

TEXAS STATE FIRE MARSHAL'S OFFICE

Firefighter Fatality Investigation



Investigation Number FY 11-07

Lt. Todd Krodle

Dallas Fire-Rescue
August 14, 2011

Texas Department of Insurance
Austin, Texas

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- City of Dallas Fire Department
- Parkland Memorial Hospital
- Dallas County Medical Examiner's Office
- City of San Antonio Fire Department
- Texas Commission on Fire Protection
- National Institute for Occupational Safety and Health

Executive Summary

On August 14, 2011, City of Dallas Fire Rescue Ladder 26 Lt. Todd Krodle was fatally injured during firefighting operations at a two-story apartment fire. At approximately 4:11 PM, Dallas Fire Rescue Dispatch received a call from a resident for a fire at the Ridgecrest Terrace Apartment complex located at 5056 Plum Grove Lane, inside the city limits of Dallas, Texas.

The building is a wood frame, multi-unit apartment building approximately 237 feet in length, and 50 feet wide, containing a total of 24 living units with identical floor plans. The exterior consisted primarily of a non-load bearing brick veneer and partial wood siding, with a composition shingle roof, constructed on a concrete slab foundation with fire walls separating units at intervals.

Lt. Krodle responded to the scene on Ladder 26 from Station 26, approximately 4 miles from the scene arriving to the north side of the building. Lt. Todd Krodle and his driver were assigned ventilation operations and laddered the East side of the building. Carrying a chainsaw, Lt. Krodle was first on the roof. The driver of Ladder 26 followed carrying an axe. As Lt. Krodle approached the peak of the roof it gave way and he fell into the attic space. Lt. Krodle was trapped inside the attic space for several minutes before he was rescued. Lt. Krodle was transported to Parkland Memorial Hospital where he died from the injuries. The intent of this report is to honor Lt. Krodle by taking the lessons learned from this incident so others may not perish.

Lt. Krodle was a 17-year veteran with Dallas Fire-Rescue.



Introduction

On Sunday, August 14, 2011, the Texas State Fire Marshal's Office (SFMO) was notified of the fatality of a member of the Dallas Fire Rescue Department (DFD) resulting from injuries sustained from a fall through the roof while fighting an apartment fire in the city limits of Dallas, Texas.

The State Fire Marshal's Office (SFMO) commenced the firefighter fatality investigation under the authority of Texas Government Code Section 417.0075. *(b) If a firefighter dies in the line of duty or if the firefighter's death occurs in connection with an on-duty incident in this state, the state fire marshal shall investigate the circumstances surrounding the death of the firefighter, including any factors that may have contributed to the death of the firefighter. (c) The state fire marshal shall coordinate the investigative efforts of local government officials and may enlist established fire service organizations and private entities to assist in the investigation.*

The investigation began on August 15, 2011, with the initial assessment and survey of the involved property including examination of the fire scene and obtaining witness information. SFMO staff at the scene sent periodic updates from to the investigation team members and an action plan of assignments and objectives for the investigation was established. The State Fire Marshal assigned SFMO Chief Investigator Dean Shirley as the Firefighter Fatality Investigation Incident Commander.

SFMO Investigator Clint Williams was assigned as group supervisor for the origin and cause investigation and to coordinate origin and cause investigative efforts of the on-scene personnel. SFMO Inspector Christopher Beasley was assigned as group supervisor for the building structures and systems examination, including gathering historical information and current conditions of the residence.

The Texas State Fire Marshal has agreements with the major metropolitan fire departments in Texas which may be called upon to assist in the evaluation of the fire ground operations and tactics and assist in developing recommendations. The San Antonio Fire Department assigned District Chief Art Villarreal and Assistant Chief Mike Walsh to assist and responded to the scene on August 16, 2011. Chief Villarreal was assigned as the group supervisor for the operations and tactics evaluation.

The Texas Commission on Fire Protection (TCFP) regulates personal protective equipment (PPE) in the state and assisted in the evaluation PPE. TCFP Compliance Officers Robert Manley and Ed Russell were assigned and responded to evaluate the personal protection equipment.

The National Institute for Occupational Safety and Health (NIOSH) Fire Fighter Fatality Investigation and Prevention Program was notified. NIOSH responded to the scene with a team to conduct an independent investigation.

Building Structure and Systems

The State Fire Marshal's Office references the 2009 edition of the National Fire Protection Association, (NFPA) 101, Life Safety Code, as the basis for evaluation of the fire incident building specific to this investigation. The City of Dallas has adopted the 2006 edition of the International Fire Code (IFC) with Dallas amendments, and the 2007 Dallas Fire Code. Where differences may exist among locally adopted codes, ordinances and previously approved conditions, the City of Dallas retains jurisdiction of code enforcement under their adopted codes.

Building History

The fire incident building is located at the Ridgecrest Terrace Apartment complex, 5606 Plum Grove Lane, apartment 103. The property is a multi-family residential complex constructed in 1968 and is approximately 43 years old. Dallas building department records indicate the property failed a certificate of occupancy (CO) inspection on October 13, 2010, which required inspection of building service systems due to a change of ownership. Records cited failure of the CO due to "no access".

According to Dallas Fire Rescue authorities, the complex has a known history of recent fires. The Dallas Fire Marshal's Office conducted code enforcement activity between September 17, 2010, and May 10, 2011, as issued under report SR # 10-00713232.

Violations noted referenced inoperable smoke alarms, required fire extinguisher maintenance, circuit breaker panels with exposed openings and unsecured compressed gas cylinders. Those identified hazards were reported to be corrected on May 10, 2011.

Building Description and Construction Details

The building occupancy is classified as an existing apartment building, and categorized as option-1 protection, with no fire detection and alarm system, or automatic fire sprinkler system present. Building construction is classified as Type V-000 wood frame construction, as defined in *NFPA 220, Standard on Types of Building Construction*.

The building is a two-story wood frame structure approximately 237 feet in length, and 50 feet wide, containing a total of 24 living units with identical floor plans. The exterior consists primarily of a non-load bearing brick veneer and partial wood siding, with a composition shingle roof, constructed on a concrete slab foundation. Means of egress from the second floor is by three open exterior stairways constructed of steel framing, each positioned in a breeze way serving four individual apartment units. The ceiling/floor assembly consists of 2x10 wood joists with a plywood subfloor and ½ inch gypsum wall board applied on the ceiling side.

High-challenge, vertically aligned fire barrier walls, constructed of concrete masonry units, divide the structure at two planes, and extend to the underside of the roof decking. The fire walls create compartments with eight individual living units abutting each fire wall. The fire wall appeared to be constructed of methods and materials meeting a 2-hour fire resistance rating. However, this confirmation was not possible through as-built construction drawings obtained from the Dallas building department. According to the Dallas building department, this construction design feature would allow the structure to be considered as separate buildings between fire wall separations. A fire wall was directly adjacent to the room of origin in apartment 103, which prevented fire from extending into the adjoining apartments on the opposite side of the wall.

Apartment 103, where the fire originated, was not occupied at the time of fire discovery. The apartment is approximately 850 square feet, containing two bedrooms, two bathrooms, a living area and kitchen. Interior finish consists of ½ inch gypsum wall board applied to 2x4 wall studs placed 16 inches on center, with a textured and painted finish. Fuel loading was typical of a residence, containing furnishings, clothing and other ordinary combustibles.

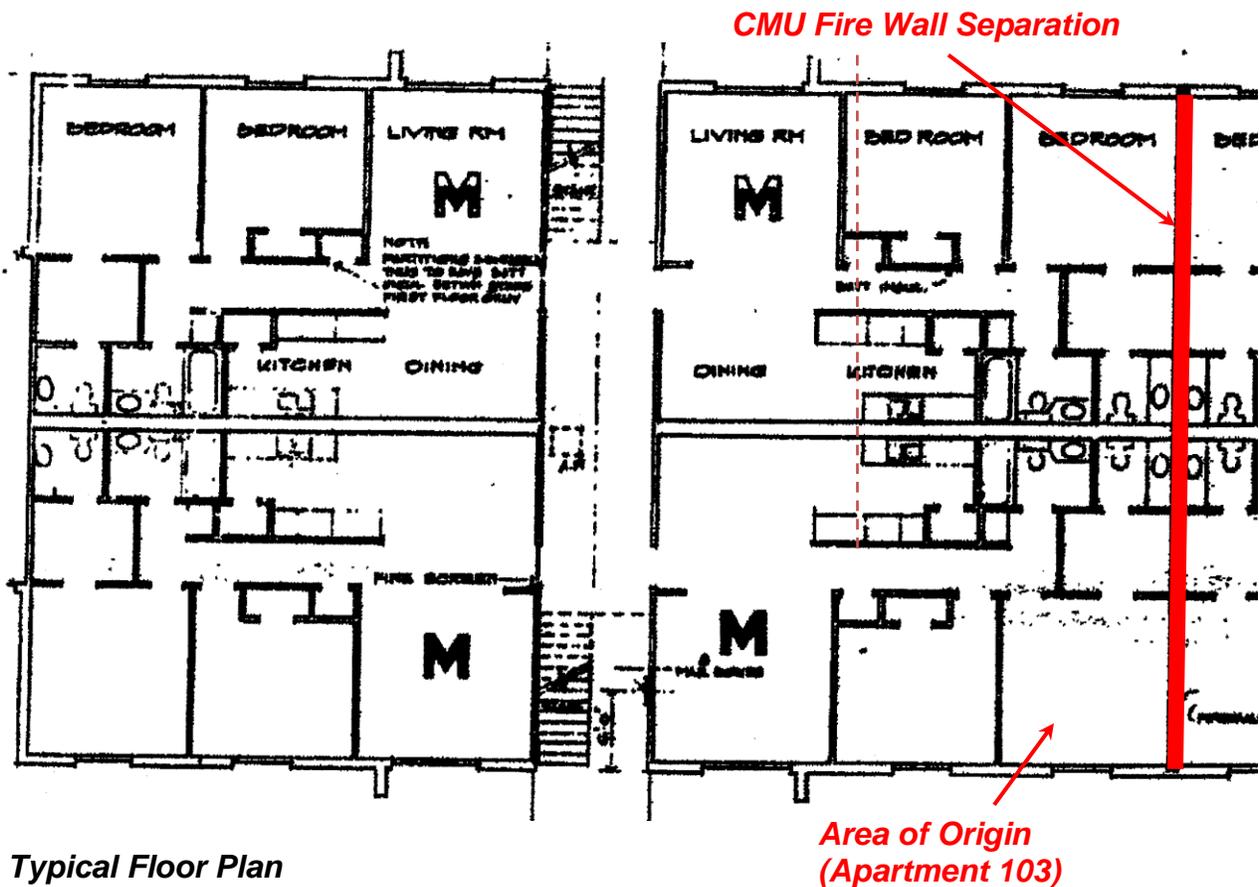


Figure 1

Roof Assembly Details

The building has a gable style roof structure that is contiguous along the entire length of the building. The roof assembly consists of pre-fabricated, engineered trusses; constructed in half-truss segments of 2x4 dimension lumber, spaced 24 inches on center with a 4/12 pitch, spanning the exterior walls. Roof decking consists of 3/8 inch thick plywood. A single layer of three-tab fiberglass impregnated asphalt shingles, with felt paper underlayment applied over the roof decking.

Perforated metal truss plates connect the top and bottom chords and internal web structure of the trusses. The vertical height of the king post member, measured from the apex to the bottom chord of the truss at the ceiling line, was 8'-6" in the fire building (Exhibit A).

Example – Roof Truss Terms

Common Roof Truss

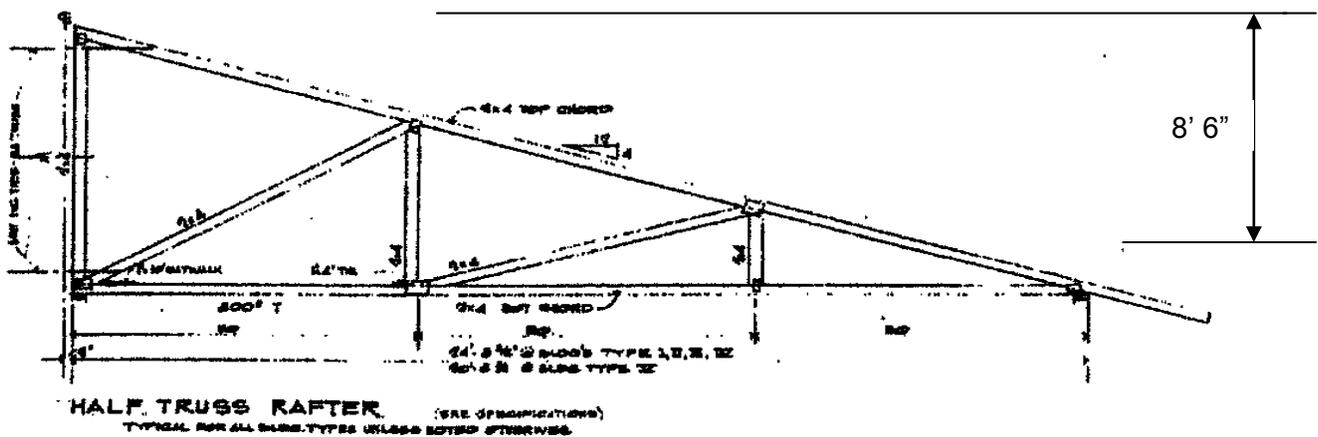
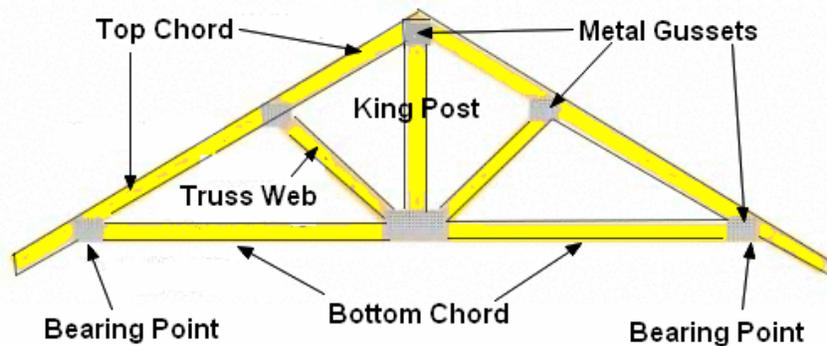


Exhibit A- As-Built Truss Diagram – Fire Building

Figure 2

Insulation of the attic space is with a mineral-wool material blown-in over the ceiling area. Continuous soffit venting was installed along the eave line of the structure. Venting was not present along the ridge line or at the gables to provide outflow of air from the enclosed attic space. The attic contained typical building service components, such as building wiring, chilled-water piping, HVAC duct work, and vent stacks for plumbing and cooking appliances.

Examination of the roof assembly within the attic space revealed deep charring of truss members. The plywood roof decking near the ridge line was burned through in some areas and exposed the felt paper underlayment, leaving only the shingle layer above intact (Exhibits B and C).



Photo 1 - Truss Assembly-Fire Building



Photo 2 - Roof Decking-Fire Building (Photo Courtesy of NIOSH)

Building Service

The building has all-electric service, and is not equipped with natural gas utilities. Electrical service is provided underground to the master panel on the north end of the building, and individual apartment units are provided with a separate breaker panel. The primary conductor for the building electrical system is aluminum wiring.

Building Life Safety Evaluation

Fire protection features for the building are limited to single station, battery operated smoke alarms in the hallways of individual dwelling units. The lack of smoke alarms in the bedrooms fails to meet minimum *NFPA 101, Life Safety Code* requirements.

Two smoke alarms were present in the fire incident apartment. One device was located in the hallway in the vicinity of the bedrooms. Fire conditions destroyed the device, as indicated by marking on the wall where it had been mounted. It was not recovered from the fire scene. A second smoke alarm was located on the end of a partition wall adjacent to the kitchen; it showed signs of severe heat damage. A battery was present, but it could not be determined whether it operated at the time of the fire.

Observation of smoke alarms in adjacent apartment units showed that batteries had been removed from some devices, notably when installed near the kitchen.

Origin and Cause Investigation

The State Fire Marshal's Office origin and cause investigation began on August 15, 2011, and was led by State Fire Marshal's Office (SFMO) Investigator Clint Williams. The Dallas Fire Rescue Fire Investigation Department conducted an investigation of the cause of the fire prior to the arrival of the State Fire Marshal's Office personnel.

On August 15, 2011, Investigator Williams travelled to the scene to assess what resources were needed to conduct a scene examination. Williams found a two-story apartment complex with minimal damage to the East, South, and North sides of the building and fire damage to one lower and one upper apartment unit on the West side. These units were identified as unit #103 and unit #203. Heavily damaged furnishings and debris removed by fire department responders were outside on the west side of the building (Photo 3).



Photo 3 (photo taken August 16, 2011)

During the scene assessment several Dallas Fire Rescue Department members were in the scene where the fire originated and inside the second floor apartment where Lt. Krodle was rescued. Williams requested the scene to be secured. Dallas Fire Rescue constructed fencing around the perimeter restricting further access.

The State Fire Marshal's Office firefighter fatality investigation continued the following day, August 16, 2011, which included the scene examination to determine the origin and cause of the fire. Investigators found indications of the fire travel from the bedroom window of the originating apartment that continued upward in the brick and wood veneer exterior to the eave of the roof and through the vented metal soffit into the attic space (Photo 4).



Photo 4

Investigators continued the scene examination into apartment 103 and found that the most damage occurred in the master bedroom. The master bedroom was bare of all furnishings, carpeting, and

carpet padding. The gypsum ceiling and areas of the interior gypsum walls had been removed, exposing undamaged areas of wood ceiling joists, wall framing, the concrete masonry unit fire wall, and the exterior wood sheathing. Minimally damaged electrical conductors were exposed next to the single window opening (Photo 5).



Photo 5

The examination of the furnishings outside included severely fire damaged king size mattresses, the remains of a nightstand or table, a wood shelf/television unit, and wood corner desk. The remains of a metal box fan and fan motor were located outside. Examination of the metal box fan shroud revealed a hole on the bottom where the stranded electrical cord touched the shroud (Photo 6).



Photo 6

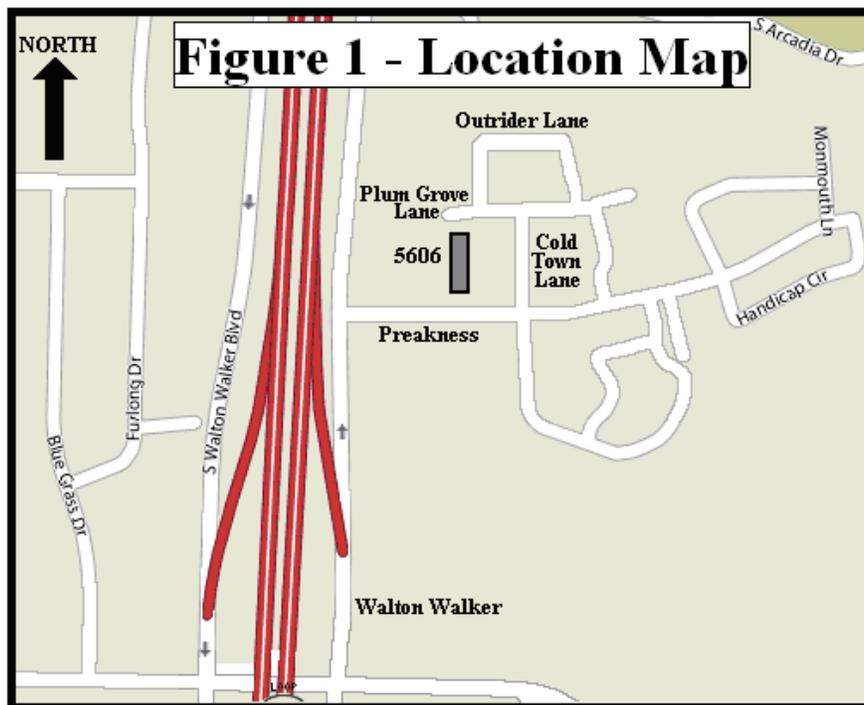
Information from the occupant indicated that the box fan was normally running on a night stand in the SW corner of the room. The box fan was plugged into a receptacle behind the bed approximately four feet from the night stand. The information from the occupant indicated that the power cord for the fan would just reach the outlet and that the bed would help hold the plug in place. Clothing was routinely piled on the floor between the bed and the nightstand at the area of the fan. The area of origin was determined to be the SW corner of the bedroom.

The cause of the fire remains undetermined.

Fire Ground Operations and Tactics

Note: The following sequence of events was developed from radio transmissions and firefighter witness statements. Those events with known times are identified. Events without known times are approximated in the sequence of the events based on firefighter statements regarding their actions and/or observations.

On August 14, 2011, at **16:11:19**, the Dallas Fire Rescue Dispatch received a call from a resident for a fire at the Ridgecrest Terrace Apartment complex. The apartments are located at 5056 Plum Grove Lane in east Dallas, Texas.



At **16:12:17**, Battalion Chief 6 (BC6), Battalion Chief 1 (BC1), Engine 52 (E52), Engine 16 (E16), Engine 26 (E26) and Ladder Truck 26 (L26) were dispatched to the Plum Grove address.

At **16:17:00**, Engine 52 arrived first and reported a “working fire” to Dispatch. Upon receipt of this report, the alarm was upgraded, with the addition of Ladder 15 and Mobile Intensive Care Unit Rescue 15 (R15).

The E52 driver positioned the apparatus on Plum Grove on the Bravo (north) side of the structure and the front 1 ¾” pre-connect cross lay was pulled by the E52 firefighter while the E52 Lieutenant assessed the scene. The Lieutenant reported seeing light to moderate smoke coming from a first floor

apartment window on the Alpha (west) side. A bystander, who said he was the occupant, told the Lieutenant that everyone was out of the apartment. He radioed that E52 was in “quick attack”, meaning offensive mode, and advanced the line into the open door of apartment #103 with the E52 firefighter staffing the nozzle.

At **16:19:18**, Engine 26 reported arriving at the complex. The E26 Engineer Operator (E26 EO) and E26 Firefighter walked to the apartment and assisted E16 advancing a line to the second floor.

At **16:20:33**, E16, E26 and L26, arrived within four minutes of first-arriving E52. E16 used a forward lay evolution to stretch a supply line from a hydrant at the corner of Cold Town and Plum Grove, the driver then parked behind E52. After securing a water supply to E52, E16 was then supplied by E52. The E16 firefighter pulled the second pre-connect cross lay from E52 and met the E16 officer at the door of apartment #103 to back up the initial attack.

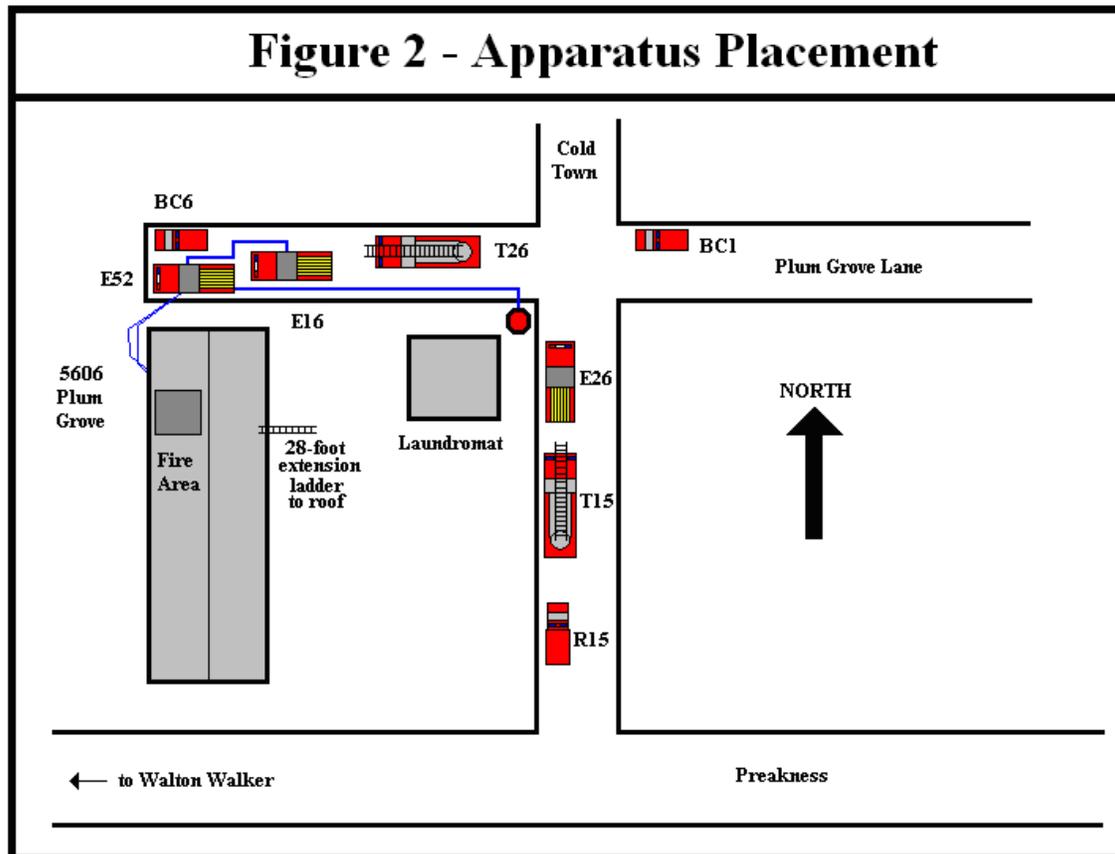
E52 advanced the line into the apartment and quickly extinguished the fire in the master bedroom on the Alpha (west) side of the building. The E52 Lieutenant stated the majority of the fire appeared to be in the area of the bed, and the fire had not extended appreciably throughout apartment 103 from the bedroom. He estimated that it took between 30 seconds to one minute to completely extinguish the fire.

No longer needed to back-up E52 inside the first-floor apartment, the E16 crew exited to search for fire extension on the second floor. When E52 exited the first floor apartment a bystander alerted them to fire in the eaves directly over the second-floor apartment window. E52 extinguished the visible flames and then advanced the line to the second-floor apartment.

At **16:21:03**, L26 arrived on scene and took a position on the Bravo (north) side of the structure behind E16 and E52. L26 Lt. Todd Krodle wanted a spot that could support aerial operations but they could not get the truck close enough. The two firefighters on board had pre-assigned duties; one firefighter took a Positive Pressure Ventilation fan (PPV) from the truck to the building breezeway and the other firefighter took a pike pole and “short” ladder. Lt. Krodle advised the L26 driver to suit up in anticipation of roof operations.

At **16:22:07** and **16:22:56**, Battalion Chief 1 and Battalion Chief 6 respectively, arrived on scene. BC1 was to act as Safety Officer and BC6 was the Incident Commander.

Figure 2 - Apparatus Placement



BC6 assumed a mobile command and was at the building assessing conditions. He noted no fire venting from any windows but saw fire at the eaves on the Alpha side and indications that fire was in the attic. He ordered Lt. Krodle of L26 to vent the roof and ordered Engine companies on scene to get in the attic by pulling ceiling on the second floor.

BC1 stated that when he arrived he was not sure whether BC6 was on scene yet. He walked to the fire building and assessed the condition. He stated that he saw a small fire at the soffit above the second-floor window. The fire appeared to be out and the incident was near termination so he went to the apartment units on the South side of the fire wall to evacuate residents there.

Smoke conditions were heavy in the breezeway on the first floor but, the fire was knocked down. BC6 saw flames out the eaves on the Alpha side and ordered E16 and E26 to advance another line up to unit 203. Outside of apartment 103, the E16 Officer was met by the E52 firefighter with the second cross-lay. They went to the second floor to access the unit above the fire floor. He noted that other crews were present and were trying to force the door of unit 203. After the door was forced, they made entry into 203. The E16 Officer noted that there was no heat but light smoke was present. He ordered firefighters to the rear bedroom on the Alpha side and pull the ceiling. BC6 saw E26 pulling ceiling and the fire in the attic space was confirmed.

While the crews were operating in the second-floor apartment, L26 Lt. Todd Krodle and the L26 EO laddered the Charlie (east) side of the building and began making their way to the roof. Lt. Krodle started and carried a chainsaw and was first on the roof with and the L26 EO following with an axe. Neither man had their gloves, hoods or SCBA masks in place at this time. The L26 EO stated that when he stepped on the roof, he dropped the axe. As he picked up the axe he looked toward the spot where Lt. Krodle had been standing and he saw a lot of smoke and a hole in the roof. The chainsaw was still on the roof near the hole. L26 EO stated that he heard Lt. Krodle yell for help and immediately broadcast over the radio that the Lieutenant was down and through the roof. Firefighters operating on the second floor heard the radio transmissions from the L26 EO and were unsure of the status of the personnel on the roof. E16 Lieutenant broadcast a "May Day" over the radio. The E16 Lieutenant walked into a small bathroom adjacent to the bedroom and saw the reflective tape of Lt. Krodle's bunker pants.

L26 EO approached the hole and reached in, attempting to grab his officer. He was not wearing gloves and he quickly withdrew his hands to don gloves. He reached in again but could not find Lt. Krodle. The L26 EO came down from the roof and quickly went to the second-floor apartment where he found other firefighters trying to free Lt. Krodle from the ceiling area.

At **16:29:35**, second alarm companies were dispatched in response to the "May Day." According to interview statements, the fire ground channels were not monitored by Dispatch. When an emergency is broadcast on the fire ground, it must be relayed to dispatchers via another radio channel by a Chief or his Technician (aide).

L26 EO went to the second-floor apartment to assist in the search for Lt. Krodle, which was already in progress. Visibility was fairly good in the bedroom above the room of origin. Much of the ceiling had been removed in the bedroom and he could see the sky through the hole in the roof where Lt. Krodle fell through.

BC6 heard the mayday and checked the roof from the Alpha side but could not see anyone. He went to apartment 203 where he found BC1 and several crew members attempting to free Lt. Krodle from the ceiling and attic space above the bathroom. Lt. Krodle was in an upright position in the attic supported by framing against his back and straddling ceiling joists and electrical cables with his boots dangling below the bathroom ceiling. The E16 Lieutenant removed his SCBA mask and attempted to place it over the face of Lt. Krodle, but he could not reach him. E16 Lieutenant alternated breaths through his SCBA mask between himself and attempts to place the mask over Lt. Krodle's face during extrication and rescue efforts.

Figure 3 - Approximate Locations of Ground Ladder and Fall Area

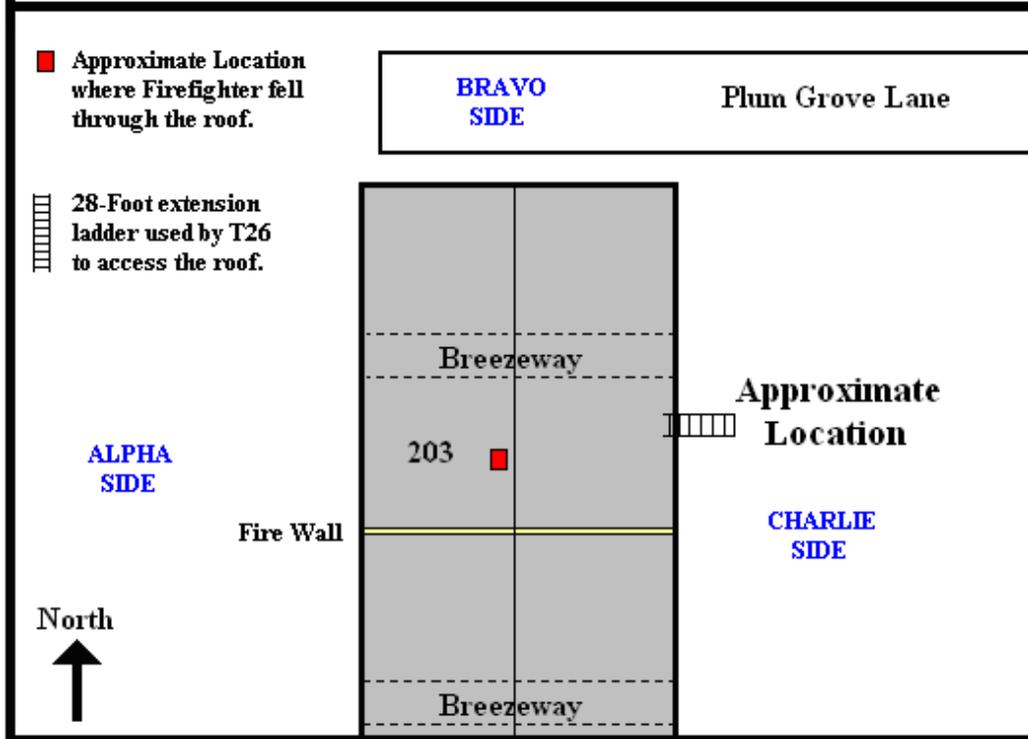
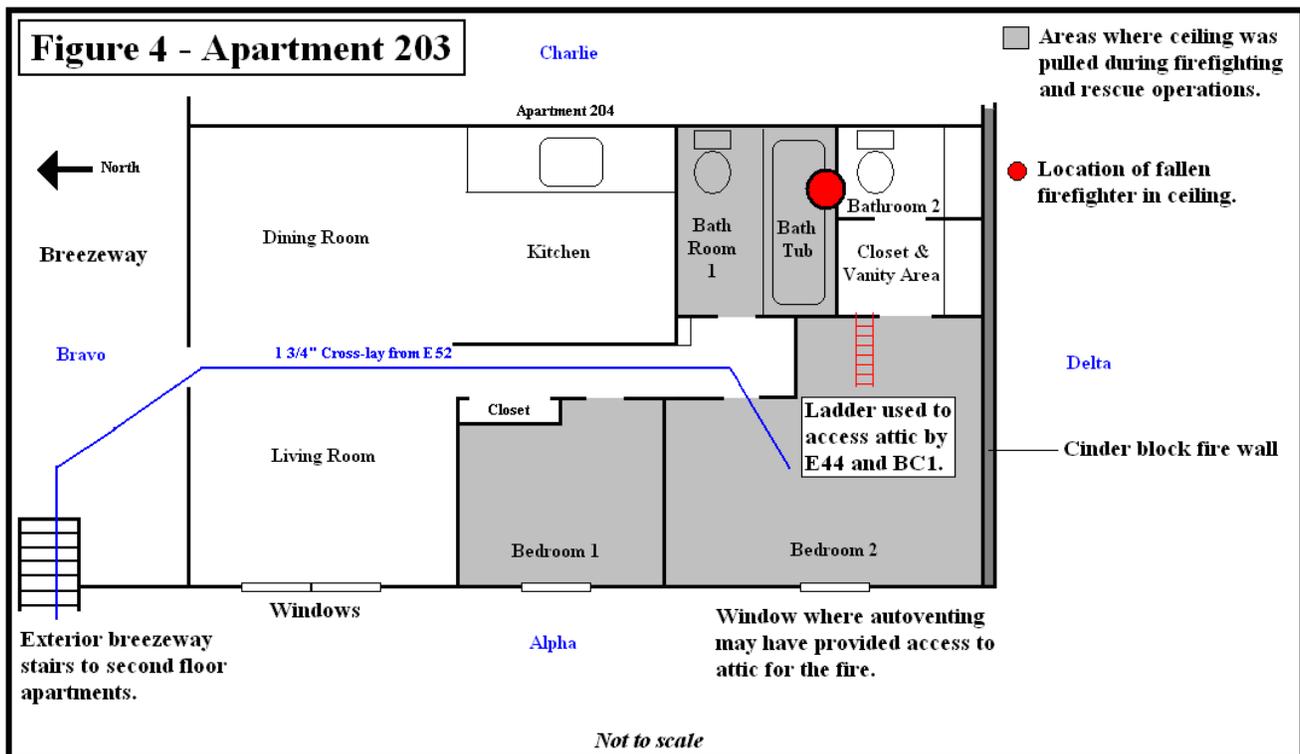


Figure 4 - Apartment 203



A gas powered chainsaw was used to cut structural members on either side of Lt. Krodle in the effort to free him from the attic space. Several cable conductors were entangling Lt. Krodle and preventing extrication from the attic space. Several firefighters were within the confined space of the small bathroom during the extrication process and the use of the chainsaw. The reported limited visibility and crowded conditions became a safety concern as one firefighter stated the long bar chainsaw came very close to his arm during the extrication effort. The rescue effort was not suspended and the focus remained on extricating Lt. Krodle.

Lt. Krodle was extricated and carried on a backboard to Rescue 15 and at **16:47:40** he was transported to Parkland Memorial Hospital where resuscitation efforts continued until hospital staff pronounced his death.

An autopsy examination conducted by the Dallas County Medical Examiner's Office concluded that Todd Wesley Krodle died as the result of inhalation of products of combustion.

Personal Protective Equipment Evaluation

The State Fire Marshal's Office investigation IC contacted the Texas Commission on Fire Protection (TCFP) and requested an evaluation of the firefighter's personal protective equipment (PPE) for performance. Paid Career Fire Departments in the State of Texas are required to meet performance and compliance rules of the TCFP and the adopted National Fire Protection Association standards.

TCFP Compliance Officers evaluated the protective equipment for compliance with Texas Administrative Code Title 37, Part 13, Chapters 435.1, *Protective Clothing* and 435.3, *Self-Contained Breathing Apparatus* and NFPA standards adopted by TCFP. Photographs taken during the examination are on file at the Texas Commission on Fire Protection. The TCFP reports are located in the reference materials of the SFMO investigation file.

On Thursday August 18, 2011, TCFP Compliance Officers Robert Manley and Ed Russell arrived at the Dallas Fire Rescue (fire department) Training and Support Services Bureau, 5000 Dolphin Road, Dallas, Texas. The Compliance Officers met with the Texas State Fire Marshal's Office investigation team, and the fire department officer assigned to manage the department's LODD investigation process.

Compliance Officers Manley and Russell collected TCFP compliance documentation from the fire department. The LODD firefighter's personal protective equipment (PPE) and self-contained breathing apparatus was examined for obvious damage and TCFP compliance.

The LODD firefighter's personal protective equipment, based on the examination and provided documentation, appears to have been NFPA 1971, NFPA 1851, and TCFP compliant at the time of the incident, with the exception of the firefighter's helmet and boots. No annual advanced inspection or annual advanced cleaning records were available for the firefighter's boots or helmet. Additionally, the firefighter's helmet did not have an attached face shield or goggles.

The LODD firefighter's self-contained breathing apparatus, based on the examination and provided documentation, appears to have been NFPA 1852, NFPA 1981, NFPA 1982, NFPA 1989 and TCFP compliant at the time of the incident. The unit appeared to have not been turned on, as the SCBA cylinder was full.

During a March 2011 bi-annual compliance inspection a TCFP Compliance Officer examined the fire department TCFP-regulated SCBA documentation and SOPs/SOGs. Based on the March 2011 FFF Investigation Case FY 11-07

examination, Dallas Fire Rescue provided TCFP-regulated SCBA documentation and SOPs/SOGs, and appeared to have been compliant with NFPA 1561, NFPA 1852, NFPA 1981, NFPA 1982, NFPA 1989 and TCFP standards. The re-examination by TCFP Compliance Officers of the electronic version of Dallas Fire-Rescue's emergency operations section of the SOPs/SOGs, after the LODD incident, indicated continued compliance with NFPA 1561 and TCFP standards.

Findings and Recommendations

Recommendations are based upon nationally recognized consensus standards and safety practices for the fire service. All fire department personnel should know and understand nationally recognized consensus standards, and all fire departments should create, update and follow SOGs and SOPs to ensure effective, efficient and safe firefighting operations.

Dallas Fire Rescue did an excellent job of quickly and effectively extinguishing this fire. The “fast attack” option selected by the first arriving company and the coordinated actions of the companies that followed quickly addressed the issues of search, fire control, water supply and back-up for the initial attack.

The decision to place crews on the roof for vertical ventilation at this incident was reasonable. Although the bulk of the fire was extinguished, or very close to being extinguished at the time the order was given to ventilate the roof to remove the heat and smoke from the attic space and second floor.

Finding 1 – Personal Protective Equipment was not utilized.

The use of all Personal Protective Equipment (PPE), including SCBA, is imperative when working in critical and dangerous areas. Lt. Krodle and his driver were not employing SCBAs, hoods, or gloves while on the roof. The fatal injuries sustained by Lt. Krodle were reported to be the result of thermal injuries to his respiratory system.

Recommendation: The use of all PPE including SCBA is mandatory when operating in areas where members are exposed or potentially exposed to the hazards for which it is provided.

NFPA 1500, 7.1.2 - Protective clothing and protective equipment shall be used whenever the member is exposed or potentially exposed to the hazards for which it is provided.

IFSTA, Essentials of Fire Fighting, (5th Edition), Ch.5 pg.167 – When operating at any emergency scene, firefighters must wear protective clothing and equipment suitable to that incident.

Dallas Fire Rescue Manual of Procedures Vol. 8, Emergency Procedures 2008, XVI Personal Protective Attire sec. E-1

1. Structure fires: Full protective clothing will be worn by all members, except the Driver Engineer, when operating in the critical area.

**Texas Commission on Fire Protection, Standards Manual for Fire Protection Personnel, 37
TAC Chapter 435 Fire Fighter Safety.**

Finding 2 – Appropriate tools and tactics for ventilation operations were not utilized.

Roof operations are very dangerous assignments. Those performing operations above a hostile fire should use appropriate tools and tactics to minimize danger to personnel. A roof ladder distributes the firefighter's weight over a greater area and avoids a concentrated load. Sounding the roof with a tool locates structural roof supports and can indicate their stability.

Recommendation: Use tools and tactics that help reduce the dangers of roof operations. Become familiar with those indicators that are a precursor to collapse.

IFSTA (2008) Essentials of Fire Fighting, (5th Edition), Ch.11.pp.476, and 556-560, Fire Protection Publications, Oklahoma State University

IFSTA (1994) Fire Service Ventilation, (7th Edition), pp.86-89, Fire Protection Publications, Oklahoma State University

Finding 3 – A Rapid Intervention Team (RIT/RIC) was not formed.

The importance of an RIT is well recognized by OSHA, NFPA and TCFP. The advantages include the availability of a fresh group of firefighters with appropriate tools and resources to quickly deploy under the control of a rescue group leader. A group of rescuers who are properly equipped and supervised results in a more controlled and safe rescue effort.

NFPA 1500, 8.8 including: 8.8.1 The fire department shall provide personnel for the rescue of members operating at emergency incidents. ***And, 8.8.7*** At least one dedicated RIC shall be standing by with equipment to provide for the rescue of members that are performing special operations or for members that are in positions that present an immediate danger of injury in the event of equipment failure or collapse.

Dallas Fire Rescue Manual of Procedures Vol. 8, Emergency Procedures 2008, XXVIII, 2 In, 2 Out Procedures, Sec. D

IFSTA (2008) Essentials of Fire Fighting, (5th Edition), Ch.2 pp. 77-78, Fire Protection Publications, Oklahoma State University

Allan V. Brunacini (2002) Fire Command, (2nd Edition) Ch. 6 “2-in 2 out”, Von Hoffman Corp.
37 TAC Chapter 435 Fire Fighter Safety

Additional Recommendations

The following recommendations may have no direct relationship to the factors contributing to the death of Lt. Krodle, however they should be considered to ensure the safety of all personnel on the fire ground.

Communication issues Fire personnel at this incident reported difficulty understanding radio transmissions and emergency traffic immediately after the collapse. There was a slight delay in the acknowledgement of a firefighter down by those on the fire ground because of background noise on scene, and the failure of the “Code Red Alert” prefacing the emergency announcement. Dallas FR fire ground transmissions are not monitored nor recorded at the Dispatch Center.

Recommendations - Consideration should be given to monitoring and recording fire ground activity. Review and use of **Dallas Emergency Procedure III, Personnel Accountability**, which requires the use of specific language to clear traffic and alert personnel is recommended. Communication recommendations.

- **Dallas Fire-Rescue Manual of Procedures Vol. 8, Emergency Procedures 2008, II, Personnel Accountability**
 3. **Code Red Alert.** Emergency radio traffic code words used to alert other members that they must temporarily suspend talking on the radio and stand-by for an emergency announcement.
- **NFPA 1221-16 7.6 Recording**
 - 7.6.1 Communications centers shall have a logging voice recorder with one channel for each of the following:
 - (1) Each transmitted or received radio channel or talkgroup

Use monitored tactical channels for general fire ground operations – Monitored channels can offer a greater degree of safety in that fact that a third party can effectively monitor /clarify sometimes hectic communications.

Use recorded tactical channels for fire ground operations – The use of recorded tactical channels allows for better reconstruction of potentially critical events, the ability to chronologically document specific events and provide for a more in-depth post incident analysis.

Stationary Command

A stationary command offers many advantages; one of the most important is a quiet vantage point from which to receive, process, and relay information. A stationary command post remote from task level operations is also beneficial in building and maintaining an effective fireground organization.

- **NFPA 1561 5.3.7.1** “Following the initial stages of the incident, the incident commander shall establish a stationary command post.”
- **Allan V. Brunacini (2002) Fire Command**, (2nd Edition) Ch.1 “The Command Post”, Von Hoffman Corp.
- **IFSTA (2008) Essentials of Fire Fighting**, (5th Edition), Ch.1 pg.39, Fire Protection Publications, Oklahoma State University

APPENDIX

TIME LINE

August 14th, 2011

- 16:12:17 Dispatch of BC6, BC1, E52, E16, E26 and L26 to 5606 Plum Grove Lane.
- 16:17:00 E52 arrives on scene and reports a working fire and launches a “quick attack”.
- 16:18:32 Dispatch upgrades the response to include an additional truck and MICU – T15 and R15.
- 16:19:18 E26 arrives on scene.
- 16:20:33 E16 arrives and forward lays a 5-inch supply line to E52. Because time stamps show that E26 arrived ahead of E16, but operations show E16 laid the supply line to E52, the supposition is that E16 did arrive ahead of E26 but did not hit the “on scene” button until after they stopped, dropped the supply line and laid to E52.
- 16: 21:03 T26 arrives on scene. Officer tells driver to get prepared to ladder the structure and ventilate the roof. While the driver is dressing, officer goes to find Battalion Chief to determine what needs to be done.
- 16:22:07 BC1 arrives on scene but does not take command as he believes BC5 is already on scene.
- 16:22:56 BC6 arrives on scene and parks near E52 and E16. BC6 then walks to first-floor breezeway to determine conditions and effects of firefighting operations. BC6 sees T26 officer and orders him to “get a hole in the roof”.
- Unknown As BC6 is walking from the second floor to the first floor via the breezeway stairs, he heard “May Day, May Day, firefighter through the roof”. He looks up once on the ground level and does not see anyone on the roof from the Alpha side.
- 16:29:35 Second alarm is dispatched: E44, E15, E14, T36, T49, BC5, BC3, R45, 807, 829, 896 and 781.
- 16:29:38 E44 is on scene (must have been very close by as only a three second response time) and runs up to BC1 to tell him that they saw a firefighter fall through the roof.
- Unknown BC6 returns to upstairs apartment and witnesses E16 and E26 crews trying to free a firefighter who is hanging from the ceiling over the bathtub. At this point, the boots are below the ceiling and fallen firefighter appears to be standing due to the entanglements in the attic. He has his helmet pushed back behind his head, no protective hood donned, and no SCBA mask on his face.
- Unknown The firefighter is freed from the entanglements and lowered to the ground and taken to the second floor breezeway. In the breezeway, the firefighter is placed on a

backboard, has PPE removed and oxygen therapy started. The fallen firefighter is carried downstairs to the stretcher of R15, secured and transferred to the ambulance.

16:47:40 Rescue 15 leaves scene with fallen firefighter and heads to Parkland Memorial Hospital.

Dallas Fire Rescue Department Statistics

The 2007 census indicates that the Dallas Fire Rescue Department serves a population in excess of 1.2 million people. Dallas Fire Rescue is an ISO CLASS 2 department.

The Dallas Fire Department consists of 1750 members at 56 Fire Stations.

DOCUMENT LOG

| Document Number | Source | Description/Assignments |
|-----------------|--------------------|------------------------------|
| 1 | Dallas FR | Incident Detail Report |
| 2 | DFR | Fire Investigation Report |
| 3 | DFR | Fire Investigation Report |
| 4 | Medical Examiner | Autopsy Report |
| 5 | DFR | Inspection Report |
| 6 | Investigation Team | List of Interview Statements |
| 7 | Investigation Team | Timeline Info |
| 8 | DFR | Certificate of Occupancy |
| 9 | DFR | Building Plans/Drawings |
| 10 | Investigation | DVD of Information |
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TCFP Examination of Personal Protective Equipment (PPE)

All TCFP regulated PPE components of the LODD firefighter, provided by the Dallas Fire Rescue (fire department) were examined by Texas Commission on Fire Protection (TCFP) Compliance Officers assigned to the investigation.

Each TCFP regulated PPE component examined by TCFP Compliance Officers was verified as being issued to the LODD firefighter, by cross referencing serial numbers with inventory records, annual advance cleaning records, and annual advanced inspection records.

- **Firefighting Boots**

The boots presented normal wear and no obvious damage. The exterior lower portion of the boots presented soot or building material residue. NFPA and manufacturer identification labels were attached to the boots and were partially readable.

No annual advanced cleaning and annual advanced inspection documentation for the boots was provided by the fire department.

Firefighting Boots Information Summary

Manufacturer: Weinbrenner
Model: Thorogood Hellfire
Stock Number: 804-6371
Manufactured Date: 09/19/2007
Plan: 73278
NFPA 1971, 2007 Edition

- **Firefighting Coat**

The coat outer shell presented normal wear. Tar droplets were observed on the right shoulder, right sleeve, and left shoulder areas. Discoloration was observed on the sleeves, shoulder, and cuff areas. The thermal liner/moisture barrier presented normal wear. Discoloration was observed on the thermal liner/moisture barrier exterior left sleeve, left forearm, and right cuff areas. The drag rescue device (DRD) presented no damage and was in the normal ready-for-use position. A secondary personal alert safety system (PASS) device was attached to the coat by a clip. A flashlight was attached to the coat by a strap. A personal accountability tag was attached to the coat by a strap. The secondary PASS device presented normal wear and no obvious physical damage. NFPA and manufacturer identification labels were attached to the outer shell and thermal liner/moisture barrier of the coat and were readable.

The fire department provided PPE annual advanced cleaning and annual advanced inspection documentation. The provided documentation indicated that the LODD firefighter's coat had been last cleaned on March 9, 2011, and inspected/repaired on March 10, 2011.

Firefighting Coat Information Summary

Outer Shell

Manufacturer: Janesville
Manufactured Date: 03/25/2009
Bar Code number: 0003966431

Thermal Liner/Moisture Barrier

Manufacturer: Janesville
Manufactured Date: 03/25/2009
Bar Code: 0003966432

NFPA 1971, 2007 Edition
Advanced Cleaning: 03/09/2011
Advanced Inspection: 03/10/2011

NFPA 1971, 2007 Edition
Advanced Cleaning: 03/09/2011
Advanced Inspection: 03/10/2011

- **Firefighting Gloves**

Both gloves were found in the right pocket of the firefighting coat. The gloves presented normal wear with no obvious damage. The accessible interior areas of the gloves presented no obvious damage. NFPA and manufacturer identification labels were attached to the gloves and were readable.

The fire department provided PPE annual advanced cleaning and annual advanced inspection documentation. The provided documentation indicated that the LODD firefighter's gloves had been last cleaned on March 9, 2011, and inspected on March 10, 2011.

Firefighting Gloves Information Summary

Manufacturer: American Firewear Inc.
Model: 9900
Manufactured Date: 03/25/2009
Bar Code: 000396432
Independent Service Provider Bar Code Number: 6000340095
NFPA 1971, 2007 Edition
Advanced Cleaning: 03/09/2011
Advanced Inspection: 03/10/2011

- **Firefighting Helmet**

The helmet presented normal wear. No face shield or goggles were attached to the helmet. The front left side of the helmet identification shield presented discoloration. The exterior helmet brim area presented soot or building material residue. The interior underside of the helmet presented tar droplets. The exposed interior underside impact shell surface of the helmet presented melting near tar droplet areas. One of the helmet suspension system straps presented melting near a tar droplet. The helmet chin strap presented discoloration. NFPA and manufacturer identification labels were attached to the helmet and were readable.

No annual advanced cleaning and annual advanced inspection documentation for the helmet was provided by the fire department.

Firefighting Helmet Information Summary

Manufacturer: Cairn's Helmets - MSA
Model: 1000
Manufactured Date: 02/04/2004
Serial Number: 216273
NFPA 1971, 2000 Edition

- **Firefighting Hood**

The hood material presented normal wear and no obvious discoloration. The hood presented areas with tar droplets and a through and through cut in the front lower center. The fire department officer observing the TCFP PPE inspection reported that the cut was

made by medical personnel during removal of the hood from the firefighter. NFPA and manufacturer identification labels were attached to the hood and were readable.

The fire department provided PPE annual advanced cleaning and annual advanced inspection documentation. The provided documentation indicated that the LODD firefighter's hood had been last cleaned on March 9, 2011, and inspected on March 10, 2011.

Firefighting Hood Information Summary

Manufacturer: PGI, Inc.
Style: 3049298
Manufactured Date: 11/01/2008
Lot Number: 1038
Independent Service Provider Bar Code: 6000340096
NFPA 1971, 2000 Edition

- **Firefighting Trousers**

The outer shell of the trousers presented normal wear and no obvious damage. The thermal liner/moisture barrier of the trousers presented normal wear and no obvious damage. A small amount of tar droplets was observed on the exterior of the right pocket. The trousers presented a through and through cut of the outer shell and thermal liner/moisture barrier along the inseam of each trouser leg. The fire department officer observing the TCFP PPE inspection reported that the cut was made by medical personnel during removal of the trousers from the firefighter. NFPA and manufacturer identification labels were attached to the outer shell and thermal liner/moisture barrier of the trousers and were readable.

The fire department provided PPE annual advanced cleaning and annual advanced inspection documentation. The provided documentation indicated that the LODD firefighter's trousers had been last cleaned on March 9, 2011, and inspected/repared on March 10, 2011.

Firefighting Trousers Information Summary

Outer Shell

Manufacturer: Janesville
Manufactured Date: 03/25/2009
Bar Code number: 0003963581
NFPA 1971, 2007 Edition
Advanced Cleaning: 03/09/2011
Advanced Inspection: 03/10/2011

Thermal Liner/Moisture Barrier

Manufacturer: Janesville
Manufactured Date: 03/25/2009
Bar Code: 0003963562
NFPA 1971, 2007 Edition
Advanced Cleaning: 03/09/2011
Advanced Inspection: 03/10/2011

Examination of Self-Contained Breathing Apparatus (SCBA)

All TCFP regulated SCBA components of the LODD firefighter provided by Dallas Fire Rescue (fire department) were examined by Texas Commission on Fire Protection (TCFP) Compliance Officers assigned to the investigation.

Each TCFP regulated SCBA component examined by TCFP Compliance Officers was verified as being issued to the LODD firefighter, by cross referencing serial numbers with inventory, SCBA Annual Full Function Test records, daily SCBA Inspection records, and SCBA Breathing Air Cylinder Hydrostatic Test records.

- **SCBA Back Frame and Harness Assembly**

The SCBA back frame presented normal wear, tar droplets, and no obvious damage.

The SCBA harness presented normal wear with tar droplets on the shoulder straps and an area of minimal char damage to the mid section of the right shoulder NFPA, NIOSH, and manufacturer identification labels were attached to the Harness Assembly and were readable.

SCBA Back Frame and Harness Assembly Information Summary

Manufacturer: Scott Health and Safety
Model: Scott® Air Pak® 75
Manufactured Date: Unknown
NFPA 1971, 2007 Edition

- **SCBA Breathing Air Cylinder**

The SCBA breathing air cylinder presented normal external wear, tar droplets, and no obvious damage. The cylinder presented a current hydrostatic test date and had not exceeded the end of service date. The cylinder pressure gauge indicated a cylinder pressure of over 4000 psi.

SCBA Breathing Air Cylinder Information Summary

Manufacturer: Structural Composites Industries (SCI)
Model: Scott 4500 30-Minute
Manufactured Date: 12/2001
Serial Number: ALT 639-102475
Last Hydrostatic Test Date: 06/01/07
NFPA 1981, 2007 Edition

- **SCBA Face Piece**

The SCBA face piece presented normal wear with a minimal amount soot accumulation to the exterior of the lens. The face piece harness presented normal wear and areas of soot or building material residue. No voice amplifier was attached to the face piece. The voice amplifier speaker diaphragm connection adapter was damaged.

SCBA Face Piece Information Summary

Manufacturer: Scott Health and Safety
Style: AV-3000
Manufactured Date: Unknown
NFPA 1981, 2007 Edition

- **SCBA Face Piece Regulator**

The SCBA face piece regulator presented normal external wear and no obvious external damage. A manufacturer identification label was attached to the SCBA pressure reducer and was readable.

SCBA Face Piece Regulator Information Summary

Manufacturer: Scott Health and Safety
Model: Scott® Air Pak® 75 4500
Manufactured Date: Unknown
Serial Number: 115S0822005777
NFPA 1981, 2007 Edition

- **Integrated SCBA PASS Device**

The integrated SCBA PASS device components presented normal external wear with no obvious external damage. The front of the integrated SCBA PASS device console assembly presented tar droplets. The automatic activation, manual activation, and battery condition of the integrated SCBA PASS during the LODD incident was undetermined by TCFP Compliance Officers during the examination. A NFPA label was attached to the back of the PASS Device Console Assembly and was readable. A manufacturer identification label was attached to the back of the PASS Device Console Assembly and was partially readable due to damage and wear.

Integrated SCBA PASS Device Information Summary

Manufacturer: Scott Health and Safety
Model: Scott® Pak-Alert® SE 7
Manufactured Date: Unknown
Serial Number: Unknown
NFPA 1982, 2007 Edition

- **SCBA Pressure Reducer**

The SCBA pressure reducer presented normal external wear and no obvious external damage. A manufacturer identification label was attached to the SCBA pressure reducer and was readable.

SCBA Pressure Reducer Information Summary

Manufacturer: Scott Health and Safety
Model: Scott® Air Pak® 75 4500
Manufactured Date: Unknown
Serial Number: 115S0823002156
NFPA 1981, 2007 Edition

SCBA Documentation Summary

The fire department provided documentation on the SCBA that was used by the LODD firefighter during the incident. The following is a summary of the provided information:

Last SCBA Duty Period Maintenance Performed by
LODD Firefighter Date: 08/14/2011

Last SCBA Annual Full Function Test Date
Prior to LODD Incident: 01/13/2011

Last SCBA Cylinder Last Hydrostatic Test Date
Prior to LODD Incident: 06/01/2007

Last SCBA Breathing Air Test Date Prior to the LODD
Incident – 2 Compressors: 05/13/2011

Examination of Secondary Personal Alert Safety System (PASS)

The secondary PASS device of the LODD firefighter provided by Dallas Fire Rescue (fire department) was examined by Texas Commission on Fire Protection (TCFP) Compliance Officers assigned to the investigation. The fire department officer assigned to manage the department's LODD investigation process stated, years ago, the secondary PASS devices were initially the department's primary PASS devices. Once the department upgraded the SCBAs to the use of integrated SCBA PASS devices, that turn on automatically when the SCBA is operating, the older non-integrated PASS devices began use as secondary PASS devices. The fire department officer assigned to manage the department's LODD investigation process additionally stated, the secondary PASS devices require the users to manually turn on the device for use.

- **Secondary SCBA PASS Device**

The secondary PASS device was attached to the front left area of the LODD firefighter's firefighting coat. The secondary SCBA PASS device presented normal external wear with no obvious external damage. The automatic activation, manual activation, and battery condition of the integrated SCBA PASS during the LODD incident was undetermined by TCFP Compliance Officers during the examination.

Secondary PASS Device Label Information Summary

Manufacturer: Grace Industries
Model: Super PASS II
Manufactured Date: Not Available
Serial Number: Not Available

Examination of Standard Operation Procedures/Guidelines (SOPs/SOGs)

During a March 2011 TCFP bi-annual compliance inspection of the Dallas Fire Rescue (fire department), a TCFP Compliance Officer examined the TCFP regulated SOPs/SOGs for compliance. The fire department provided an electronic copy of the emergency operations section of the SOPs/SOGs following the LODD incident. The emergency operations section of the SOPs/SOGs was examined by the TCFP Compliance Officers. The emergency operations section of the SOPs/SOGs covered the following TCFP regulated areas:

- 37 TAC Chapter 435.11 Incident Management System (IMS)
- 37 TAC Chapter 435.13 Personal Accountability System
- 37 TAC Chapter 435.15 Operating at Emergency Incidents
- 37 TAC Chapter 435.17 Procedures for Interior Structure Fire Fighting (2-in/2-out rule)

Examination of Training Records

The Dallas Fire Rescue (fire department) provided the LODD firefighter's training records for the previous two annual reporting periods, which are required by the TCFP Standards

References

1. NFPA [2009]. NFPA 101: *Life Safety Code*, 2009 Edition. Quincy, MA: National Fire Protection Association
2. NFPA [2008]. NFPA 921: *Guide for Fire and Explosion Investigations*, 2008 Edition. Quincy MA: National Fire Protection Association
3. NFPA [2007]. NFPA 1500: *Standard on Fire Department Occupational Safety and Health Program*. Quincy, MA: National Fire Protection Association
4. NFPA [2008]. NFPA 1521. *Standard for Fire Department Safety Officer*. 2008 Edition. Quincy, MA: National Fire Protection Association
5. NFPA [2008]. NFPA 1561 *Standard on Emergency Services Incident Management System*, 2008 Edition. Quincy, MA: National Fire Protection Association
6. NFPA [2004]. NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medicals Operations, and Special Operations to the Public by Career Fire Departments*, 2004 Edition. Quincy, MA: National Fire Protection Association
7. U.S. Occupational Safety and Health Administration Respiratory Protection Standard, CFR 1910.134
8. Dallas Fire Rescue Manual of Procedures
9. Texas Commission on Fire Protection Standards §435.17 - Procedures for Interior Structure Fire Fighting
10. IFSTA [2008]. *Essentials of Fire Fighting and Fire Department Operations*, 5th ed. Oklahoma State University. Stillwater, OK: Fire Protection Publications, International Fire Service Training Association
11. NFPA [2008]. *Structural Firefighting - Strategy and Tactics*, 2nd Edition. Quincy, MA: Klaene, Bernard J.; Sanders, Russell E
12. NFPA [2009]. *Fundamentals of Fire Fighter Skills*, 2nd Edition, Quincy, MA; International Association of Fire Chiefs
13. NFPA [2006]. *Fire Officer Principles and Practice*. Quincy MA: International Association of Fire Chiefs
14. IFSTA (1994) *Fire Service Ventilation*, (7th Edition), pp.86-89, Fire Protection Publications, Oklahoma State University
15. U.S. Department of Homeland Security - Federal Emergency Management Agency, *ICS Management Characteristics* <http://www.fema.gov/emergency/nims/ICSpopup.htm#item5>