

NEW JERSEY DIVISION OF FIRE SAFETY

OFFICE OF THE STATE FIRE MARSHAL

Analysis of Fire Department Emergency Operations During Two Responses to the Same Residence

**Teaneck, New Jersey
March 21 and 22, 2005**

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STATE OF NEW JERSEY
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INTRODUCTION

The purpose of this investigation is to report the actions taken by the members of the Teaneck Fire Department during two responses to the same residence. During the second response, four children were killed. The origin and cause investigation for this incident was conducted by the Bergen County Prosecutor's Office Arson Squad. It should be noted that the NJ Division of Fire Safety did not have the jurisdiction to investigate the origin and cause of this fire and as such, did not conduct such an investigation.

The investigation of these incidents was conducted by the New Jersey Division of Fire Safety's Office of the State Fire Marshal at the request of the Teaneck Fire Department and the Township of Teaneck. This investigation was conducted independently of any other investigation performed by local officials. The Teaneck Fire Department, under the command of Chief John Bauer, and the Bergen County Prosecutor's Office Arson Squad, under the command of Sgt. William Stallone, provided their full cooperation.

EXECUTIVE SUMMARY

On March 21, 2005 at 8:44 p.m., the Teaneck Fire Department (TFD) responded to a report of a loud explosion and smoke in the house at 501 Rutland Avenue. Upon arrival, responding firefighters were guided into the basement to investigate a problem with the boiler; however they could not find an odor or smoke. The firefighters, who combined have more than 100 years of experience, began investigating the area. They found that the emergency switch of the boiler had been shut off and later learned that the mother living in the home had turned it off.

The basement of the home was sectioned off to provide for various uses of the area. There was a large portion that was used for a recreation/family room, an area that contained two beds that were usually used by the house keeper and one of the children, and two small rooms; one containing the oil fired boiler, the other utilized as a laundry room.

After investigating the basement area, the responding firefighters determined that a "blowback" of the oil burner had caused the reported explosion and smoke. "Blowback" occurs when an accumulation of vaporized fuel oil in the combustion chamber suddenly ignites due to a delayed ignition. This causes too much pressure, which results in a loud bang and the release of smoke.

The firefighters found multiple problems with the boiler, including closed water valves, a low water level, a non-functional low-water cut-off and a dirty flue pipe. Fire personnel made the necessary adjustments to restore the boiler to a safe and operable condition and advised the owner of the problems that were found. The owner was also directed to have the boiler serviced as soon as possible.

TFD units then cleared the scene.

Five hours later, on March 22, 2005 at 1:43 a.m., the TFD was called back to the residence for a reported structure fire. While en route to the incident, TFD units were advised that police were already on scene and had reported a working basement fire with entrapment. When TFD units arrived on scene at 1:46 a.m., they observed smoke coming out of the home's windows and police officers using a neighbors' ladder to rescue a woman through a small window from the porch roof. Neighbors had already rescued two children from the same window before any emergency responders had arrived on scene.

TFD units began immediate rescue and fire suppression operations, with crews operating inside and outside the structure. A crew entered the basement with a hoseline for fire suppression while additional crews began interior rescue operations on the second floor. The crews had difficulty conducting exterior

rescue operations because of small window sizes and obstructions, such as window air conditioning units. With the woman now rescued from the window, interior crews located and removed two children from the second floor master bathroom. At that point, multiple firefighters began running low on air, which required them to immediately exit the structure to replace air tanks prior to resuming operations.

With the fire now extending inside the hidden wall spaces toward the upper floors, crews placed additional hoselines and ground ladders into service. Soon after, additional firefighters located and removed two more children from a second floor bedroom. All four of the children that were pulled from the structure were unable to be revived and died of their injuries.

The Bergen County Prosecutor's Arson Task Force determined the fire to be accidental in nature and had started in the basement. They determined the fire originated in the area of a refrigerator/freezer appliance that had overheated. The refrigerator was located in the basement of the structure, remote from the boiler, which was suspected as the cause of the first incident.

Key points identified during the Division of Fire Safety's investigation include:

- The Teaneck Fire Department conducted a diligent investigation in order to find the cause of the first incident.
- The Bergen County Prosecutor's Arson Task Force determined the second incident to be accidental in nature and had started in the basement.
- The Bergen County Prosecutor's Arson Task Force determined the fire originated in the area of a refrigerator/freezer appliance that had overheated.
- The refrigerator was located in the basement of the structure, remote from the boiler, which was suspected as the cause of the first incident.
- It is unknown if the condition that caused the second incident was present during the first incident, or if two separate problems occurred within hours of each other.
- The lack of an adequate number of operational and/or properly placed smoke detectors in the home did not allow early warning to the occupants providing time for escape.
- Firefighters had difficulty gaining access to victims and ensuing extrication efforts due to the small window openings in the home and encumbrances to access points.

- The fire spread rapidly to the upper portions of the residence due to construction features allowing for unimpeded fire extension inside the void spaces of walls.
- The quick action of neighbors contributed significantly to the successful rescue of two children prior to the arrival of emergency responders.

INVESTIGATION

During the course of this investigation, dispatch transcripts were obtained from two sources, the Teaneck Fire Department and the Teaneck Police Department. Each agency performs dispatching for their own personnel at their own facilities. The times contained in each transcript were recorded by the Dictaphone systems at each facility. However, the times given over-the-air by the police dispatcher differed from the recorded times by four minutes and the times given over-the-air by the fire dispatcher differed from the recorded times by two minutes. Since no baseline time gauge could be obtained from each facility, it is unknown to what extent the dispatch times truly differed between agencies. This report reflects the times as given over-the-air by each agency to their own personnel, and should only be viewed as approximations.

To provide for uniform identification of locations and operational forces in a scene, the incident scene is divided geographically into smaller parts that 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."*

Incident # 1 – March 21, 2005

On March 21, 2005 at 8:44 p.m., the Teaneck Fire Department (TFD) responded to a report of a loud explosion and smoke in the house at 501 Rutland Avenue. Initial response for the TFD consisted of Engines E-1 and E-4, Ladder L-1, Rescue R-1, and Deputy Chief (DC) Joseph Palazzola. E-4 arrived on the scene at 8:47 p.m., reporting that everyone was out of the structure and they would investigate. DC Palazzola arrived immediately thereafter, assuming Incident Command (IC).

The crew of E-4 met with the entire family, which consisted of an adult female occupant, her six children and the housekeeper. The housekeeper stated that the problem was in the basement. As the crew of E-4 entered the front door of the structure, they noted that no odor or smoke was present and continued into the basement. DC Palazzola went to the Division B door, meeting with the E-4 crew at the stairs to the basement. Once in the basement, again the crew found no odor or smoke. Taking into consideration the information they had received upon dispatch and the description of the events as related by the occupants of the home, firefighters suspected a "blowback," or delayed ignition of the oil burner.

At 8:49 p.m., E-1, L-1, and R-1 arrived on the scene. DC Palazzola determined they E-1 and R-1 were not needed and released them from the scene.



Figure 1 – The home at 501 Rutland Avenue.

Lt. Sean Mackey of L-1 and his crew proceeded into the basement with a thermal imaging camera (TIC) to assist with the investigation. Lt. Mackey is an experienced plumber with over 20 years of experience working for a licensed plumbing contractor. On the way to the basement, a member of L-1 noticed that the emergency shut-off switch for the boiler was turned “off.” However, the investigation revealed that the boiler was still warm as if it had been running.

The mother later stated that she had turned off the switch, stating she believed there was a problem with the boiler. Crew members proceeded to visually check all other areas and appliances in the basement, but found no problems. The TIC, although turned “on,” was not used at any point of this operation due to their determination that the boiler was the most likely source of the problem.

During Lt. Mackey’s check of the boiler, multiple problems were noted. The water level valves were closed and when opened, the water level was too low. The low-water cut-off was found to be inoperable, and the flue damper was dirty. The inside of the fire-box appeared to be okay, but the outside of the boiler around the fire-box was scorched, which is typically a sign of a blowback. Once

Lt. Mackey had made the necessary adjustments to the boiler, the switch was turned “on” and the boiler appeared to operate properly.

DC Palazzola cleared the scene at 8:53 p.m., transferring IC to Lt. Richard Paratore of E-4, advising the mother that Lt. Paratore would let her know their findings. Lt. Paratore then advised her of their findings, recommending that a service technician check the boiler, and telling her to call the fire department again if she noticed any other smoke or odor. The mother agreed with the findings of the TFD personnel, as she stated that the boiler had been serviced multiple times in the recent past to correct problems.

L-1 cleared the scene at 9:01 p.m., followed by E-4 at 9:03 p.m.

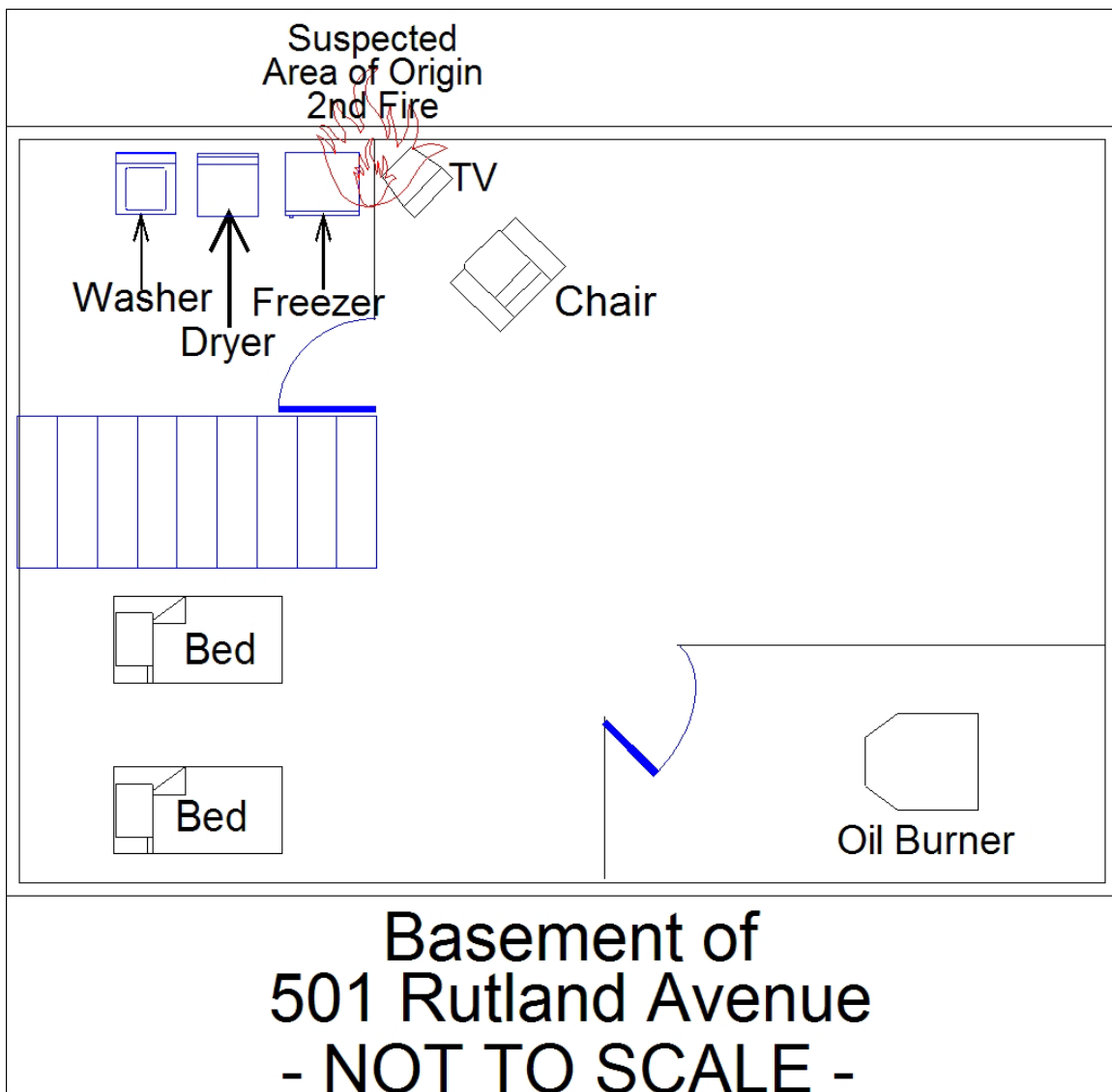


Figure 2

Incident # 2 – March 22, 2005

Five hours later, on March 22, 2005 at 1:40 a.m., the Teaneck Police Department (TPD) was dispatched to a reported house fire at 501 Rutland Avenue. At 1:43 a.m., the TFD was also dispatched to the fire. Initial response for the TFD consisted of Engines E-1 and E-4, Ladder L-1, Rescue R-1, and DC Palazzola.

Neighbors stated during interviews that prior to the arrival of police and firefighters, they placed a ladder to the front porch roof and had already removed two children from the second floor bathroom window on the Division A side of the house. They were in the process of going back up the ladder to attempt additional rescues. Police were first to arrive on scene, encountering the housekeeper in the front yard, who stated that there were still four children trapped inside. Two of the children had already exited. Police officers ascended the ladder in an attempt to rescue a woman who was now visible in the second floor bathroom window, but was wedged inside the window frame unable to move in or out.



Figure 3 – An inside view of the second floor bathroom window where two children and their mother were removed from the home.



Figure 4 - An exterior view of the same second floor bathroom window where two children and their mother were removed from the home.

Upon arrival at 1:46 a.m., E-4 encountered heavy smoke coming from the structure and saw police officers descending the neighbor's ladder due to the deteriorating conditions. The TPD reported that the fire was in the basement. DC Palazzola arrived on location at 1:47 a.m. and assumed IC. Firefighters from E-4 then ascended the neighbor's ladder in an attempt to remove the woman, while the E-4 operator placed a "roof ladder" alongside the neighbor's ladder. Police officers proceeded back up the ladder, standing-by as firefighters used tools to remove the window frame that had trapped the woman. As the firefighters tried to free the woman, she reported that there were still multiple

children inside the structure. After freeing the woman, both the TFD and TPD assisted her down the ladder to the front yard, where she was tended to by emergency medical service (EMS) personnel. Following this, the firefighters went back up the ladder to the roof and tried to make entry through a window on the Division A side near the A/D corner. However, this window was obstructed by an air conditioning unit, which needed to be completely removed and delayed their ability for a rapid entry. Once the window was accessible, two of the personnel entered the window into a bedroom to search for victims.

While these actions were occurring, firefighters forced entry into the structure and deployed a 1-3/4" hoseline to the basement for fire suppression. Other firefighters proceeded to the second floor with a Thermal Imaging Camera (TIC) to assist with interior rescue operations. All other available personnel were deployed to assist with search and rescue operations. After searching the second floor, firefighters located two children on the floor of the master bathroom, the same bathroom from which the mother was rescued. Both children were removed from the structure via the interior stairs.

After knocking down the fire in the basement, personnel called for a TIC to be brought into the basement to perform a search, as they recalled two beds being in the basement during the prior incident. Firefighters found no victims but did find that the fire had traveled into the hidden spaces of the walls, and was extending to the upper floors of the structure, eventually breaking-out on both the first and second floors.

Firefighters had now located two other children in a second floor bedroom. These children were also removed from the structure via the interior stairway. Although earlier reports indicated four children were trapped and were now removed from the structure, personnel continued thoroughly searching all areas of the structure, including a walk-up attic space that contained a bedroom. With no additional victims located, the fire was brought under control shortly thereafter.

The Bergen County Prosecutor's Arson Task Force determined the fire to be accidental in nature and had started in the basement. They determined the fire was caused inside the area by the refrigerator/freezer appliance that had overheated. The refrigerator was located in the basement of the structure, remote from the boiler, which was suspected as the cause of the first incident.

The Casualty Scenario

The fire resulted in the deaths of four children, 4 to 15 years of age, and severe injuries to their mother, 42 years of age. The mother was rescued from the second floor bathroom window and suffered severe respiratory injuries. The two children who were located in the same bathroom died of their injuries. The two

other children who died on the scene were located in the second floor bedroom at the Division B/C side.

The two children who were rescued by the neighbors were 7 and 12 years old. They survived the incident uninjured, along with the 37 year-old housekeeper.

FINDINGS

Utilizing Thermal Imaging Cameras to Investigate Unknown Incidents

Fire departments in New Jersey have a unique benefit in that all were supplied with one or more thermal imaging cameras (TIC) by the state. The Teaneck Fire Department was the recipient of several cameras.

The dispatch information received by the TFD indicated that there was an explosion resulting in a smoke condition in the home at 501 Rutland Avenue. It was for this reason that the first arriving crew brought a TIC into the structure. Upon entry however, all crew members reported there was no smoke or odor of smoke in the residence. They reported that conditions in the home were completely normal. It was for these reasons that the crew members stated they did not employ the use of the TIC. Rather, they opted to investigate the area utilizing their senses of sight, smell and hearing, which are typically well honed in experienced firefighters.

Taking into consideration the information they had received upon dispatch and the description of the events as related by the occupants of the home, firefighters suspected a “blowback,” or delayed ignition of the oil burner. This occurs when atomized oil is delivered to the combustion chamber but is not immediately ignited. When it finally ignites, an explosion in the combustion chamber takes place. An explosive sound or “thud” accompanied by a puff of smoke may occur. The blast can also knock the flue pipe down allowing smoke to enter the area. If the flue pipe is not blown down, most of the smoke is channeled up and out of the chimney but a small puff of smoke may still be visible and emit a faint odor, as was the case in this instance. In this situation, the smoke created by the blowback would have dissipated prior to the arrival of the fire department.

In order to understand conditions where a TIC would be a useful tool, it is important to understand how TICs work.

Thermal energy is not visible to the human eye. A TIC is a device that translates thermal energy (heat) into an electrical picture on a television-like screen. The TIC can detect differences in temperatures of objects as little as 0.5 degrees centigrade. Hot things appear white, hotter objects appear brighter white, and colder items appear black to gray. However, there are limitations as to what TICs can “see.” Thermal energy does not travel directly through walls or insulated objects.

DFS investigators did not conduct an origin and cause investigation of this incident because they were not requested to do so and is out of the Division’s jurisdiction. An investigation and examination of the home was not able to be conducted by DFS personnel until several months after the fire.

The Bergen County Prosecutor's Arson Task Force determined the fire to be accidental in nature and had started in the basement. They determined the fire was caused inside the area by the refrigerator/freezer appliance that had overheated. The refrigerator was located in the basement of the structure, remote from the boiler, which was suspected as the cause of the first incident.

As previously explained in this section and specifically relating to the inability of TICs to "see" through insulated objects, the TIC would not have been an effective tool in locating this overheated fan motor, if it was in fact overheating at the time of the first incident. This is due to the heavy insulation that surrounds the unit. Additionally, the TIC would show the normal heat that is given-off by a properly operating electrical appliance such, would not indicate a problem.



Figure 5 – An image of a normally operating electrical device, in this case a laptop computer, as viewed by a thermal imaging camera. This illustrates how even normally functioning equipment emits heat energy that is observed by a thermal imaging camera. Note the warmer areas are represented by whiter shades indicating warmer temperatures. Cooler areas are represented by darker shades.

In the course of this investigation, DFS performed informal testing of common household appliances with respect to their standard operating heat signatures. This testing was performed using an identical TIC to that utilized by the TFD, and included the testing of a refrigerator/freezer, a television, a VCR unit and clock radio. The TIC detected that these appliances all give-off heat when operating normally. Specifically, while observing the refrigerator with the TIC, the insulation encasing the unit prevented the TIC from discerning a heat signature from the unit except from those components that were not insulated such as the compressor, the

compressor motor and the coils containing the refrigerant. The fan motor inside the unit was not able to be seen.

Firefighters stated during interviews that they were confident in their investigation of the first incident. They advised the mother of their findings and the corrective actions that needed to be taken, and to contact the TFD again if a subsequent problem arose. The mother concurred with these findings and further stated that on at least three occasions a service technician had worked on the boiler to correct problems.

Conditions Hampering Rescue Efforts of the Fire Department

The house located at 501 Rutland Avenue was constructed in the 1930s and was designed and built in a manner that was customary at the time. Whereas newer homes are constructed in accordance with the NJ Uniform Construction Code and must have windows of adequate size to allow both egress of occupants and entry of fully equipped firefighters. This is not always the case in older homes.

The windows in the house generally were steel casement type with center steel partitions. The windows were substantially smaller than what are required in new construction. This made egress and rescue efforts of the occupants much more difficult and time consuming. It was noted that the woman who was rescued from the second floor bathroom window had become wedged and necessitated the forcible removal of the steel window frame to allow her rescue. Additionally, it must be noted that many of the other windows in the home were outfitted with window mounted air conditioning units. Many other windows were partially blocked by large pieces of furniture, such as the bed in the master bedroom that further slowed rescue personnel entering the structure.

It is also important to note that the doors of the bedrooms in the home were equipped with "hook and eye" latches located on the outsides of the doors near the top. It was not possible during the course of this investigation to determine conclusively if these devices were engaged at the time of the fire or whether they hampered the escape of occupants. A makeshift wooden gate was also located at the top of the stairs to the second floor that required firefighters to force their way through.

Small window sizes and obstructed windows are commonly encountered by firefighters, especially in areas with a preponderance of older homes. This is not to say that firefighters are unprepared or ill-equipped to deal with these types of situations, rather it is only to illustrate that even the most competent and best equipped firefighters' rescue efforts can be slowed by such obstacles.

A common theme of fire prevention programs offered by fire departments and state and national fire organizations is the concept of establishing and maintaining multiple exit routes for occupants of dwellings. Occupants are instructed to have at least two ways out of their home in and the event that normal egress ways such as doors may not be usable if they are blocked by fire. For this reason, windows must be considered as alternate escape routes and homeowners are advised to keep windows clear of obstructions as much as possible.

The Critical Role of Smoke Detectors

On the early morning of March 22, 2005 only two working smoke detectors were found. These detectors were located on the first and third floors of the home. Other detectors in the home were found to be missing batteries or had been removed completely prior to this incident.

The NJ Uniform Fire Code requires that all one and two family dwellings be equipped with a minimum of one smoke detector on each level of the home. Therefore, this home would have required at least four detectors. The code does not require routine inspection of smoke detectors by code enforcement officials, but rather only when a new home is constructed or upon resale of an existing home. Records obtained during the course of this investigation revealed that at the time of the sale 501 Rutland Avenue in 1998 to the owners/occupants at the time of the fire, working smoke detectors were present and in compliance with the requirements of the NJ Uniform Fire Code.

Each year in the United States, non-working smoke detectors play a role in many of the thousands of deaths and injuries caused by home fires. In a recent survey, half of the 1,000 respondents questioned mistakenly believed that in the event of a fire, they would be awakened from sleep by the smell of smoke in time to escape. In reality, smoke disorients people, dulls their senses and makes them lose consciousness due to the smoke containing carbon monoxide.

Operating smoke detectors are vital to the early warning of occupants when a fire occurs. Many times, they are the only protection a family has to allow a rapid evacuation before conditions deteriorate to the point where an area is untenable. It is incumbent upon the occupants of a dwelling to ensure that smoke detectors are present and operable by testing regularly and replacing batteries and/or defective units when necessary.

While not a required service offered by fire departments, many departments have enacted policies where firefighters who respond to homes for non-life threatening incidents check to make sure smoke detectors are present and operational. Some go as far as carrying detectors on their fire apparatus and installing them in homes where there are no detectors. At the time of these incidents at 501 Rutland Avenue, the Teaneck Fire Department did not have a similar policy in place.



Figure 6 – This photograph shows the smoke detector that was located in the basement. It shows that the battery was missing at the time of the fire. This is evidenced by the uniform discoloration of the unit caused by the fire.

Since the time of these incidents, the TFD has instituted a policy where if firefighters observe deficiencies with regard to smoke detectors in homes that they have responded to, the Fire Prevention Bureau is contacted and personnel will visit the home. They will inspect smoke detectors and install batteries and/or replace the detectors, free of charge. Additionally, the fire department mailed fire safety brochures to all residents and provides voluntary fire safety inspections if requested to do so.

Construction Type Relating to Fire Spread

The involved structure was constructed of wood framing in what is commonly known as “balloon style.” This is an older style of construction that was quite common in homes built prior to the 1950s. Unlike “platform style” wood frame construction, which is a wood stud framing system in which studs are story height and floors provide some inherent firestopping, balloon style uses continuous studs for the full, multi-story building height and inherent firestopping is not provided between floors. This characteristic allows for fire spread from lower levels in the structure to all areas above the fire floor, often into the attic space. Fire spreading in this manner is usually concealed until it burns through a wall or the roof. Many times firefighters discover a fire in a basement only to discover the fire has traveled to upper levels, especially attic areas. The fire at 501 Rutland Avenue burned in this fashion, spreading from the area of origin in the basement through the Division C wall and ultimately, into the upper floors.

Fires that burn in this manner can develop unnoticed; when the fire finally breaks through to living spaces it is fully developed and capable of producing large quantities of smoke and heat. This is particularly critical when occupants have limited time to escape, which is further reduced because non-operational smoke detectors did not sound any early warnings.

Homeowners can identify balloon style construction in their homes especially in basement and attic areas by being able to see open areas between interior walls and exterior walls. It is possible to install firestopping in these homes and may be pursued by homeowners through local construction contractors.

Maintenance of Equipment

During the first incident response at 501 Rutland Avenue, firefighters found problems with the boiler in the residence and made adjustments in order to correct a low water problem. Heating appliances are complicated and require regular maintenance by qualified personnel.

The Division of Fire Safety recommends that service be performed at least annually in order for heating equipment to operate safely and at peak efficiency.

Further, the Division recommends that the normal fire department practice for situations involving malfunctioning equipment is to put the equipment out of service and advise the owner to have the unit serviced immediately. Repairs to equipment other than to replace batteries in malfunctioning smoke detectors, should not be undertaken by firefighters. Firefighters should, however, inspect smoke detectors to ensure that they are in working condition.

CONCLUSION

The Teaneck Fire Department (TFD) responded to two separate incidents on the night of March 21, 2005 and the early morning of March 22, 2005. The first incident involved a report of a loud explosion and smoke in the house at 501 Rutland Avenue. Firefighters were unable to find smoke upon arrival and found only problems with the home's boiler.

The second incident brought the fire department back to the residence which was found involved with fire. Four children who lived in the home perished in the fire.

There are several factors that resulted in the deaths of the children in the early morning hours of March 22, 2005.

This investigation did not find any indication that the Teaneck Fire Department conducted anything short of a diligent investigation in order to find the cause of the first incident. Lacking evidence of smoke or the odor of smoke when they arrived, six highly experienced firefighters worked to find a problem that did not readily present itself. They examined all areas of the basement before turning their attention to the oil burner, based on the information they had received and the physical evidence of soot on the unit.

Division of Fire Safety investigators were unable to determine during the course of this investigation if the condition that was the cause of the second incident was present during the first incident or if it was merely a tragic coincidence that two separate problems occurred within hours of each other.

Significant issues that contributed to the outcome of these incidents were discovered as a result of this investigation. A major issue was the lack of an adequate number of operational and/or properly placed smoke detectors. A working smoke detector in the area of the fire origin could have provided early warning to the occupants allowing precious time for escape.

Other factors included the difficulties experienced by firefighters in gaining access to victims and ensuing extrication efforts due to small window openings, encumbrances to access points and the rapid spread of fire to the upper portions of residence due to unimpeded fire travel inside the void spaces of walls.

It should also be noted that the quick action of neighbors contributed significantly to the successful rescue of two children prior to the arrival of emergency responders. Those who participated in assisting with these rescues did so without regard for their own safety and are to be commended for their actions.

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