COPY

Fire & Explosion Investigation
Report
By: Stephen Hart, Consultant

Date of Incident:

August 18, 2009 (Tuesday)
15:45 p.m. (approximate)

Location of Incident:

Henness Flats Apartments
11929 Waters Way (Building No. 6, Unit 101)
Truckee, CA

Scope/Purpose:

On August 20, 2009 Acting California State Fire Marshal Tonya Hoover/CAL-FIRE called Consultant Hart and indicated that there had been a fire and explosion in Truckee, CA and that his assistance was requested to aid ABI-Unit Investigator Tony Guevara in the investigation. According to Acting SFM Hoover the fire and explosion was in a newly constructed apartment building with a fully operational fire sprinkler system.

Note: It should also be pointed out that Consultant Hart has more than 44-plus years of experience with construction techniques, inspection practices, codes and standards, as well as fire investigation. Consultant Hart has been a Apprentice/ Journeyman Electrician, Building Inspector, Building Official, Fire inspector, Fire Marshal, OSFM Deputy Director (Appointment by Governor Pete Wilson), and while there had the ABI-Unit as one of my two Divisions to oversee. Additionally, as a "retired annuitant" I have worked for the OSFM since my retirement in April 1999 on several projects and serve on 10-11 Advisory Committees, Task Forces, Work Groups, etc. Additionally, Consultant Hart was the Director of the Fire Sprinkler Advisory Board of Southern California for seven (7) years and since retiring has been a consultant to the National Automatic Sprinkler IP-Fund for nearly 10-years.

General Descriptive Summary:

At approximately 3:45 p.m. on Tuesday, August 18, 2009 the Truckee Fire Protection District responded to a reported fire and explosion at the Henness Flats Apartment Complex. 11929 Waters Way, Truckee, CA. It should be noted

that the Henness Flats Apartment Complex is a 92-unit apartment complex owned by The Pacific West Companies and the facility management partner is Cambridge Real Estate Services. According to City of Truckee records (Dept. of Building & Safety) the Building Permits for the eleven (11) buildings were issued on June 28, 2009 and the Final Inspection (Certificate of Occupancy) issued on September 20, 2007.

Note: According to the Town of Truckee Newsletter (Issue: 13 – Dated November 2005) this Apartment Complex was first submitted as "Gray's Crossing", a 92-unit complex of affordable rental housing and was included in the Development Plan and through efforts by the Town of Truckee obtained almost $3.5-million in additional grant dollars.

The unit where the fire and explosion occurred was located on the first floor and was on the east end of the building. The automatic fire sprinkler system riser which served the 12-unit apartment building was located on the exterior wall adjacent to this unit. The unit where the fire and explosion occurred was occupied by five (5) individuals and the force of the blast caused window glass to be blown more than 86-feet across the adjacent parking area of the complex. The force of the blast also caused an interior door frame and attached door to an adjacent bathroom to be pulled out approximately 3-inches from the frame in which it was installed.

As a result of the fire and explosion the five occupants all received burn injuries from the resulting blast. The mother, 27-year old Isela Minutti died of her injuries shortly after being airlifted to a Reno Hospital. The husband/father, 30-year old Wuliber Martinez who was burned over 40-45% of his body was airlifted to UC Davis Medical Center Burn Unit, Sacramento, CA. Their three small children, 12-years old, 7-year old and a 10-day old baby, were treated at Tahoe Forest Hospital on Tuesday and released to relatives that evening.

There are twelve (12) individual apartment buildings within the complex, of which Building No. 6 was a 2-story structure consisted of 12-apartment units. This structure was the largest structure within the complex, having a floor area of approximately 14,798 square feet. The first floor has (2) two bedroom units and (4) three bedroom units. The second floor has (2) two bedroom units and (4) three bedroom units. The two bedroom units are at each end of the building with the (4) three bedroom units in the middle. The area of the first floor is 7,776 square feet and the second floor is approximately 7,022 square feet.

Note: It should be noted that Building No. 6 and No. 8 are identical in size and are the largest structures within the 92-unit apartment complex. Additionally, the two bedroom units are 1,011 square feet in floor area, while the three bedroom units are 1,199 square feet.

The modular structures were built at the Guerdon Enterprises, LLC Facility, 5556 Federal Way, Boise, Idaho and the fire sprinkler piping (CPVC) was installed at that time, transported to the Truckee, CA site where they were assembled and the final connections of the residential fire sprinkler system completed. The fire sprinkler contractor that installed the fire sprinkler piping in the modular units in the Guerdon Enterprises facility was Simplex-Grinnell, 8783 W. Hackamore Drive, Boise, Idaho 83709. The Fire Protection Contractor that made the final connections between each modular unit and to the water mains, risers, and water supply was Simplex-Grinnell Fire Protection Systems, Co., 1655 Marietta Way, Sparks, Nevada 89431 Phone: (775-331-0590).

It is further noted that the fire sprinkler drawings and calculations (four sheets FP-1 thru FP-4) were "Drawn by: TS" (dated: 05-22-06), "Designed by: TS" (dated: 04-03-06) and "Approved by: RA" (Dated: 04-03-06) and due to the fact that the design and installation was performed by an "out-of-state" Fire Protection Contractor, the drawings were stamped and signed by Jerry L. O'Neal, a Registered Fire Protection Engineer (#1586) and plans date stamped December 31, 2007.

The City of Truckee Building & Safety Department and Truckee Fire Protection District employed the services of Mr. Eric Price, Senior Project Manager with Engineered Fire Systems, Inc. (13457 Colfax Highway, Grass Valley, CA 95945 – Phone (530) 274-9400 and E-mail: eprice@efs1.com) to perform the plan review for the fire sprinkler system drawings and supportive hydraulic calculations as well as perform the actual field inspections, witnessed testing, and final approval of the fire sprinkler systems.

Note: According to Mr. Eric Price, the automatic fire sprinkler system was hydraulically designed to the 2002 edition of NFPA-13 (Standard for the Installation of Sprinkler Systems).

The submitted drawings show the overhead fire sprinkler piping being supplied by a 4-inch main that runs the length of the building and stubs up with a 2-1/2-inch riser which feeds the two units on the first and second floor levels. The drawings (FP4 of 4) indicate "Antifreeze System Capacity 256.2 Gal."

(Antifreeze Solution for Potable Water [NFPA-13:7.5.2.2]) and Glycerine Used – Solution: 50% Water – Freezing Point: -20.9-degrees F.

Note: According to Mr. Eric Price, he ran the volume calculations for Building No. 6 and came up with a volume of 371.6 gallons. The 4-inch main has a volume of 133.3 gallons. It is possible that the volume calculations of 256.2 did not include the 4-inch main.

Fire and Explosion Scenario:

Following the evacuation of the injured victims, the Town of Truckee Police Department and Truckee Fire Protection District requested the assistance of the Cal-Fire – Office of the State Fire Marshal (Arson & Bomb Unit) and Bureau of Alcohol, Tobacco & Firearms Investigators to assist in reconstructing the sequence of the fire and explosion to determine the cause of the incident.

In discussions with ABI Investigator Tony Guevara it appears that Mr. Wuliber Martinez was apparently cooking (frying) onions in a frying pan over the stove (electric) when it caught fire, and as he turned around (180-degrees) to the kitchen sink with the flaming frying pan to put water on the fire and the fire sprinkler activated directly over him and upon activation a violent explosion resulted. As a result of the fire and explosion it was noted that eight (8) of the ten (10) residential sprinklers within the unit activated.

In addition, his wife 27-year old Isela Minutti was apparently standing in the Dining Room/Living Room area (adjacent to the Kitchen counter) and the resulting burns/explosion caused her death. According to footprints on the rug in the Dining Room/Living Room she was approximately 5- to 7-feet from the initial sprinkler that activated over the kitchen sink. From where her body was found when rescuers arrived, she fell toward the window in the Living Room which was blown outward.

A photograph, taken by ABI Investigator Tony Guevara of the fire sprinkler over the Kitchen Sink was a Residential Pendent Sprinkler (decorative, fast response, frangible bulb sprinkler) Model TY-2234 (SIN TY2234 – 4.9 K-factor) and the ceiling was a flat-smooth ceiling. In accordance with U/L 1626 (Residential Sprinklers for Fire-Protection Service) the temperature classification rating for this fire sprinkler is Ordinary (135-170 [155-degrees F] with a maximum ceiling temperature of 100-degrees F).

It is of interest that in U/L 1626 (Section 41.6 – Exposure to antifreeze solutions) five (5) samples are to be assembled onto a manifold. The manifold is to be partially filled, such that the inlet of each sample is exposed to the following antifreeze solutions (*70% glycerine/30% tap water mixture - by volume*) for 90-days at a temperature of 189-degrees +/- 3.6-degrees F.

On Tuesday August 25, 2009 Consultant Stephen Hart visited the Henness Flats Apartment Complex, 11929 Waters Way, Truckee, CA with ABI Investigator Tony Guevara and Division Chief Ben Ho/Cal-Fire [Fire Engineering], arriving at approximately 11:00 a.m. and met with Fire Marshal/Deputy Chief Bob Bena of the Truckee Fire Protection District. The walk-thru of the apartment revealed that the fire sprinklers had been replaced, and that the sprinkler system was being serviced for the entire building. The unit of fire origin was being dried out and the walls had been cleaned with the exception of the Kitchen, which was left in the same condition in which it was found upon response on August 18th at 3:45 p.m.

The frying pan was still in the sink. The kitchen cabinets were scorched but not heavily burned. The fire damage was minimal; however, the explosion damage was evident by the door and doorframe in the doorway of the adjacent bathroom. The rugs had been pulled up and dried out. The windows had been replaced, Consultant Hart took several photographs of the interior and exterior of the apartment building, and the riser assembly on the east end of the building. The walls of the unit were relatively clean, but will most likely be repainted. The unit reflected having had a very quick fire and accompanying explosion.

Research on Antifreeze Materials:

In researching the two basic antifreeze materials, Propylene Glycol and Glycerin, it was found that both come in "ready-to-use" or "concentrated" solutions. The two types of antifreeze come in standard quantities of 1-gallon plastic bottles (6 per case), 5-gallon pails, 30-gallon drums, 55-gallon drums, 275-330-gallon totes, and 5,000-gallon tank truck.

Specific Gravity of Glycerine runs from 1.141 to 1.096 and Propylene Glycol runs from 1.033 to 1.020 for "ready- to- use" solutions and 1.165 to 1.100 and 1.045 to 1.027 respectively for concentrated solutions.

In reading several of the Material Safety Data Sheets both Propylene Glycol and Glycerine Solutions are classified as Class 1 flammable liquids in higher concentrations and often have a handling statement stating "Avoid generation of mist." Under Physical and Chemical Properties the Explosion Properties states "Not to be expected".

The National Fire Protection Association issues guidelines for the installation of fire sprinkler systems. NFPA-13, the Standard for the Installation of Sprinkler Systems, states that for potable water systems, only pure glycerine (C.P. or U.S.P. 96.5 percent grade) or propylene glycol can be added to prevent freezing. A mixture of 50% glycerine and 50% water protects against freezing for temperatures down to -20.9-degrees F, while 50% water/50% propylene glycol protects down to -26-degrees F. Antifreeze systems are limited to sprinkler systems with a volume capacity of 40 gallons or less; so, the actual discharge of non-toxic antifreeze agent would be 20 gallons or less for a 50/50 solution.

The NFPA Automatic Sprinkler Systems Handbook, Section A-4.5.1 of NFPA-13, 1999 Edition (page 185) states: "Antifreeze solutions can be used for maintaining automatic sprinkler protection in small, unheated areas. Antifreeze solutions are recommended only for systems not exceeding 40 gallons. "*Commentary: The current reaction by a number of water purveyors to the use of antifreeze solutions in sprinkler systems has impacted the antifreeze system option, even though NFPA-13 only allows the use of nontoxic antifreeze solutions when the system is connected to the public water supply. Many local regulations require antifreeze systems to be equipped with a reduced –pressure zone backflow prevention device to guard against potential contamination of the public water supply. These local regulations have impacted the economic advantages offered by antifreeze systems to some degree.*

A distinction is made between the use of additives for potable and non-potable water. The solutions noted in Table 4-5.2.1 could be described as food-grade chemicals.

The size limitation of antifreeze systems is only a recommendation because of the cost, not because of system performance. NFPA-13 does not place any limitation on the size of antifreeze systems."

The NFPA-13, 2002 Edition (Standard for the Installation of Sprinkler Systems) Annex A 7.5.2 (page 13-223) states: "A.7.5.2 Listed CPVC sprinkler pipe and fittings should be protected from freezing with glycerine only. The use

of diethylene, ethylene, or propylene glycol are specifically prohibited. Laboratory testing shows that glycol-based antifreeze solutions present a chemical environment detrimental to CPVC."

The NFPA-13, 2002 Edition (Standard for the Installation of Sprinkler Systems) Annex A.5.3.1 (page 13-223) states: "A 7.5.3.1 All permitted antifreeze solutions are heavier than water. At the point of contact (interface), the heavier liquid will be below the lighter, preventing diffusion of water into the unheated areas."

The NFPA Automatic Sprinkler Systems Handbook, Section 7.5 of NFPA-13, 2002 Edition (page 162) states: "*Commentary: Antifreeze systems, which are covered in Section 7.5, are typically used as subsystems of a wet pipe system. Antifreeze systems are intended to protect small areas that could be exposed to freezing temperatures, such as outside loading docks. Antifreeze systems are also used for residential areas that are not protected against freezing temperatures, since residential sprinklers are currently listed only for wet pipe systems.*"

Special Note: The NFPA Automatic Sprinkler System Handbook, Appendix Section 4-5.3.1 of NFPA-13, 1999 Edition (page 189) states: "All permitted antifreeze solutions are heavier than water. At the point of contact (interface), the heavier liquid will be below the lighter liquid, preventing diffusion of water into the unheated areas. "*Commentary: Since all permitted antifreeze solutions are heavier than water, an interface at which the water in the wet system will stay above the heavier antifreeze solution is created. If possible, the entire antifreeze system should be below the level of this interface, this preventing the diffusion of water into low temperature areas. When the antifreeze system is above the interface, alternative piping arrangements and additional system components as illustrated in Figure 4-5.3.1 and 4-5.3.2 are necessary.*"

The NFPA-25, 2006 California Edition (based on the 2002 Edition of NFPA-25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems) Section 5.3.4 (page 25-16) Antifreeze Systems states: "The freezing point of solutions in antifreeze shall be tested annually by measuring the specific gravity with a hydrometer or refractometer and adjusting the solutions if necessary."

The NFPA-25, 2006 California Edition further states in Annex A-5.3.4 (page 25-60): "Listed CPVC sprinkler pipe and fittings should be protected for freezing with glycerin only. The use of diethylene, ethylene, or propylene glycols is specifically prohibited. Where inspecting antifreeze systems employing listed CPVC piping, the solution should be verified to be glycerine based."

The NFPA-25, Standard for the Testing, and Maintenance of Water-Based Fire Protection Systems Handbook, 2002 First Edition (page 78) states: "Commentary: New antifreeze solutions are being introduced for use in early suppression fast-response (ESFR) systems and NFPA-13, 2002, restricts the use of antifreeze in ESFR systems to those that are listed specifically for that use. Some ESFR systems may require additional inspection, testing, and maintenance compared to the traditional systems used today and covered by (Section) 5.3.4). In such cases, the manufacturer's recommendations should be followed.

Because antifreeze systems usually are used in small systems, additional inspection, testing, or maintenance activities may be required to ensure uniform mixtures when large antifreeze systems are used to protect large systems. An example of such additional activities would be circulating the mixture to prevent the antifreeze from settling out of the solution."

According to the Material Safety Data Sheet provided for Hill Brothers Chemical Company on their product name: Propylene Glycol (CAS Number: 57-55-6 and MSDS No. CP21500) under Section V – Fire Fighting Measures, the product has a flash point of 214- to 225-degrees F, Lower Explosive Limits: 2.6/Upper Explosive Limits 12.5, and it is noted under Unusual Fire and Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it may explode in the heat of a fire. Vapors are heavier than air and may accumulate in lower areas.

Similar Case of Fire and Explosion:

In researching the use of antifreeze solutions in fire sprinkler systems a similar activation and explosion occurred on October 28, 2001 at 5:21 p.m. at the Windandsea (Wind and Sea) Restaurant, 56 Shrewsbury Avenue, Highlands, New Jersey. According to the Fire Investigation Report, prepared by the County of Monmouth Office of the Fire Marshal, 1027 Highway 33, East, Freehold, New Jersey 07728 [Phone: (732-938-5323], the structure was a three (3) story wood

frame building. The second and third floors were protected by an antifreeze type fire sprinkler system.

According to a statement from the witnesses working or eating in the second floor restaurant/enclosed deck they heard a pop sound and a fire sprinkler activated and then saw a liquid spraying down from above. Followed by a fireball developing at the ceiling in the area where a ceiling mounted heater was located. .

Located near the ceiling were nine (9) Sun Pak heaters rated at 25,000 BTU's each. On the wall to the rear of the row of ceiling heaters were sidewall mounted fire sprinklers. These sprinklers were supplied by a Propylene Glycol filled – antifreeze solution sprinkler system. The sidewall sprinklers installed were Viking Model M – Ordinary Classification – Nominal Temperature Rating 155-degrees F, maximum recommended ceiling temperature 100-degrees F.

The cause of the fire and explosion was in the opinion of the investigators present that the heat at the ceiling level at the rear of the heater in the area of the sidewall sprinkler reached the temperature that caused the sprinkler to activate. "When the system activated, the mixture of Propylene Glycol and water sprayed under pressure on to the ceiling heater located in front of the sidewall sprinkler. At that time the vapors from the sprayed liquid mixture ignited and flash fire occurred."

Two injured people were transferred to Saint Barnabus Burn Center. A partial list of the injured was included in the report prepared by MCPO Detective Hubeny. That list included 18 injuries.

Special Note: It should be noted that on page 4 of 6 of the Sunpak Patio Heater cut-sheets, under the Fire Sprinklers Section is the following statements: Fire Sprinklers must be located at an appropriate distance from each heater to avoid accidental activation of the sprinkler. Ethylene Glycol or Propylene Glycol must never be used in fire sprinklers where heaters are present as these substances may become flammable when heated. A fire sprinkler professional must be consulted when heaters are installed where fire sprinklers are present to insure that heaters and the fire sprinkler system are properly integrated. Specific guidelines can be found in NFPA-13 regarding design and specifications for Fire Sprinkler Systems near heaters.

Conclusion:

Points to be considered:

- The ambient temperature in Truckee, Ca on August 18, 2009 at approximately 3:45 p.m. was between 80- and 85-degrees F.
- The origin of the fire and the open flame of the frying pan and the heat release thereof.
- There are several similarities between the New Jersey Incident (10-28-01) and the Truckee, CA Incident (08-18-09):
  - Both incidents involved a fire sprinkler system with antifreeze mixture,
  - Both incidents had fire and explosion on lower floor level of a multi-level structure (Highlands, New Jersey 2nd and 3rd floor antifreeze, fire and explosion on 2nd floor; Truckee, CA 1st and 2nd floor antifreeze, fire and explosion on first floor),
  - Concentrations were designed for 50%/50% mixture (Glycerine/Water).
- Truckee System contained volume of 371.6 gallons which at 50%/50% would be 185.8/Glycerine/185.8/Water.
- According to Investigator Tony Guevara/Cal-Fire (ABI) samples were taken from this building (No. 6) and other buildings in the complex by Truckee Fire Protection District (Fire Marshal Bob Bena) and Investigators from the Bureau of Alcohol, Tobacco & Firearms and sent to a laboratory and results came back with readings in the ranges above 60%.
- Since all permitted antifreeze solutions are heavier than water, an interface at which the water in the wet system will stay above the heavier antifreeze solution is created, thus the concentration of antifreeze would settle to the 1st floor portion of the system.
- The design characteristics of a residential fire sprinkler:
  - Fast response sprinkler technology,
  - Actual Delivered Density (ADD) – the measurement of the rate at which water is placed on the surface of a burning combustible array,
  - Required Delivered Density (RDD) – the measurement of a particular material's ability to be suppressed once ignited,
  - Response Time Index (RTI) – the sensitivity of the fire sprinkler to activate,
  - Deflector design characteristics, which relate to the droplet size,
  - General discharge characteristics (water distribution) of a residential fire sprinkler with a "wall-wetting pattern",
  - Activation of the initial residential fire sprinkler (TY-2234) over the kitchen sink,
  - Proximity of the residential fire sprinkler in relationship to the sink in the Kitchen,
  - Smooth flat ceiling of 8-feet above the floor level,
- Southwest Gas did not find any gas leakage.

Fire damage to the apartment unit, and to the contents (as seen by reviewing the photographs of Investigator Tony Guevara/Cal-Fire (ABI) showing that a "flash fire" occurred but the damage from the fire was minimal and that the damage from the resulting explosion was extremely intense.

It is therefore the opinion of this writer, that the fire and resulting explosion at the Henness Flats Apartment Complex. 11929 Waters Way, Truckee, CA on August 18, 2009 at approximately 3:45 p.m. was most likely caused by Mr. Wuliber Martinez, age 30-years; who was apparently cooking onions in a frying pan (approximately 8- to 10-inch diameter) and upon finding the pan on fire while on the stove, took the pan by the handle and turned around (180-degrees) and while attempting to extinguish the flames, the fire sprinkler directly above him activated, discharging a solution of glycerine-based antifreeze which was ignited by the flames coming from the burning onions in the frying pan and the resulting explosion of the glycerine solution cause fatal burn injuries to his wife, Islesa Minutti, Age 27-years; and burn and blast injuries to him and their three (3) children; ages 12-years, 7-years, and 10-days old.

Questions which need to be researched:

1) What was the "cause of death" of Islesa Minutti?
2) Was there any Glycerine residue found in her lungs?
3) Was there any Glycerine residue found in Mr. Wuliber Martinez's lungs?
4) What was the actual readings of Glycerine found in Building No. 8 (the identical building to Building No. 6)
5) Was there any records obtained from Grinnell Fire Protection (Sparks, NV) which show how much Glycerine was purchased for this jobsite?
6) Who was the manufacture of the Glycerine used on this project, and was it ordered as "Ready-to use" (50%/%50%) or "Concentrated"?
7) "If" it was concentrated Glycerine, who and how was it mixed and/or filled into the fire sprinkler system(s)?
8) Does the CA Dept. of Housing & Community Development (HCD) have records for the modular units constructed in Idaho and transported to Truckee, CA and assembled?
9) Did Simplex-Grinnell (Sparks, NV) have a CA Contractors State License Board (CSLB) Fire Protection Contractors (C-16) license, or were they using the CA Branch offices license(s)?
10) What does NFPA consider to be a "Large Antifreeze System" which is referenced in the NFPA-25, Standard for the Testing, and Maintenance of

Water-Based Fire Protection Systems Handbook, 2002 First Edition (page 78) Commentary.

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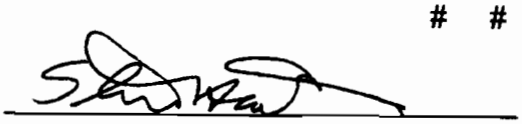

Stephen D. Hart, Consultant
(National Automatic Sprinkler IP-Fund)
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