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SOG5050/2007/1 LARGE STORE FIRE TACTICS

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Issue 1

Warning: This document is provided free of charge and serves as a draft guideline for the purposes of peer review and discussion only. It should not be taken in an advisory capacity but where fire authorities wish to utilise the guidance within to assist forming or improving their own SOPs they are welcome to do so.



What is different about 3D Firefighting as opposed to traditional structural firefighting strategies? Quite simply it involves a 'culture change'. It demands greater attention is paid to the three-dimensional risk - the 'hidden dangers of smoke as it transports throughout a structure to lay in wait for firefighters. The real danger may exist in what you cannot see as opposed to what you can! The hazards of 'flashover'; 'backdraft' and 'smoke explosions' are generally known but little understood by firefighters. The way a fire grows, develops and on occasions spreads so rapidly that firefighters become trapped or killed, is often taken for granted.

There is clear evidence that some fire commanders do not fully appreciate the practical aspects of fire behavior or understand the counter measures of tactical ventilation; or anti-ventilation (a strategy rarely documented in training manuals); 3D water-fog pulsing; or the safe deployment of firefighters under risk-based guidelines and principles.

Fire-ground commanders and company officers should adopt a greater appreciation of the when; how; why; and where to deploy; attack; ventilate or isolate fires and gain a more in-depth and practical understanding of what 'coordinating' fire attack with ventilation actually means.

- Large floor spaces
- Lightweight trusses
- Concealed roof spaces
- High ceilings
- Rapid fire spread
- Needs pre-planning
- Identify truss systems
- Avoid self deployments
- Accountability
- Avoid horizontal vents
- Consider roof vents
- Restrict deployments
- Communicate!

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3D FIRE

Disclaimer

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Large Store Fire Tactics

The Dangers of Large Commercial Structures

The tragic events that occurred this week at the Sofa Super Store fire in Charleston SC, where nine firefighters were killed, reminds us all that we must learn from past experience and take heed of the warnings issued following previous life losses. This review is not simply to critique the sofa warehouse fire itself but rather look at past experience in an effort to consider our own tactical approaches to developing fires in such buildings



- Large floor spaces
- Lightweight roof trusses
- High ceilings and/or;
- Concealed roof spaces

There is a vast amount of documented experience of fires in these types of structure and many of these reports involve firefighter fatalities, all concluding with similar recommendations as to how to handle these types of fire and hopefully prevent such life losses.

It is absolutely essential that fire authorities pre-plan for these type of incidents and provide a written standard operating procedure that takes into account past experience and lessons learned.

Be sure that your firefighters understand what is required of them in advance of facing such a daunting task themselves.

Rapid Fire Phenomena - Three Basic Types

Flashover

Flashover is generally a heat induced development of a compartment fire although added ventilation may also speed up the flashover process. The breaking of a window or the opening of a door can initiate a flashover.

Backdraft

Backdraft is an event that may occur where a fire has been under ventilated for some period and is not receiving enough air to develop naturally. Any sudden inflow of air may initiate the event.

Fire Gas Ignition

The term 'Fire Gas Ignition' covers a wide range of rapid fire phenomena where accumulations of fire gases and smoke are transported towards an ignition source, or where high energy heat is added to a gas pre-mix.

Learning Outcomes:

| | |
|---|---|
| 1 | Pre-planning—Know the Structure in advance! |
| 2 | Hazard Recognition & Warning Indicators |
| 3 | Communication on the Fire-ground |
| 4 | Limiting the number of firefighters committed |
| 5 | Accountability—Avoid Self-Deployments! |
| 6 | Rapid Fire Development always likely |
| 7 | How, why, where and WHEN to ventilate! |

Special points of interest:

- *Wide-span floor area means high ceilings and/or ceiling voids*
- *Such construction is renowned for hiding smoke and flaming combustion at high level, masked by the smoke layer or the ceiling itself*
- *Rapid fire phenomena may occur early forcing a defensive strategy*
- *Large floor areas test incident command systems and communications to the limit!*



Charleston Sofa Super Store Tragedy as Nine Firefighters Lose their Lives - A Tactical Review



Recommendations from Previous NIOSH Store Fire and Commercial Building Reports

- Ensure such buildings are frequently reviewed by firefighters with the objectives of pre-planning in mind
- Ensure firefighters are trained to identify roof truss systems
- Strict staffing control and fire-ground accountability is essential
- Consider the use of thermal imaging cameras to assist size-up
- Recognize the dangers of fire spreading unnoticed or hidden by a smoke layer, in attic spaces or under high ceilings
- Consider vertical ventilation
- Use extreme caution when operating above or below wide-span roof trusses
- Fire departments should establish an SOP for operations in such structures
- Firefighters should not be committed to working either above or below a lightweight roof truss that is exposed to fire

At the Sofa Superstore fire in Charleston, firefighters faced the predicament of occupants reported by dispatch as being trapped inside and were therefore forced to commit crews to an interior approach. Under such circumstances we must consider the following –

A Risk-based Tactical Approach where Occupants are Reported Trapped

- Fires in structures of this nature are known to develop extremely rapidly
- Limit the number of firefighters entering the structure and assure their accountability through task based objectives and pre-entry briefings, as well as an effective accountability system of entry and egress



- Ensure hose-lines and water supplies are adequate for the task
- Be absolutely certain that the information you are providing search & rescue teams is the most up-to-date available at that time and communicate to them any changes to that information as made known
- As soon as occupants are accounted for, consider an immediate evacuation of firefighters and a defensive mode of attack where the roof truss or ceiling void is exposed to fire, heat or smoke
- Consider the safest entry point - In this case occupants were reported as trapped towards the rear of the structure but multiples of firefighters entered from the front
- Avoid horizontal ventilation as far and as long as possible, particularly where crews are working inside - at this incident several large store-front windows were taken from the exterior by firefighters, after crews were committed inside
- Take note of fire behavior hazard indicators such as changes in smoke color; sudden or powerful air-inflows that might indicate backdraft conditions; rising and lowering cycles of the smoke layer interface, indicating turbulence that accompanies rapid but unseen fire development etc
- The hazards associated with flashover; backdraft; or smoke explosion; are much greater in these type of premises

Reports attached

This safety bulletin is provided in draft format for peer review only - It does not represent a complete SOP or advise in full on any specific tactical approach to such fires - Provided by Firetactics.com 2007

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Los Angeles Firefighters Respond to Drug Store Fire

Story and Photos by Rick McClure, LAFD

On August 4, 2004, at 1733 hours, Los Angeles firefighters responded to the reported structure fire at a Sav-On drug store in the Arleta area of Los Angeles.

First arriving Engine 98 reported a large, one story "Drug Store" with heavy smoke and fire showing from the rear of the building and appeared the fire was in the attic.

In all, 30 companies of Los Angeles firefighters, 10 rescue ambulances, 6 Battalion Chief officer command teams, 4 EMS Battalion Captains and one Assistant Chief under the direction of Deputy Chief Jimmy Hill, responded to the fire.

Firefighters, initially using large stream handlines, encountered heavy fire conditions inside and were forced to retreat and go into a master stream, defensive attack on the fire.

It took 2 hours and 35 minutes to control the blaze.

One fire captain sustained a knee injury and was transported to a local hospital, and another firefighter was treated at the scene for heat exhaustion.

Cause of the blaze is undetermined at this time and the dollar loss is still being tabulated.

The store was open for business at the time of the fire.

Related:

- [Los Angeles Firefighters Fight Blaze](#)



ON THE JOB PENNSYLVANIA (By Jay K. Bradish)
16 DEPARTMENTS BATTLE MASSIVE STORE FIRE
Reprinted from the May 2000 issue of FIREHOUSE® MAGAZINE

On March 29, 1999, a fast moving fire destroyed the K-Mart store in the Route 51 Plaza in Pleasant Hills, PA. About 200 firefighters from 16 departments battled the blaze, which caused an estimated \$12 million in damage.

The 95,000 square foot, one story, cement block building was constructed in 1961. The flat roof was constructed of steel trusses with corrugated steel decking and a built-up roof. The store contained general merchandise, a pharmacy, a garden center and an auto center. The building lacked a sprinkler system and it was constructed in 1961, before it was required by law.

Pleasant Hills is a densely populated suburban community eight miles south of Pittsburgh and protected by 65 members of the Pleasant Hills Volunteer Fire Company.

INITIAL OPERATIONS



The fire company was dispatched at 12:38 P.M. to a reported "fire in a store-room." Chief Dan haeck immediately responded in Command 2 from a prior call and requested mutual aid from the Whitehall Volunteer Fire Company and the West Mifflin Volunteer Fire Department Stations 295 and 296. Pleasant Hills Engine 2 responded a minute later with a crew of seven. Haeck arrived on scene at 12:41, reported a working structure fire and established a command post in front of the main entrance (side 1). Engine 2 arrived on scene at 12:42, and was ordered to lay a five-inch supply line from a private hydrant at the south end of the Plaza to the main entrance on side 1, a distance of 450 feet. The crew of this engine initiated the initial attack and rescue operations.

Firefighters were faced with approximately 200 patrons and employees mass exiting the building through two single doors at the front entrance. The main sliding doors were inoperative due to an electrical failure from the fire. Store officials told the firefighters that the fire was located in a rear storeroom on side 3. At this time, dense yellow smoke was issuing from the roof area on side 3 and the garden center on the north end of the building (side 4) was charged with smoke down to the two-foot level. Black smoke was rising 75 feet into the air from the center of side 3.

At 12:43, a Pleasant Hills Rescue/Pumper, Rescue 2, responded with a five-man crew. Whitehall Assistant Chief Lee price arrived on the scene and took command of the side 1/side 4 corner at the north end of the building. The store manager told Truck Captain Gene Esken that the fire could be reached by going through the main entrance, to the rear of the store and up some stairs to a stockroom built as a "mezzanine" level above the ground floor. That's where the merchandise on the storage racks was burning.



Pleasant Hills Truck 2, a 102-foot elevated platform, responded at 12:45 with a four-man crew. A five-member attack team under the command of Pleasant Hills Captain Scott Kunz advanced an attack line consisting of 200 feet of three-inch hose with a 2 1/2-inch water thief and 200 feet of two-inch hose from engine 2 through the main door on side 1.



The firefighters had advanced about 30 feet inside the building when they encountered high heat and thick, black smoke advancing quickly from the rear of the store. The crew could hear a roar from the advancing fire and the collapsing roof. The metal deck roofing aided in the fire spread due to the three-foot open area between the bar joists where the superheated gases became trapped and ignited below the roof level, causing early collapse.

Rescue 2 arrived at 12:47 and laid a supply line from the North Route 51 hydrant to the front of the building to supply Truck 2. Truck 2 and West Mifflin Truck 295 were positioned on side 1 near the front entrance. Haeck ordered the interior crew to abandon the line and retreat from the structure.

The interior crew was already retreating due to the fire conditions and collapse when the order was given. It was decided to go into a defensive mode with master streams. At 12:50, Kunz informed the command post that all firefighters had safely exited the building. Within two minutes, the fire reached the front of the store, blowing out the front windows and threatening Engine 2. Assistant Chief Todd Pritchard placed the engine's 1,000-GPM stepgun into service along with a 200-foot 2 1/2-inch handline and a 1 1/2-inch trash line into operation at the front doors of the building. At the same time, Lieutenant Rob Richardson placed the engine's 2000-GPM deck gun into operation to protect the apparatus and firefighters from the flames.

Whitehall Truck 6, a 75-foot aerial, arrived on scene at 12:51 and was positioned on side 3, where Price was reporting heavy fire through the roof. At 12:51, the hydrant supply line to Engine 2 was charged. Haeck requested mutual aid from Broughton Fire Company at 12:53. At 12:54, the hydrant supply line to Rescue 2 and the supply line to Truck 2 were charged. A minute later, Engine 65's hydrant supply line was charged. West Mifflin Squirt 296 was positioned on side 1 south of the main entrance. Whitehall Rescue 6, a walk-in rescue with a cascade system, then arrived and was positioned on side 4 (north end).

VARIETY OF HAZARDS



Haeck again advised all firefighter NOT to enter the building. Supply lines were established from engines to Truck 295 and Truck 6. Haeck told price he was concerned about a collapse on side 3 as the building was fully involved and his primary concern was safety. Haeck ordered all firefighters who were in smoke to be masked-up as pesticides, ammunition and propane were burning and exploding. Minimum collapse zones were established around the building.



At 1:02, Price reported to command that the walls on side 3 were bowing. Haeck ordered the apparatus and crews be repositioned to the side 3/side 4 corner. Price requested additional manpower to side 3 to help relocate the apparatus and hoselines. From the platform of Truck 2, Lieutenant Mark Grimm reported that the wall on side 1 was leaning inward. Truck 2 requested additional water pressure from Rescue 2, but was told no more pressure was available. The Brentwood Fire Company was called for mutual aid at 1:10. Broughton Engine 42 arrived at 1:11 and was positioned at the Route 51 hydrant south of the complex. West Mifflin Wagon 295 had just completed laying a 1,200-foot supply line from this hydrant to West Mifflin Engine 295, positioned on side 1.

Engine 65 and Truck 6 reported to command that they had relocated to the corner at side 3/side 4 at 1:12. South Baldwin Engine 8 laid a 2,000-foot supply line from Engine 65 to a hydrant on East Bruceton Road west of the fire. Option Engine 10 hooked onto this hydrant with soft suction. Engine 65 was then able to supply Castle Shannon Truck 15, a 100-foot elevated platform located on side 4, with 2 200-foot supply lines. Engine 65 was also supplying Truck 6.

Haeck requested mutual aid from Jefferson Fire Rescue at 12:55. Rescue Engine 73 was set up at the corner of side 1/side 2 to protect the south-end exposures. This engine was supplied with a supply line from Engine 2. Crews operated 2 2 1/2-inch handlines. Jefferson Hills Fire Rescue Truck 16, a 100-foot aerial, was set up at the corner of side 2/side 3 and was supplied with a supply line from Pleasant Hills Engine 25, which was hooked onto the south private hydrant with six-inch soft suction that was initially taken by Engine 2.

A cement block firewall separated K-Mart from a furniture store and five other businesses. A coordinated defensive stand was successful at this point, even though the fire wall became distorted and damaged. Squirt 296, Truck 295 and Truck 16 operated aerial master streams along this area. Firefighters advanced two 2 1/2-inch handlines, one to the roof and one to the interior of the furniture store from Jefferson Hills Engine 293 along with Engine 2's 1,000-GPM stepgun to protect the exposures.

DECONTAMINATION ORDERED



Haeck declared the fire under control at 3:40 P.M. By 8 P.M., it was decided to release mutual aid equipment not in operation at the scene. Because of the various hazardous materials that had burned, decontamination of all firefighters and apparatus was

required. The Allegheny County Hazardous Materials Team was responsible for the decontamination of firefighters.

Water from firefighting operations mixed with paints, solvents, oil, fertilizers, pool chlorine, soap, shampoo, and pharmaceuticals and flowed into Lewis Run, Peters Creek and toward the Monongahela River. The Pennsylvania-American Water Co., whose water intake is at Becks Run, was notified and monitored the water for contamination. The City of Pittsburgh Department of General Services sent a diesel fuel tanker to the scene to supply fuel to the apparatus.

Pleasant Hills crews remained on the scene with one engine and one ladder until 9:30 the following morning. Crews returned several times over the next several days to extinguish hot spots as demolition crews removed the collapsed roof of the building.

An investigation was conducted by local fire officials, the Allegheny County Fire Marshal's Office, the Pennsylvania State Police Fire Marshal's Division and the Bureau of Alcohol, Tobacco, and Firearms National Response Team. Investigators believe that the fire was accidental and was caused by an electrical malfunction in the fixed wiring in the second-story storeroom.

In addition to the 16 departments that battled the blaze, several other departments were on standby. Over 12 million gallons of water was used to extinguish the fire. Two firefighters suffered minor injuries. Approximately \$3,500 worth of firefighting equipment was destroyed. Emergency medical services were coordinated by Baldwin EMS and four other agencies.

***Jay K. Bradish, a Firehouse® contributing editor, is a former captain in the Bedford Township, PA Fire Department. He has been a volunteer firefighter and fire photographer for more than 20 years.*