to exit the structure. Following the "Mayday", two other personnel also found themselves disoriented and running low on air. They soon found a window for emergency egress, but encountered much difficulty getting out due to its size. While exiting, it was realized that FF Sternesky was also in this room with them.

Three personnel immediately entered the room through this same window and quickly located FF Sternesky unconscious on the floor. After a short struggle to remove him, he was brought through the window where he was examined by awaiting personnel. After attempting CPR on him, he began shallow breathing on his own. EMS personnel took over his care and transport to a local hospital. Shortly after his release from the hospital, EFD Chief Robert Moran thought that he still did not look well, and insisted that he be taken to St. Barnabas Medical Center. There, it was found that he still had life-threatening carbon monoxide levels in his blood. Following extensive treatment, he was released.

The origin and cause investigation for this incident was conducted by the Bergen County Prosecutor's Office Arson Squad. The fire was determined to be accidental in nature, caused by an electrical malfunction. Furthermore, FF Sternesky's SCBA was later sent to NIOSH for operational testing to determine if any malfunctions occurred.

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:**
   Low staffing levels for this incident caused some EFD FFs to perform vital fireground tasks alone, without the assistance of a partner.

REMEDY:
Staffing must be maintained at a level that allows for teams of at least 2 FFs to perform all vital fireground tasks, including search and rescue, fire suppression, and ventilation. Additionally, tests conducted with the Dallas, Texas Fire Department indicated that staffing below a crew size of four can quickly overtax the operating force and lead to higher losses.

2. FACTOR:
In following the concept of crew integrity, firefighters are paired in teams that enter the hazardous area together, perform their assigned task together and exit together. Crew integrity was not maintained at many times during this incident, including by the hose crew operating in the basement.

REMEDY:
Fire departments must take all possible measures to ensure that firefighters maintain crew integrity to provide for their safety and to prevent freelancing during fireground operations.

3. FACTOR:
Upon attempting to exit, FF Sternesky lost contact with the hoseline, causing him to become disoriented and unable to locate an exit door.

REMEDY:
Firefighters must maintain contact with the hoseline during times of reduced visibility. Properly following the hoseline will lead back to the point of entry into the structure.

4. FACTOR:
The personnel accountability system utilized by the EFD was not capable of effectively tracking the location, function, and time of personnel operating at the incident scene.

REMEDY:
Fire departments shall adopt and utilize a personal accountability system that is compliant with the current Incident Management System (IMS) regulations under N.J.A.C. 5:75. Departments shall further designate personal accountability officers (PAOs) to monitor each entry point into a structure so as to monitor the locations, functions, and times of personnel.

5. FACTOR:
FF Sternesky failed to monitor his SCBA air supply, causing him to suddenly become low on air. Furthermore, although FF Sternesky

was equipped with a Personal Alert Safety System (PASS) device, he did not manually activate the alarm upon becoming distressed.

REMEDY:
Firefighters must continually monitor their SCBA air supply gauges while conducting operations in an IDLH atmosphere; the low air pressure alarm should not be solely relied upon to advise the user when to exit. Additionally, PASS devices must be provided, used, and maintained in accordance with PEOSH regulations under N.J.A.C. 12:100-10 et seq. Although many departments still rely on PASS devices that must be turned "on" manually – devices that are acceptable by PEOSH regulations – they are not ideal because the firefighter must remember to activate the PASS device. For this reason, fire departments should strongly consider upgrading their SCBA to those employing automatic PASS devices.

6. FACTOR:
The full validity of the NIOSH testing on FF Sternesky's SCBA could not be determined as the SCBA received a new air cylinder and was cleaned prior to being secured for this investigation.

REMEDY:
Any equipment that is directly involved in a firefighter injury or fatality must be immediately secured in the condition in which it was last utilized to prevent altering any condition that may have contributed to the possible equipment failure.

7. FACTOR:
Many radio transmissions, including FF Sternesky's "Mayday" message were muffled and/or indiscernible due to the characteristics of SCBA facepieces.

REMEDY:
Fire departments should upgrade SCBA facepieces with voice-amplification modules to ensure effective communication while the SCBA is donned.

8. FACTOR:
Although a Thermal Imaging Camera (TIC) was brought to the front door, there were no indications that it was utilized by personnel during operations, including the time during the search efforts for FF Sternesky.

REMEDY:
Fire departments that possess TICs should routinely employ the use of them during structural firefighting operations. Furthermore,

the TIC should be an integral part of rescue operations, as it can save precious time in locating and removing victims.

9. FACTOR:

Although FF Sternesky issued a "Mayday" on his portable radio, his message was garbled, and it did not state his location. Additionally, personnel were evacuated from the structure upon receipt of the "Mayday" message.

REMEDY:

Fire Departments must train all personnel on procedures for issuing a "Mayday", and also on the proper actions to be taken following the receipt of a "Mayday". To this end, the NJ Division of Fire Safety has proposed regulations for standardizing "Mayday" and evacuation signal procedures.

10. FACTOR:

An interim EFD Rapid Intervention Team (RIT) was not established, and the 2nd alarm mutual aid RIT had not yet arrived on scene during the time that FF Sternesky and other FFs were in distress and needed immediate assistance.

REMEDY:

Incident Management System (IMS) regulations under N.J.A.C. 5:75 require that fire departments utilize a properly equipped and trained RIT to rescue distressed firefighters when operating in a hazardous atmosphere. An interim RIT must be established using on-scene personnel prior to the arrival of a dedicated RIT.

11. FACTOR:

The EFD communications system was inadequate, as there was only one radio channel dedicated for all fire department dispatching and operations, possibly hampering the ability for important messages to be transmitted. EMS personnel failed to communicate with the IC or report to the command post, causing much confusion as to their status on the scene.

REMEDY:

Incident Management System (IMS) regulations under N.J.A.C. 5:75 require that larger fire departments have multiple radio channels, including a main dispatch channel. The concept of Unified Command shall be utilized when multiple agencies respond to an incident.

INVESTIGATION

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."*

The Incident

On December 12, 2003 at 0003 hours, the Englewood Fire Department (EFD) was dispatched to a report of a house fire at 396 W. Hudson Ave. Initial response for the EFD consisted of Truck T-2, and Engines E-3 and E-2. While units were still en-route, dispatch information was updated indicating that the local police were reporting a working fire in the basement and that all the residents had evacuated. Deputy Chief (DC) Gerald Marion, who was off-duty but heard the initial call, radioed that he was responding at this time. T-2 was the first to arrive at 0007 hours, four minutes after the dispatch time, followed shortly thereafter by E-3 and E-2. Captain Robert McLoughlin of T-2 became the initial Incident Commander (IC) and reported that he had smoke showing from a 1.5 story residence. His initial orders were for E-3 to lay a 5" supply hose to a municipal fire hydrant that was across from the structure, and to stretch a 2" hose line to the interior for an offensive fire attack. Additionally, Lt. Raymond Ryland of E-3 became the interior officer, positioning himself on the basement stairs to monitor conditions. Following this at 0008 hours, five minutes after the dispatch time, the IC requested a second alarm, which would bring off-duty personnel and mutual aid companies to the scene; the dispatcher proceeded to clear the fireground frequency for the dispatch of the recall personnel.

DC Marion arrived on scene at 0010 hours, seven minutes after the dispatch time, at which time he met with the IC to receive a situation / status report (sit/stat). At 0012 hours, nine minutes after the dispatch time, Chief Robert Moran radioed that he was responding. This was followed by a second dispatch of the recall personnel over the fireground frequency.

Once inside the structure, the hose crew had some difficulty in locating the interior stairway into the basement; once located, they proceeded down the stairs to extinguish the fire. Upon reaching the bottom of the stairs, the hose crew

Figure 1
Side “A” of the home at 396 West Hudson Avenue in Englewood

could only advance a few feet, and could not locate the seat of the fire. This was due to storage and partition walls obstructing their advancement. The hose crew encountered high heat and smoke levels, with fire extending along the ceiling above a partition wall. FF Robert Heller, who was working the nozzle of the hoseline radioed to the IC that they were encountering heavy smoke and a large volume of fire, but they were not hitting the seat of the fire yet. It was at this time that FF Michael Sternesky, who was backing-up FF Heller on the hoseline, realized that his air supply was getting low. He alerted FF Heller of this, telling him that he needed to leave. FF Heller told FF Sternesky that he would be okay on the hoseline, and to exit the structure. Shortly after FF Sternesky left FF Heller, the interior conditions quickly deteriorated.

It should be noted that FF Sternesky reported that he encountered both Lt. Raymond Ryland and FF John Escobar during his attempt to exit. It was reported that although he told both personnel of his situation, neither one assisted him in exiting the structure; FF Sternesky believed that both personnel simply shoved him out of the way, refusing to help him. In follow-up interviews with both personnel, they reported that FF Sternesky appeared frantic and disoriented. When they attempted to calm him to help him, they were unsuccessful and FF Sternesky simply disappeared into the smoke. It

was at this time that they tried to locate him when both became disoriented and distressed themselves. Due to the conflicting reports of how the events inside the home transpired during FF Sternesky's attempt to escape and the lack of eye-witnesses, investigators were unable to determine exactly what happened at that time.

At 0014 hours, 11 minutes after the dispatch time, DC Marion assumed the role of IC from Capt. McLoughlin, who now ordered a second hoseline off of E-3 to be brought to the rear of the structure for the heavy fire conditions there. Capt. McLoughlin requested a status report from the interior officer, Lt. Ryland; although the reply was indiscernible, Capt. McLoughlin also advised him that that they might have to knock the fire down from the outside first. At this time, the basement hose team tried to radio another report to Capt. McLoughlin, however, it was very garbled and indiscernible. This message was immediately followed by a muffled message from FF Sternesky: "Firefighter Sternesky, Mayday, Mayday!" Upon hearing the Mayday, Capt. McLoughlin immediately called for all personnel to evacuate the structure; the dispatcher repeated the message for the evacuation. This was followed by another muffled "May-Day" transmission, and a garbled transmission of "Where are you?" possibly from Capt. McLoughlin. Again, the dispatcher repeated the message for the evacuation. Two personnel still inside the structure, Lt. Ryland and FF Escobar (who FF Sternesky had previously encountered), began following his voice, when they also became disoriented and low on air.

At 0016 hours, 13 minutes after the dispatch time, the IC radioed the dispatcher that they had a "man down", and that they were attempting rescue operations. Chief Moran radioed on scene at this time, and called for accountability of all units. Soon after, the dispatcher radioed the IC that the ambulance should be on scene; however, it was reported that the EMS personnel never came to the Command Post, resulting in much confusion as to their status and location. The dispatcher radioed the IC that there were 4 recall personnel in Fire Headquarters, and that they would be responding with the Rescue unit R-1. Chief Moran then proceeded to assume the role of IC from DC Marion, and continued to request accountability for all units.

At 0019 hours, 16 minutes after the dispatch time, the third dispatch for the recall personnel went out over the fireground frequency. Lt. Ryland and FF Escobar were now together in a room at the rear of the structure; they soon found a window to escape, but had great difficulty due to the size of the window. Both had to remove their SCBAs to fit through the opening with the assistance of personnel on the exterior. During this time period, R-1 and a mutual aid unit from the Teaneck FD arrived on the scene. FF Escobar exited first, followed by Lt. Ryland; as he exited, he felt something hit his leg, possibly someone's hand. Upon exiting, he told Capt. McLoughlin that there was still someone inside the room. Three personnel: FF Robert Heller, FF Darius Hunt, and Lt. Michael Marino immediately entered the window for the rescue operation. They quickly

located FF Sternesky on the floor of the room. They had difficulty moving him due to furniture and debris partially on top of him. Minutes later, they removed FF Sternesky through the window, with the assistance of personnel on the exterior.

Figure 2
View of side "C" of the dwelling. Note the 1st floor window nearest to side "B" of the structure. This is the window where Lt. Ryland and FF Escobar escaped and where FF Sternesky was rescued from.

The firefighters who rescued Sternesky were certified EMTs and found that he was not breathing. Since it was still unknown if EMS personnel were on scene, the firefighters began CPR on FF Sternesky and he soon began shallow breathing on his own. During this time, the area surrounding FF Sternesky became very chaotic; the EFD personnel were gathered over him, basically in shock over the situation. DC Marion ordered the personnel to back away so that he could be evaluated. Medical personnel soon arrived at the rear of the property, taking FF Sternesky to a waiting ambulance.

Firefighting operations resumed shortly thereafter; however, once adequate mutual aid personnel arrived on scene, Chief Moran pulled all EFD personnel from the scene, ordering them to return to the station. After extensive firefighting operations, the fire was extinguished without further incident.

The Casualty Scenario

At the time of the incident, Firefighter Michael Sternesky was a 35-year-old member of the Englewood Fire Department, with approximately 5 years of experience. As previously stated, during interior fire suppression operations, he realized that his air supply was running low, prompting him to exit the structure. Upon becoming disoriented in the deteriorating conditions, he soon ran out of air and lost consciousness. He was eventually rescued by other EFD personnel and transported to a local hospital.

Upon being released, Chief Moran sent FF Sternesky to St. Barnabas Medical Center for a follow-up examination, where it was found that he still had life-threatening carbon monoxide levels in his blood. Following extensive treatment there, he was released.

ANALYSIS

Staffing Levels

At the time of this incident, the initial staffing levels for the responding EFD units were as follows:

Truck 2 – Captain (initial IC), 1 FF as the driver, and 2 FFs for the crew
Engine 3 – Lieutenant (interior officer), 1 FF as the driver, and 2 FFs for the crew
Engine 2 – one FF as the driver, and one FF crewmember (FF Sternesky)

At the time of the incident, it was the policy of the EFD that the Truck responds first with the shift commander, followed by the 2 Engines. If the apparatus is not actively being utilized, the driver (FF) will perform fireground operations as needed. Policies within the EFD allowed for a minimum staffing level of 1 officer and 6 firefighters before additional personnel would be brought in on overtime. A full compliment of personnel was considered to be 2 officers and 10 firefighters (plus the Chief and Deputy Chief during the day shift).

FF interviews revealed that EFD personnel frequently find it necessary to perform tasks alone, as there is not sufficient personnel on-duty to perform the necessary tasks as teams and/or simultaneously. It should be noted that prior to this incident, Chief Moran reported that he had made multiple requests for the municipality to make provisions for additional personnel; however, no action was taken to increase staffing.

Crew Integrity

In following the concept of crew integrity, firefighters are paired in teams that enter the hazardous area together, perform their assigned task together and exit together.

During this incident, there was a lack of crew integrity exhibited by all personnel. As previously stated, FF interviews revealed that during this incident, the personnel conducted various operations alone, including interior search, and exterior ground ladder and ventilation operations. Although the hose crew initially had crew integrity, once FF Sternesky's air supply became low, he left his partner, FF Heller in the basement alone on the hoseline. However, it should be noted that FF Heller did advise him that he would be okay operating alone. While FF Sternesky was exiting the basement, he lost contact with the hoseline and became severely disoriented upon the rapid deterioration of conditions. It is believed that his loss of contact with the hoseline played a critical role in his inability to exit the structure, resulting in his subsequent distress.

As a method of coping with the many incidents where crew integrity is not possible due to staffing levels, the EFD has issued portable radios to all on-duty personnel. These radios allow FFs operating alone to maintain contact with other personnel on scene.

Personal Accountability System

A personal accountability system is utilized to provide the IC with an improved means of tracking the location, function, and time of personnel operating at the incident scene.

During this incident, the EFD utilized a 2-tag accountability system in which one tag was kept on the firefighter's turnout gear at all times, and the other tag was placed on a collector board in the Ladder truck, as this is always the first responding apparatus. This board is divided into sections for each apparatus; at the beginning of each shift, personnel place their tag on this board next to the apparatus number that they are assigned to. Although this system can track personnel that are on the incident scene, and which apparatus they responded on, it does not allow for the tracking of their specific location or assignment at an incident scene. Although each apparatus has riding assignments based on seating positions, these assignments frequently change or overlap once on the scene.

The EFD did not designate any accountability officer(s) to monitor the points of entry into the structure. Thus the concept of accountability of personnel location, function, and time was subject to, and did in fact fail. Normally, when operating under an IMS, the IC retains this function if it is not delegated to a subordinate. At this incident, Chief Moran arrived after multiple units were on scene and crews were already working inside the structure. Although he knew which units were on scene, he could not ascertain from Capt. McLoughlin or DC Marion exactly who was operating, where they were deployed, or who needed to be rescued.

Self-Contained Breathing Apparatus (SCBA) Issues

During this incident, the EFD utilized 4500 psi / "30-minute" SCBAs manufactured by SCOTT. It should be noted that 30 minutes refers to the theoretical amount of air supply in the tank, however, this amount can be drastically reduced depending on many factors, any of which can exhaust the air supply much sooner. These factors include amount of physical exertion, an improper facepiece seal, loose valve or hose connections, or activating the air bypass on the facepiece regulator. When asked if he experienced any of these factors, specifically regarding air leaking from his SCBA, FF Sternesky could not recall.

All EFD personnel check their assigned SCBA at the beginning of each shift. FF Sternesky stated during his interview that he verified that the air tank was filled and he recorded the pressure on the log sheet. The log sheet, however, contradicts this statement as the pressure was not indicated; only a check-mark was present, not the air tank pressure. There were also no problems noted on the log sheet, and personnel stated they would frequently top-off their SCBA air tanks as needed following any use.

The SCBA that FF Sternesky was wearing was also equipped with two safety devices, an integrated Personal Alert Safety System (PASS), and a low air pressure alarm. A PASS device is designed to assist rescuers in locating a downed or disoriented firefighter even in dense smoke. 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 distressed firefighter. The low air pressure alarm is a device that will alarm once the air supply of the SCBA reaches approximately ¼ capacity, alerting the FF to begin exiting the structure prior to running out of air. During this incident, the FF Sternesky used an SCBA with "VibraLert" which causes the regulator attached to the face mask to continually vibrate upon having low air pressure.

An interview of FF Sternesky indicated that his low air pressure alarm activated, prompting him to begin exiting the structure. However, after becoming disoriented by the deteriorating conditions, he suddenly ran out of air completely, at which time he issued a "Mayday" over his portable radio. Due to the "Mayday", all personnel were evacuated from the structure.

As previously stated, FF Sternesky's "Mayday" message was very muffled due to having his SCBA facepiece donned. Additionally, there were multiple instances of other radio transmissions from other FFs throughout the incident that were garbled and indiscernible due to having their SCBA facepieces donned. This possibly hindered the effective communication of important fireground information.

Following this incident, the EFD secured FF Sternesky's SCBA for the pending investigation. It was brought back to the EFD Headquarters, where it was cleaned, a new air cylinder was installed, and it was removed from service. The SCBA was then sent to the National Institute for Occupational Safety and Health (NIOSH), where it underwent testing procedures to determine the unit's compliance with regulations found in 42 CFR 84 and NFPA 1981. The full NIOSH testing report for FF Sternesky's SCBA can be found in Appendix 1 at the end of this report.

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. This is accomplished because 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.

At the time of this incident, the EFD had 2 TICs; at least one was initially on scene on T-2. This TIC was located in the front cab of T-2, and was grabbed by Capt. McLoughlin upon arrival on scene. He brought the TIC to the front door of the structure and placed it on the steps for Lt. Ryland to bring it into the structure. However, interviews with Lt. Ryland and other FFs revealed that they did not remember seeing the TIC at the door. All indications were that the TIC never made it into the structure, including during the rescue of FF Sternesky.

"Mayday" Procedures

During this incident, FF Sternesky issued a "Mayday" message upon becoming disoriented and distressed. As previously stated, his message was muffled due to having his SCBA facepiece donned, and he did not give his approximate location in the structure. Although the IC received the "Mayday", he immediately ordered all personnel out of the structure, FF Sternesky again repeated his "Mayday", but no location was given. A garbled transmission of "Where are you?" was heard, but no reply was given. Extensive communications between personnel followed on the fireground frequency, which possibly hampered the transmission of urgent messages between FF Sternesky and the IC.

Firefighter interviews revealed that although the EFD trained in using the "Mayday", this was the first time that it was used for a real emergency. Additionally, it was reported that the scene became very chaotic following the "Mayday". Personnel did not regroup for an accountability roll call, therefore nobody knew who or how many personnel were in distress, nor did they know if rescue operations could immediately commence since they did not know the reason for the order to evacuate.

Rapid Intervention Team (RIT)

In accordance with Incident Management System (IMS) regulations under N.J.A.C. 5:75, which adopts the National Fire Protection Association (NFPA) Standard 1561, fire departments are required to provide at least two firefighters outside of an IDLH atmosphere. These firefighters are tasked with searching for and rescuing lost or trapped firefighters, should the need arise. It is recommended that this concept be taken to a higher level with the establishment of Rapid Intervention Teams (RIT).

Initial operations for this incident 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.*

During this incident, mutual aid fire departments were dispatched upon the request for the 2nd alarm / staff recall. This brought additional personnel and apparatus into the scene for fireground operations. Typically, the EFD would designate mutual aid personnel as the RIT upon their arrival on scene. It should be noted that there was no RIT designated during the initial stages of this incident; during the rescue operations, RIT personnel were utilized for other fireground duties, and the RIT was later reassembled with additional mutual aid personnel.

Communications

This investigation revealed a significant problem with the EFD communications system. The problem is that EFD communications consists of only one dedicated fire department radio frequency, and another secondary frequency that is shared between multiple agencies. This problem was evident in listening to the fireground communications during this incident; as this incident escalated, the dispatch of recall personnel tied up the frequency, possibly cutting-out attempted fireground communications. EFD personnel acknowledge that the communications system is frequently overburdened by radio traffic, and that fireground messages often get cut-out by the dispatch of additional units and/or multiple incidents occurring simultaneously.

There was an inter-agency communication problem with EMS noted during the rescue operations. EMS personnel did not report to the command post to check-in with the IC, therefore it was believed that they were not on scene. Typically, under the concept of Unified Command, a representative from each agency involved with an incident will contact and/or stand-by at the Command Post (CP) for orders from the IC. Although EMS was actually on scene, since they did not report to the CP, they were not in position to immediately tend to FF Sternesky upon his removal from the structure.

Critical Incident Stress Debriefing (CISD) Team Use

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. The teams are made up of specially trained fire, police and EMS personnel, along with mental health professionals who provide training and guidance to the team members and assist at the debriefing sessions. The assistance provided by the CISD Team helps to sensitize the firefighters to the possibility of stress reactions, hopefully avoiding future stress related problems. It allows the members to understand the range of normal reactions and provides a method to deal with the incident and its after-effects. CISD Teams are regionalized in New Jersey and are part of a statewide network.

Following the rescue of FF Sternesky, and upon the arrival of mutual aid companies, the IC pulled all EFD personnel from the scene to regroup. He requested a CISD team to respond to their headquarters to be available for any FFs who needed assistance. Shortly thereafter, all EFD personnel were sent back to headquarters to meet with the CISD team.

Public Employees Occupational Safety & Health (PEOSH) Inspections

Following this incident, an investigation was performed by the NJ Department of Labor (DOL) PEOSH Unit. Various issues were found to be non-compliant with adopted regulations; additional information regarding these issues can be obtained from the NJ Department of Labor.

LESSONS LEARNED

Staffing Levels

A factor which contributed to the outcome was the lack of adequate staffing. Some members operated by themselves without benefit of a partner at all times. This practice goes against all accepted protocols and should not occur. However, members of this department have been working understaffed for such a long time, it has become common practice. Firefighters reported that if they did not operate in this manner, they would not be able to do any type of operations at all. While their dedication to duty is admirable, the risks they assume are unacceptable.

Municipal officials, fire departments and IC's must remember that when determining staffing levels, it has been demonstrated that when staffing levels fall below four firefighters per company, critical fireground operations are not carried out when needed. 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. Similarly, the National Fire Protection Association (NFPA) in its Standard 1710; Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments notes that engine companies and ladder truck companies each "shall be staffed with a minimum of four on-duty personnel."

Municipal officials need to understand that as the recognized employers of the department, they are legally responsible for inadequacies of a fire department. Elected officials can be cited for violations of laws and regulations and held liable in civil suits arising from departmental actions including those caused by inadequate staffing. Public officials need to adequately staff the fire department in order to assure fireground operations are conducted in a safer, more effecient and effective manner.

Firefighter Survival Techniques

Since fire incidents are dynamic events and can change drastically at any given time, it is imperative that firefighters be prepared for dire situations should they occur. No matter how cautious FFs are, conditions can deteriorate rapidly and they can become lost or trapped. With this in mind, fire departments need to train firefighters to deal with situations such as these. 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 personal emergencies calmly in order to make reasoned decisions. Many times panic takes over and firefighters do things such as removing their masks that hastens their death. It is difficult to simulate a training scenario where a firefighter actually feels his/her life is threatened but creative, realistic and safe training exercises can be developed to help prepare firefighters for dire situations.

Crew Integrity

The concept of crew integrity is paramount to ensuring the safety of FFs and helps to prevent freelancing. Simply stated, firefighters are paired in teams that enter the hazardous area together, perform their assigned task together and exit together. As a team, they formulate tactics that will most efficiently and safely accomplish what is to be done. Through continual training, the concept of crew integrity will become second nature and firefighters will understand that working as an individual is neither desirable nor tolerated.

Fire departments must take all possible measures to maintain crew integrity to prevent freelancing on the incident scene. Company officers and training officers should work within the context of ongoing training programs to create a culture in the department's ranks that freelancing is never acceptable or tolerated. Company officers and safety officers on incident scenes need to be constantly vigilant with respect to crew integrity and immediately intervene if they see that freelancing is occurring.

Personal Accountability System

Regulations for the NJ 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, and the second tag is given to a designated accountability officer prior to entering the IDLH. This system includes the use of Personal Accountability Reports (PARs) / roll calls, all within the framework of the IMS that is required to be utilized at all incidents.

The NJPAS is more than simply handing tags to the designated officer. It is also a system that requires communication between crews working inside the structure or hazardous area and company officers and the IC. Interior crews must continually apprise their company officers regarding conditions, location, and what they are doing. 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, therefore lessening the chance of firefighters freelancing.

Self-Contained Breathing Apparatus (SCBA) Issues

As previously stated, the air supply of an SCBA can be drastically reduced depending on many factors, including physical exertion, which will exhaust the air supply much sooner. In fact, the Philadelphia Fire Department conducted extensive testing in a firefighting skills proficiency course with FFs using SCBA. For the 750 FFs tested, the average air consumption for a SCBA rated for 30 minutes was less than 15 minutes from full tank to low air pressure alarm.

Again, the low air pressure alarm is designed to activate when the air supply reaches approximately ¼ capacity. However, FFs should not rely solely on this alarm to alert them to exit the hazardous area, as all mechanical devices are subject to failure. Even with proper SCBA maintenance, FFs must periodically monitor their SCBA air pressure gauge during operations. Also, during routine checks, the SCBA air pressures should be logged to track any possible problems with air leaks.

PASS devices can save lives, however they must be provided by the employer, used, and maintained in accordance with PEOSH regulations under N.J.A.C. 12:100-10 et seq. Although newer technology automatically activates an integrated PASS device upon turning-on an SCBA, many departments still rely on PASS devices that must be activated manually. Although these devices are acceptable by NFPA standards, the burden is on the firefighter to remember to activate the PASS device. As is the case with anything else, adding the human factor into the equation increases the chance for error.

Current technology can assist with the communication difficulties typically encountered by FFs that have their SCBA facepiece donned. All SCBA manufacturers now offer voice amplification modules that are integrated on the facepiece to allow for normal-voice communication. This greatly increases the effectiveness of fireground communications by virtually eliminating the muffling and garbling that was commonplace. It is strongly recommended that all FDs consider upgrading their SCBAs with these devices for the safety of their personnel.

As previously stated, the EFD failed to preserve FF Sternesky's SCBA in the same condition that it was last utilized. It is essential that fire departments preserve any equipment involved in firefighter injuries or fatalities so that a complete investigation of said equipment can be performed at a later date. This preservation should occur immediately following the incident, without cleaning or changing any components, such to minimize the possibility of altering the conditions that may have contributed to the possible equipment failure.

During NIOSH testing of FF Sternesky's SCBA, the unit was subjected to 7 performance tests. The unit passed all but one of the tests; the low-air vibrating

alarm was found to activate at a slightly higher pressure than considered acceptable, resulting in a “failure” (the alarm activated earlier than expected).

The full NIOSH testing report for FF Sternesky’s SCBA can be found in Appendix 1 at the end of this report.

Thermal Imaging Cameras (TICs)

Fire departments that possess TICs should routinely employ them during structural firefighting operations, as well as search and rescue operations. While TICs do not replace time-honored skills, they serve as an important tool to make searches for victims more efficient and result in a higher level of safety for firefighters. Just as firefighters outfit themselves with a set of irons and flashlight, they must equip themselves with a TIC every time they enter a situation where visibility is reduced.

The TIC must be an integral part of rescue operations for lost or trapped firefighters from the inception of the rescue, as it can help speed a RIT to the firefighter saving precious time in locating and removing the victim(s). Fire departments must continually train utilizing their TIC so that all firefighters become proficient in its use.

“Mayday” Procedures

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 their best guess of their location. For this reason, every interior crew should be equipped with a portable radio equipped with a sufficient number of operational frequencies as well as a dedicated command frequency. Utilizing their radio, they need to notify the incident commander of their situation using a pre-determined emergency term such as “Mayday”, and giving their name, location, and nature of the problem. Additionally, FFs need to immediately activate their PASS devices manually so as to help rescue crews locate them quickly, and all non-essential radio transmissions should cease so that the IC or rescue personnel can communicate with the distressed FF(s).

The NJ Division of Fire Safety has proposed regulations pending approval for standardizing “Mayday” and evacuation procedures. These regulations will be added to the current IMS regulations under N.J.A.C. 5:75.

Rapid Intervention Team (RIT)

Incident Management System (IMS) regulations under N.J.A.C. 5:75, which adopts the National Fire Protection Association (NFPA) Standard 1561, require

fire departments to provide at least two firefighters outside of an atmosphere that is immediately dangerous to life and health (IDLH). These FFs are tasked with searching for and rescuing lost or trapped FFs, should the need arise. It is recommended that this concept be taken to a higher level with the establishment of dedicated Rapid Intervention Team (RIT).

These teams should be specially trained and equipped to deal with rescue of FFs under the worst possible conditions. The teams can be composed of departmental personnel or mutual aid personnel. It is important for the IC to request a RIT 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 automatically upon receipt of a report of a working fire.

If this concept is adopted by the fire department, it is crucial that the members of the RIT obtain all necessary training and equipment. Once on scene, team members should not be utilized for any other tasks. Other FD members need to be well versed in the duties, responsibilities and operations of the RIT.

Communications

The aforementioned IMS regulations state that a communications system should meet the demands of the fire department for both routine and large-scale emergencies. The regulations further state that larger fire departments *shall* require several additional radio channels (in addition to the main dispatch channel) to provide for the volume of communications associated with multiple alarm situations that can be common in larger municipalities. The communications system should be compatible with typical mutual aid departments, and should provide reserve capacity for unusually complex situations.

It is strongly recommended that the EFD communications system be upgraded to provide a reliable means for their personnel to operate during emergency incidents, as the radio is often the only link between personnel operating inside and outside of a hazardous area or situation.

While operating at scenes that require the response of outside agencies and/or departments, the concept of Unified Command must be utilized. Under this concept, a representative from each agency involved with an incident will contact and/or stand-by at the Command Post (CP) for orders from the IC. These representatives will exchange pertinent information with the IC to reduce the chance of freelancing and increase accountability of personnel on the scene.

Emergency Care of Firefighters

The NJ Department of Health and Senior Services (NJ DOH) has issued a guide book, "Emergency Management Considerations for Firefighters" (also known as the "Pink Book") to the emergency departments of all hospitals in the State. This book covers the proper medical procedures and considerations for treating and/or stabilizing various firefighter injuries. It should be noted that the NJ DOH is currently updating the "Pink Book", and changing the title to "Guidelines for the Emergency Care of Firefighters". All FDs should check their local hospitals to ensure that emergency room staff do possess and are familiar with this guide book.

In accordance with American Burn Association recommended guidelines, and in keeping with the policies of The Burn Center at Saint Barnabas, a certified burn treatment facility for care and transport of burn patients, all individuals meeting the following criteria should be referred to the nearest certified burn center:

- *All Partial thickness (2nd degree) burns ≥10% TBSA*
- *All Full thickness (3rd 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 directly at (973) 322-5920, or the NJ DOH at (609) 984-1863

Critical Incident Stress Debriefing (CISD)

The use of a CISD Team in situations such as this 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.

The Division of Fire Safety recommends the notification and use of CISD teams when the 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*

Currently, there are many CISD teams throughout the state, most of which are made up of other public safety individuals. These teams will respond on a 24-hour basis whenever requested. 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

CONCLUSION

The injuries to FF Sternesky were found to be the result of two significant factors. These included the rapid depletion of FF Sternesky's air supply, and inadequate staffing to perform vital fireground operations. This staffing issue can be directly attributed as the cause of several other aspects of this incident including the lack of crew integrity, the practice of individuals performing tasks alone, rather than in pairs at the least; and the inability to assemble an interim rapid intervention team utilizing personnel from the initial response.

Other factors such as the limited use of thermal imaging cameras, poor radio communications, unfamiliarity with emergency procedures and/or panic that prevented the effective utilization of those procedures. The lack of an adequate personnel accountability system also influenced the outcome of this incident.

It is the NJ Division of Fire Safety's sincere hope that the lessons learned from this and other similar incidents will serve to educate elected officials and the fire service and inspire them to take all necessary measures to reduce firefighter injuries and deaths to the greatest extent possible.

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NIOSH – Status Investigation Report of One Self-contained Breathing Apparatus Task No. 13458 – February 4, 2005

APPENDIX 1

Status Investigation Report of One
Self-Contained Breathing Apparatus
Submitted by the
New Jersey Division of Fire Safety
Trenton, New Jersey
NIOSH Task No. 13458