THE BOOK OF SHUPE

TRADITIONAL PRINCIPLES WITH THE MODERN FIRE SERVICE

INTRODUCTION

BY AARON FIELDS

I first met Jeff Shupe at a conference on the West Coast in 2002, or so. I was new to the fire service and was searching out folks that could help me fill in the holes in my knowledge and skill base. I had become painfully aware that I had some “holes in my game”.

After a particular evolution I recall Jeff recognizing that I was lost. I recall Jeff pulled himself out, turned over the station and spent twenty minutes or so explaining what and why of what we were doing to me.

Up to that point my experience had been one that most of us suffer. Brow beating for being new, lack of patience with working through skills from senior members, a “because I told you so” attitude. You know, fire service standard. But this time was different. Jeff pulled me aside explained why, talked me through how, in other words had a conversation with. There was none of the before mentioned behavior. He wanted to ensure that I got it, not only how, but why. In order to impart experience, we must first having an understanding of why, followed by a skill set that is shared.

It was simply a really senior guy taking a new guy under his wing and making sure the new guy got it. What I was struck with, is unlike many fire service instructors, he didn’t have the vibe of trying to prove anything. He freely admitted mistakes he had made and why they were relevant to how he does it today.

Keep in mind, he didn’t know my name or even where I worked.

I went away from that class feeling like I had an ally. I also knew right then, that the fire service standard for training wasn’t good enough, on a technical, nor cultural level. That twenty minutes of instruction helped set my compass in the direction I go. I also knew that if I was ever in a position, I would pass along anything that I could the way it should be done. I would attempt to be part of the cultural and technical solution.

Though Jeff doesn’t know until he reads this, I also looked every year to see if his fire department was hiring. Jeff rode on the back and I might just have a chance of riding with him if I worked there.

The years go by, I get asked to start showing a skill set that I have begged, borrowed, and tweaked. From the very first class I have cited my sources; I am simply one guy in a long line. When you practice with me, by definition, you are getting to practice with Jeff Shupe and the others who helped mold me.

Over the years the word got back to Jeff that some odd-ball from the far left coast, is citing him as an mentor. At another conference, years later, he introduces himself with “Aaron, my name is Jeff Shupe and I hear you have been saying some nice things about me.” “Do you like coffee, let’s sit down and talk.” Today, I can not only call Jeff one of my “senior men,” I can also call him a friend.

Jeff is one of the greats in our industry. He is what we should be; humble, skilled, passionate about the job, and straight talking.

Jeff would have never put this book together himself. It is important to me that folks get the opportunity to connect with one of the best. With the help of the Nozzle Forward cadre, Jeff's wife, and a couple of other "odd-balls from the Midwest we present to you...

The Book of Shupe

Jeff, all I can say is thank you.

Aaron Fields

Seattle Fire/ Nozzle Forward

TRIBUTE

BY JEFF DIEDERICH

My first encounter with Jeff Shupe was in early 1994. I was a cadet in a fire academy at the local community college, and HJS was the lead instructor. As I was a 20 year old kid I couldn't gauge the gravity he had except the undivided attention and respect he had from all of the other instructors and administrators. There was no question who was in charge of the direction and responsibility of that class. If the first impression is the most important one, then I would suggest studying HJS for his respectful, but not fickle personality that conveys leadership with principled personal bearing.

In 2010 my friend Matt Ditlevson told me about a fire service instructor from Seattle who was all about the art of hose line management. The kicker was that this guy was always referencing the instructors that helped him find his calling, and one of those names was HJS. My interest was peaked as I followed up, and took Aaron Fields class a couple of times. In conversation with Fields I made mention of my background with Shupe. That brought me back full circle to my fire service mentor. It is my deduction that Shupe is the most referenced without recognition fire service leaders out there, and Fields agreed. If you look at the publishing dates of his articles in this tribute book, and then the current gospel of the "engine guru's" out there making a big splash, I'm sure you will agree.

Jeff's character is above the average as you might expect. An interesting note is his devotion to family as well as the fire service. Finding balance between these two things is never easy for people that take their life's work as seriously as Jeff does. He celebrates his Cleveland Fire probation date with his anniversary with Kathy. It is obvious that he and "The Red Head" are still in a loving relationship, and he always smiles when talking about his kids. For the fire service everywhere I say "thank you" to Jeff's wife and children for all the support necessary for Jeff to pass on his life's work through his publications and teaching. My wife and sons have also found a friend in the Shupe family. Spending some time on their favorite inland lake with music and homemade brews in hand, and while cruising Jeff's 1974 fiberglass boat he restored makes for some great family memories. I am just as thankful for that as any of the professional experiences he has helped me with.

I am thrilled to have a small part in this collaborative effort to re-upload the traditional principles Shupe is presenting, defending and practicing. Both in family life and in the fire service Jeff knows exactly where he is and where he wants to go.

Thank you for all you have contributed Shupe.

Now let's get back to work!

Jeff Diederich

TABLE OF CONTENTS

James J. McNamee, Chief
Division of Fire

Subject: Commendation for the successful rescue of a 75 year old male victim trapped on the 2nd. floor of a 2 story dwelling on fire.

Sir:

I wish to recommend Hayden Shupe, Batt. 4 Aide for a special commendation for the fine rescue of a trapped 75 year old male occupant of a 2 story dwelling on fire at 3903 Bridge Ave. on Dec. 9, 1983 at 0030 hrs. Upon arrival of Batt. 4, fire was showing at several 2nd. floor windows and it was evident that this would be a hot smoky fire. An elderly female occupant who was injured but had escaped the fire told us that her husband was still inside the dwelling on the 2nd. floor. TF4 & L4 made the initial attack up the stairway and was searching for the victim. The heat and smoke made this a difficult operation and the rooms were cramped with the occupants belongings. At this point Hayden Shupe crawled along the floor to the front of the dwelling through thick smoke and found the victim in a front bathroom overcome. Shupe dragged the heavy male victim back to the stairs and other members of the Batt. helped him get the victim to a C MED. vehicle.

The victim is in stable condition as is his wife, and he will survive thanks to Hayden Shupe and all the men of TF4, L4, Rs2, E20, E1, and E2, who also did a fine job at this fire.

Respectfully Submitted by,

Joseph M. Vassel

Joseph M. Vassel
Batt. Chief, 4th. Bn.

* *

C OF C FORM 79-10

CITY OF CLEVELAND

DEPARTMENT OF PUBLIC SAFETY
DIVISION OF FIRE

RESCUE SQUAD CO. NO. 1

JANUARY 9 19 86

TO JAMES J. MC NAMEE (NAME) CHIEF, DIVISION OF FIRE (TITLE OR RANK)

FROM JEFF SHUPE (NAME) FGF. (RANK OR GRADE)

SUBJECT PERSONAL DISTRESS DEVICE

SIR:

Respectfully report that I have been using a personal distress device (Lifeguard II) by Antenna Specialists Co. of Cleveland, Ohio since October, 1985. This device is faithful to its obligations and works as it is designed to. There have been no malfunctions or problems with it.

The PDD is a battery-powered device using a 9 volt battery. When the battery is low, the unit will give a low-power "chirp". With the distress alarm activated, the PDD is capable of signaling for a period of approximately 10 hrs.

The switch mechanism employed is a cap-type switch protected by the body from being knocked-off. It is a 3-position switch: OFF * ON * ARM. When turned on for firefighting, the user puts it in the ARM position. The ON position will activate the alarm manually. The alarm is designed to activate when the user is motionless for a period of approximately 30 seconds. A few seconds before the alarm activates, a pre-alarm tone will sound. Sometimes the user stands still for a short time and is not in danger, thereby telling him to reset the alarm. This can be done by turning the device to the OFF position, then back to ARM. As long as there is movement by the user, the alarm will not activate.

The case of the PDD is made from LEXAN polycarbonate, which is very resistant to shatter. Color of the unit is a hi-visibility yellow.

RESPECTFULLY SUBMITTED AND FORWARDED THROUGH _____ CHIEF _____ BATTALION

BY _____ CAPTAIN, COMMANDING _____ CO. NO. _____

APPROVED AND FORWARDED TO THRU _____ CHIEF OF DIVISION

BY _____ CHIEF _____ BATTALION

C of C. FORM 73-10

CITY OF CLEVELAND

DEPARTMENT OF PUBLIC SAFETY
DIVISION OF FIRE

_____ CO. NO. _____

_____ 19 ____

TO _____ NAME _____ TITLE OR RANK

FROM _____ NAME _____ RANK OR GRADE

SUBJECT _____

SIR:

The Lifeguard II is a device meeting compliance by the NFPA. This means that the PDD has been designed to go through and pass a series of tests including drop-tests, audible sound tests, etc.

Maintenance of the unit is very minimal, as mentioned before the case is of Lexan. To clean it, just use soap and water.. Probably the most important item to check is the alarm to make sure it is working properly and as timed. To do this, first turn the switch to the ON position to check the manual alarm. Then turn the switch to the ARM position and place on a surface that won't move, and time the device till alarm. If this procedure sounds simple, that's because it is. When putting this PDD in position for use at a fire, just turn to the ARM position and your ready. If you feel yourself in danger, turn back switch to ON position and you have manually activated the alarm.

I have used this device every day that I'm at work. It has been in fires during wet and dry conditions, hot and cold environments. It is durable and adaptable for our use.

I strongly urge purchase of this personal distress device for the members of the Cleveland Fire Dept.

RESPECTFULLY SUBMITTED AND FORWARDED THROUGH _____ CHIEF _____ BATTALION

BY _____ CAPTAIN, COMMANDING _____ CO. NO. _____

APPROVED AND FORWARDED TO THRU _____ CHIEF OF DIVISION

BY _____ CHIEF _____ BATTALION

C of C. FORM 73-10

CITY OF CLEVELAND

DEPARTMENT OF PUBLIC SAFETY
DIVISION OF FIRE

_____ CO. NO. _____

_____ 19 ____

O _____ _____
NAME TITLE OR RANK

ROM _____ _____
NAME RANK OR GRADE

UBJECT _____

R:

If and when these devices are provided for the Fire Dept., I would recommend a class to give orientation on its specs, capabilities, and care & use. Perhaps an addition to SOP #8 could be drawn-up to include check of the PDD along with the SCBA at the start of each tour of duty.

Respectfully submitted,

Jeff Shupe, FGF
Rescue Company 1

RESPECTFULLY SUBMITTED AND FORWARDED THROUGH _____ CHIEF _____ BATTALION

BY _____ CAPTAIN, COMMANDING _____ CO. NO. _____

APPROVED AND FORWARDED TO THRU _____ CHIEF OF DIVISION

BY _____ CHIEF _____ BATTALION

City of Cleveland
GEORGE V. VOINOVICH, MAYOR

DIVISION OF FIRE
1645 SUPERIOR AVENUE
CLEVELAND, OHIO 44114
(216) 621-1223

JAMES J. McNAMEE
CHIEF

ALL-AMERICA CITY

December 15, 1987

Firefighter Hayden J. Shupe
Rescue Squad 1

I want to commend you on your heroic performance in the search operation at 2640 East 65th Street on December 7, 1987. However, it is extremely painful to all when sometimes the best efforts do not have positive results, especially when it is the fatal loss of 4 children and their grandfather.

The professional Firefighting skills you demonstrated by putting yourself in danger proves how fortunate the citizens of Cleveland are in having you on the Cleveland Fire Department. I am sure that you will continue to do the kind of job that will make your fellow Firefighters be proud to serve with you.

A copy of this letter will be placed in your personnel file.

Sincerely,

James J. McNamee, Chief
Division of Fire

JJM:wif
cc: Chief Mitchell, Executive Officer
William Kuhar, Firefighter, Public Education
Personnel File

The Rotary Club of Cleveland

MEDAL

for

Heroism Beyond the Call of Duty

is hereby awarded to

Hayden J. Shupe

for an act of valor performed

December 7, 1987

William C. Boehm
President
Rotary Club of Cleveland

James J. McGowan
Fire Chief
Cleveland, Ohio

Mitchell J. Brown
Director of Public Safety
Cleveland, Ohio

THE PLAIN DEALER

TS&LIVING

C

SATURDAY, AUGUST 27, 1988

The reality of fighting fires, like the 1982 local blaze pictured here, is expressed by firefighters from across the country in the book "Firefighters: Their Lives In Their Own Words."

PD/GEORGE HEINZ

Smoke eaters

Fighting fire is tough, dangerous and dramatic

By BRIAN E. ALBRECHT
STAFF WRITER

It was a five-alarm fire — flames blowing out windows, breaking through the roof of the former manufacturing plant — yet, ironically, Capt. Ronald Baker of the Baltimore Fire Department suddenly found himself in danger of drowning.

Moments before, he had stepped through a fourth-floor window, taken two steps and dropped 30 feet into a pitch-black elevator shaft. A girder broke his fall, and his pelvis in four places. He continued down another 30 feet, landing on his back, breaking it, then found himself being pulled under 3 feet of water by the weight of his equipment.

"I was like, 'OK, keep your cool; you know you're not dead and you can get out of this.' And then I started sinking, and I was like 'Oh, God, you're going to drown . . .' "

Struggling out of his gear, fighting cascading torrents rushing down the shaft from water being used to extinguish the blaze, choking through clouds of suffocating smoke, Baker eventually made himself heard and was rescued.

Three days later, Dennis Smith found him in the hospital. "He was in pain; he looked just a mess, but after telling me his story, all he could say was how he was going to get better so he could go back to work — that resolve and determination was so great," Smith recalled.

Smith has assembled firefighters' opinions ranging from the job's risks and rewards . . . to their experiences in plane crashes, rescues and nearly every type of fire imaginable.

"Later, I thought I'd like to share this guy's determination with other people. I knew I couldn't improve upon his story as a writer, that the only way to do it was as a journalist, so I went throughout the country looking for people like Ronald Baker."

The result is "Firefighters: Their Lives in their Own Words" (Doubleday, $18.95). Smith, a veritable Joseph Wambaugh of the smoke-eating set, has written eight other books (both fiction and non-fiction) dealing with fires and firefighters. He is perhaps best-known for the first, "Report from Engine Co. 82," an account of Smith's own firefighting experiences in the South Bronx from 1963 to 1981.

That first book had a profound impact on Cleveland firefighter Jeff Shupe, 36, who provided a local view of the profession during Smith's recent visit.

Shupe said his interest in firefighting — dating to when he was an 8-year-old in Canton who saw a fire truck and swore he'd drive one like it some day — was fanned to a white heat in 1972 with release of "Report from Engine Co. 82."

"It had me all nuts about firefighting. When his book came out, it was like lighting a fuse under a rocket," he said. Shupe even sent a letter to Smith, commending the book and asking how he, too, could join the New York City Fire Department.

Smith said the first book was "used by a lot of people to get a sense of what firefighting was all about." He said his latest was meant to accomplish both that and to relate, verbatim, the stories of firefighters like Ronald Baker.

SEE FIREFIGHTER/8-C

PD/ANDREW CIFRANIC

Firefighter

FROM/1-C

From interviews conducted in fire stations across the country (including Cleveland), Smith has assembled firefighters' opinions ranging from the job's risks, rewards and impact on family life, to their experiences in situations including plane crashes, rescues and nearly every type of fire imaginable.

Some of the thorny issues of the profession also are tackled. One such issue involves women firefighters. A woman in the book told of her experiences in training: "The animosity was unbelievable . . . The fireman giving the class made it plain that this was a man's job he was teaching." She said comments directed at her included: "You don't belong here; you're taking the job from a man who needs it."

Smith said opposition to women firefighters is twofold, involving both "a 100-year-old society (of male firefighters) . . . that just doesn't change overnight," plus "a cultural problem regarding women in that they're not strong enough — which, as it turns out, is generally true. They've got to work out to develop their upper body strength. Firefighting is a dragging job, a pulling job . . ."

Lowering physical standards in training (as was done in New York) so women can qualify merely exacerbates the problem, according to Smith. "It's a real mistake. While they may get the job, they're marked for life as someone who 'snuck' into the job," he said.

Shupe conceded that the issue "is as hard to swallow here as anywhere else. No one likes the idea of somebody being 'given' a job." He also said many male firefighters have misgivings about the ability of women, clad in 40-plus pounds of equipment, to pull down ceilings, carry out victims and other tasks of the profession. "It's a very physical job."

(Of the 884 firefighters on the force here, 10 are women. A federal judge recently ruled that the city did not discriminate in agility tests given women firefighter candidates in the past, but urged establishment of programs that would increase the number of women in the department.)

Regardless of sex, the risks and rewards of being a firefighter are extensively covered in the book. It's a job that can involve scenes of pure horror:

■ Incidents such as the one in which a Buffalo firefighter who responded to a propane tank explosion that had already destroyed two engines, killing the crew of one, watched as his brother from another fire company was carried away with a 5-inch wood stake driven into his throat.

■ Fires where, as one firefighter put it, "for every square inch of smoke you ingest, a square inch of something else comes out through your eyes, nose and mouth."

■ The human suffering witnessed by those working fire rescue

'The children get me more than anything. It takes a toll. Sometimes I think of my own children. What would happen if I lost one of them in a fire? I don't know how I would handle it. I really don't.'

children get me more than anything. It takes a toll. Sometimes I think of my own children. What would happen if I lost one of them in a fire? I don't know how I would handle it. I really don't."

The rewards can be as touching as a saving a young boy's puppy on Christmas Eve; as dramatic as a nationally televised rescue of a baby wedged in an underground pipe; as miraculous as discovering the sole survivor of airline crash.

They can be as simple as the plain satisfaction of doing a good job. As one firefighter related in the book: "The response I usually get from the general public is that you came quickly and you were skillful and you cared. That's what I want. You can't get any better than that."

Risks and rewards both play a part in why people become firefighters.

Shupe, who works with one of the three fire rescue squads in the city, checked off his reasons: "It's the challenge, the sense of excitement in defeating a fire, the satisfaction of doing a good job, the camaraderie."

Comments given by firefighters in the book echo those sentiments:

■ "When you're fighting fires, you say, 'There's a fire. There's a challenge.' You rise to that challenge, you want to beat it. When you do, you feel high . . . You're doing something important. That's what all firefighters feel about themselves: they feel important."

■ "We love risk-taking as firefighters. That attracts a lot of us. We are a nation of risk-takers, who do not believe in absolute safety."

■ "It's a job where you can find a lot of satisfaction because you can see the results of your work immediately. You know right away that you've helped people."

And then there was the firefighter who'd spent a lifetime eating smoke and knocking down fires, whose career was spent avoiding desk jobs and paper work just so he could stay out on that line of helmets and hoses. For him, firefighting came down to an old saying in the profession:

"I hate to see somebody's house burn down, but when it does, I want to be there."

City of Cleveland

Certificate of Appreciation

This certificate is awarded to

FIREFIGHTER HAYDEN J. SHUPE, RESCUE SQUAD 1

in recognition of extraordinary dedication and determination in saving the life of Joseph Barnes, 2, from a fire on Gaylord Avenue on Jan. 10, 1989. Although the search was hampered by heat, smoke, zero visibility, blocked or unusable entrances, and a confusing apartment layout, firefighters risked their lives to save a child.

Several times during this long and difficult search, they were driven out of the house by excessive heat, but each time, they returned, aggressively and persistently, until the child was found. Their heroic and exemplary efforts were performed in a manner consistent with the highest standards of professional fire service. The firefighters in the building were supported by fellow officers outside, who were fighting a fire that had spread from the basement to the attic. To each of you, congratulations on a job well done!

THE CORPORATE SEAL OF THE CITY OF CLEVELAND THE STATE OF OHIO. U.S.A.

AWARDED BY GEORGE V. VOINOVICH, Mayor

This 13th *day of* February *19* 89

George V. Voinovich

Silver & Gold, Inc.
of Greater Cleveland

Award for Valor

presented to

Hayden Shupe

of the Cleveland Fire Department for rescuing a female
October 18, 2001

Behind the Badge • Behind the Men & Women Behind the Badge • Behind the Men & Women Behind the Badge •
Silver & Gold

April 30, 2002
Date of Presentation

President

Business Manager

Cleveland Fire Department

Medal of Valor

This certificate awarded to

Firefighter Hayden Shupe

Engine 24

FOR YOUR HEROIC ACTIONS AT INCIDENT #44640 ON OCTOBER 13, 2001

YOU ENTERED A BURNING STRUCTURE FIRE WITHOUT THE PROTECTION OF A HOSELINE AND SEARCHED THE FIRE AREA. YOUR UNSELFISH ACTIONS SAVED THE LIFE OF AN UNCONCIOUS FEMALE VICTIM.

CHIEF _____ ASSISTANT CHIEF Ed Norman

The Rotary Club of Cleveland

CITY OF CLEVELAND FOR VALOR

MEDAL

for

Heroism Beyond the Call of Duty

is hereby awarded to

Hayden Shupe

for an act of valor performed

October 13, 2001

President
Rotary Club of Cleveland

Fire Chief
Cleveland, Ohio

Director of Public Safety
Cleveland, Ohio

C OF C 73-81
11/26/02

Division of Fire
Inter Office Correspondence

To: Kevin Gerrity, Chief, Division of Fire

From: Jeffrey Hageman B.C. Chief of Special Services

Subject : Engine Company Operations

I recently received a very comprehensive report from FGF Hayden Shupe E-24, in regards to engine co. operations, hosebed configurations and the use of solid bore nozzles. FGF Shupe has identified the pitfalls of 2" hose, common errors by FF's, flow charecteristics , the need to discontinue the "intermediate size hose" (2"), and the use of automatic nozzles.

FGF Shupe suggests the use of a 300' 1 ¾" w/straight bore nozzle on the crosslay, 300' 1 ¾" w/straight bore nozzle off the rear and 300' 1 ¾" with a low pressure elkhart stsm 30 w/fog nozzle also off the rear.

In our conversation the conclusion that was drawn was that this would be an excellent set-up for the FDNY or the Chicago Fire Department. These two cities have a much different running district than the city of Cleveland has. Their "bread & butter" fires are the 4 story walk-up, brownstones or tenement houses. These buildings require larger volumes of water and greater fire stream distances which Solid bore nozzles provide. One of the main problems in this type of structure fire is ventilation. In our city as you well know the "bread & butter" fire is the 2 ½ story frame.

I believe the current set-up we have which offers a 15/16" Solid bore as part of our break-apart combination nozzle is much more versatile. The combination tips offer excellent fire streams and protection for our nozzlemen. This is not to confuse using the fog to protect the nozzleman with proper ventilation, with upsetting the thermal barrier during fire attack with a fog pattern.

The BEARS unit w/TAC-5 conducted tests with the Elkhart stsm-20-fgat break-apart nozzle and the 15/16" solid bore stack nozzle.The conclusion was that this nozzle flows an identical Solid stream when the removable fog nozzle was taken off. In addition

Division of Fire
Inter Office Correspondence

this is the nozzle of choice when making foam and you still have the option of a fog pattern when needed in other situations such as automobile fires and rubbish fires.

In the future the division should purchase more 1 ¾" hose and break-apart nozzles.This would allow the phasing out of the 2" and implementation of 3 - 1 ¾" hose loads. Currently the 2" hose is all atleast 12 yrs. old. The use of the break-apart stsm-20-fgat should be used on the back step as well as in situations at hi-rise fires. I do not believe the use of 15/16" solid bore stack tips on 1 ¾" hose is a necessary change for the Cleveland fire department.

As part of the continuing education program at the FTA, I would like to see in the near future a class on handline operations and ventilation.

I want to thank FGF Shupe for his input, concerns and enlightenment on the current state of engine co. operations with the CFD. FGF Shupe's 28 years experience as a Firefighter and 12 years as a fire instructor and his dedication to the fire service have provided very valuable input.

Cc; Pat Kelly B.C.,Operations
Pat Gallagher Captain,E-24
Hayden Shupe, FGF E-24
File

Cleveland Fire Department
Engine Company Operations

Purpose: To examine engine company operations and to look at providing more efficiency and fireground attack capabilities for engine companies of the Cleveland Fire Department.

Scope: To look at increasing fire attack efficiency and capability through a more user-friendly hose load system coupled with fire hose nozzles designed to give greater flow volumes at lower operating pressures.

Reason: The present system of hose loads used on engine companies of the Cleveland Fire Department do no permit flexibility and fire attack capabilities when considering the present hose load configuration coupled with the nozzles presently used.

On most fires where a second 1-3/4 inch hose line is stretched, the company performing that function must: (1.) Find another nozzle. (2.) Take the time to couple the nozzle to the hose. (3.) Then stretch the hose for service.

In many cases, a company in haste will stretch a 2 inch hose just because there is a nozzle already attached and ready to go. There are several problems with 2 inch hose:

1. Because it has 1-1/2 inch couplings, and the hose is just 1/4 inch larger in diameter, members often think it has the same weight and characteristics as 1-3/4 inch hose.

2. The weight of this hose, when filled with water, is substantially more than 1-3/4 inch hose, making it harder to maneuver and control, especially in restrictive areas with only two firefighters and in some cases, only one firefighter on the hose line.

3. The flow characteristics of the 2 inch hose is insufficient when used as an exterior hose on major fires. Coupled with the automatic nozzle, it flows less than acceptable volumes especially when only one firefighter is controlling and supporting the hose line (one major fire department, through testing, determined that if one firefighter can support a hose line while flowing then that flow is less than desirable.)

4. The flow from two inch hose with automatic nozzles is about the same volume that 1-3/4 inch hose can flow. So why have an intermediate size hose line that can lead to extra effort and struggle by our members and has less maneuverability and no gain in overall fire power?

5. Fire departments from coast to coast, rural to urban, volunteer to full-time have conducted testing and evaluation and have settled on 1-3/4 inch and 2-1/2 inch hose for fire attack. The history of 2 inch hose within the Cleveland Fire Department is short and not clear. The hose first came out in 1982. Without any background or training, it was put in service to replace 2-1/2 inch hose with the belief it would flow that of 2-1/2 inch hose and provide an easier to handle hose line. Neither goal has been attained.

When this hose has been used inside structures, especially residential type, it has proven itself to be heavier and harder to handle. When the hose is stretched up or down stairs, or in tight hallways, the hose occupies more area because of its larger hose volume and also does not bend easily otherwise, kinking may occur. Coupled with the automatic nozzle (which regulates itself to approximately 100 PSI) the hose becomes rigid and is a constant struggle.

Because of the lack of gain of fire power in this hose in comparison to 1-3/4 inch hose, there is no benefit for our members. It is recommended to discontinue purchase and use of this hose and also to not purchase automatic nozzles.

6. To increase flexibility and attack capabilities and to make stretching of second, third (and even fourth) attack hose lines more efficient and easier to accomplish, it is recommended to consider an efficient, yet simple way of loading hose and to change nozzle types.

Most fires in Cleveland are fought using 1 3/4 inch hose. Many times a second hose line is necessary - sometimes a 3rd , and sometimes more. (A second line should be stretched by the 2nd due engine company whenever there is any volume of fire, or if the fire is in a multi-story structure; for fire extension; or to support the initial attack lines's position if they are encountering severe conditions; to protect important paths of egress. A third or fourth hose line should be stretched by subsequent arriving engine companies if any doubt exists about the control efforts.

Minimum target flows for 1 3/4 inch hose lines should begin at approximately 150 gpm*. This is easily achieved by using a solid bore nozzle with a 15/16" tip size. In actuality, this tip size at 50 psi nozzle pressure will deliver over 180 gpm. This is excellent knock-down power for this size hose line which is much easier to handle, and can control 2 or 3 rooms of fire.

By delivering this volume of water, the results are better control capabilities(coming from a hose line that is easier to handle because of less weight, and also has less pressure in it because it requires only 50 psi nozzle pressure. This makes firefighters safer, but more importantly any trapped

occupants may have a better chance of survival because of quicker knock-down.

The solid stream 15/16 inch nozzle packs more punch and penetration. It does not push air into the fire area, nor does it upset thermal balance. The stream when used properly disperses larger water droplets (and volume) over the fire area, absorbing larger amounts of heat. Coupled with ventilation, you have a tremendous reduction of heat and an air exchange taking place, which results in better control efforts.

The other nozzle to be used as a companion to the solid bore nozzle is the low pressure combination type. This nozzle will deliver a minimum of 150 gpm @ 50 psi. It is the model TSM30FLP by Elkhart Brass. This combination of solid bore and combination type nozzles will allow our members an excellent choice of tools guaranteeing good initial flows, whether the engine is arriving at a working structure fire or a smaller still type fire.

HYDRAULICS

All personnel of the Cleveland Fire Department must understand the role of the engine company - the goal is to get water on the fire. Members must understand that engine company personnel deal with hose and water. Whether on the first, second, or third due engine, water is the concern along with stretching hose lines to attack the fire or to supply protective systems or auxiliary appliances. Ladder companies and squad companies provide the other services to the fire ground.

Members on engine may rotate duties on a daily basis, or may have positions assigned monthly. Regardless, each member can use a simple formula to calculate proper pump pressures. It consists of : NOZZLE PRESSURE + FRICTION LOSS +/- ELEVATION

If the nozzle is solid bore.....

50 psi nozzle pressure + 20 psi friction loss per 50 ft. length +/- 5 psi elevation

If the nozzle is combination.....

50 psi nozzle pressure + 20 psi f.l. per 50 ft. length +/- 5 psi elevation

If both types of nozzles are used, figure approximately 60 psi n.p. plus the rest of the formula.

Hand lines of 1 3/4 in. Should never exceed 300 ft. in length.

ALWAYS, engine company personnel (nozzleman, back-up) should be on the hose line. In case of any pressure surge, or if the line needs to be moved or for whatever reason, including accountability and safety, the work on a hose line is made easier by company concept, where engine company personnel take care of hose work - ladders and squads take of truck work.

However, all personnel must be taught to remove kinks from hose lines. One kink may cost 5 gpm. If there are several kinks in a hose line, it may take away from the volume of water necessary for extinguishment AND safety.

Use of these nozzles will result in lower operating pressures, which in turn means less pressure in hose lines , making them easier to manage.

Nozzle Mechanics - the proper method of holding the nozzle and dispersing the stream so it "works the fire for you", should be instructed to everyone.

Hose Bed Alignment:

The following hose bed alignment is recommended:

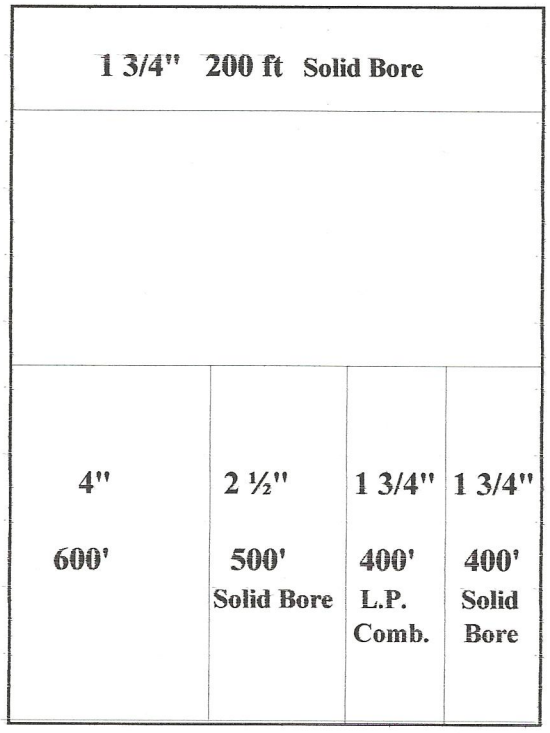
(1.) One bed, 1-3/4 inch hose, 400 feet with solid bore nozzle.

(2.) One bed, 1-3/4 inch hose, 400 feet with combination nozzle.

(3.) One bed, 1-3/4 inch hose, 200 feet with solid bore nozzle.

(4.) One bed, 2-1/2 inch hose, 500 feet with solid bore nozzle.

(5.) One bed, 4 inch hose, 600 feet (supply).



25 Operating Tips for Engine Companies

By Jeff Shupe, Firefighter
Cleveland Fire Department

Since the engine company is the most basic unit of service for fire attack, every member of every fire department should know the principles of engine operations and what it takes for an engine to arrive at a working fire, start water quickly, and maintain a sustained attack of the proper size and flow.

The following is a list of operational guidelines needed to get your engine company started in the right direction.

1. **Engine companies function as a team with a mission: "To get water on the fire!"**

Unlike ladder, squad, or rescue companies, whose members are assigned to cover different positions on a fire building (roof, outside vent, rear, floor above fire, etc.), the people responding on engines have the basic duty to attack and extinguish the fire. If engine company personnel do not perform their job by attacking the fire, the question is: who will? And if, for example, ladder company personnel find themselves on the nozzle, then their duties will not get done; and there will most likely be a delay in getting water on the fire. That could result in the loss of control efforts, greater loss of property, and worse — loss of life…be it civilian or firefighter!

2. **Don't block access to the fire building with poor apparatus placement.**

As a general rule, ladder trucks should "command" the fire building. If the aerial device is to be used for firefighting, rescue, or as a means of safety – access or egress for firefighters, it is no good if it is blocked from the building by poor engine placement. Personnel responding on engines must always keep this in mind. An example to illustrate this is when an engine is already on the scene, in a narrow, dead-end street. In this case, an engine second due should stop before entering the block so the ladder truck can get "into" the building. The second-due engine should consider backing into the block so that it may drive out to good water if a relay is necessary.

3. **If an engine is responding from a station with a truck company and another engine is first due, the truck should lead the response.**

Know your response district!

Know your dispatch assignments!

Know your approach to the fire location!

Listen to the radio!

4. **Attack hose should be loaded with male couplings "out," with nozzle(s) attached, and few or no adapters/appliances.**

SIMPLICITY! Study the fire problem potential in your city or district. Look at the buildings you may have to "stretch" into. Load your hose so it plays out easily with a minimum of effort from the hose bed. Remember how to estimate how much hose is needed to reach the fire. Use nozzles that give you the best flow possible with a minimum reaction force.

5. **Use a big-enough and long-enough hose line (1¾-inch cannot extinguish a fully involved house!)**

Most fires in dwellings and apartments are handled with one or two 1¾-inch hose lines. One 1¾-inch hose line can handle one, two, or maybe three rooms of fire. But this diameter hose will NOT extinguish all sizes of fires. Remember the acronym ADULTS, of which the late Andy Fredericks so often spoke?

Make sure you have enough hose to reach the fire area and a little beyond. The person on the nozzle should be responsible for having the "working length," which is about 50 feet of hose.

6. **BIG fires require BIG flow. Apply in a big way.**

Eight 1¾-inch hose lines surrounding a large fire do not constitute big flow volume, especially if these lines are equipped with automatic nozzles. Large fires require heavy, solid streams with force and penetration to reach into the fire and get to the seat. Lesser or smaller volume streams will not have effective power to extinguish any amount of fire and will probably put you in a "holding or containment" position — known to many as defensive! (A standard fire stream from a 2½-inch hose is 250 gpm.) Remember, when using heavy streams to position them to cut off the movement of the fire.

7. **Don't crowd the nozzle. Space yourselves approximately five feet apart on a hose line.**

If firefighters on the hose line take their position, crowding should not occur. Too often everyone wants to have a "piece" of the fire-attack action — the officer or person in charge of the operation must guard against this.

8. **Make every effort to keep the hose straight (approximately 5 to 10 feet) behind the nozzle to avoid kinking and whipping.**

Keeping the hose line straight makes for a more manageable operation with less effort by personnel. Coupled with good "nozzle mechanics," this will give the attack team an extremely maneuverable hose line to work with.

9. **There's generally more than one way into a fire building. Hose lines can be advanced up ladders or via ropes or through windows.**

Coordination is the key, along with good strategy and tactics when it comes to getting multiple hose lines into a structure. Knowing when and where and how to do this evolution can put a hose line in service in another part of the building, quickly with minimal effort.

10. **Support hose couplings on hose lines going up the side of a building.**

GRAVITY – 24/7! It wants to pull that hose line back to earth. Another reason to check your hose couplings during annual hose testing. Do you check hose couplings at test time?

11. **If you're stretching into an apartment building fire on an upper floor, use the "well hole" if present to minimize the length of the stretch.**

If one standard length of hose is 50 feet, then stretching one length vertically should take the hose line up five stories. Remember, support the hose couplings!

12. **Don't walk by any charged hose line that has kinks in it. Remove the kinks!**

ALWAYS remove kinks in a hose line. One kink may rob the hose team of several several gallons per minute. A few serious kinks may take away the amount of water needed to control the fire and keep the nozzle team protected.

13. **Tighten loose or leaking couplings.**

Lost water, more friction loss!

14. **Learn your nozzle(s) characteristics and how to "sound" with a stream.**

This is important, especially when operating in poor visibility and you need to find your "bearings" or things like walls or ceilings. When making a hallway filled with smoke and heat, open the nozzle at the ceiling first to control the hallway, then down and straight ahead in front. Listening for the water to ricochet may give you an idea of how long it may be. Listen to the power of the hose stream, also. Sometimes the person controlling the nozzle has to hold it close to his body because of no help from back-up and the pressure is too much to handle. In some of these cases the bale becomes partially closed. Even in heavy smoke conditions it is recognizable from its sound and should alert the nozzle operator to readjust the nozzle in front, so full flow can be attained.

15. **Move (or "lighten up") the hose line with the nozzleman's command. Don't move the nozzleman into the fire!**

People behind the nozzle operator, upon hearing the call for more hose, should not push hose toward the nozzle, but rather "feed it" to the team. If the attack team has to stop for whatever reason, hose pushed in behind them may kink or make the hose less manageable. Once again, try to keep the hose as straight as possible behind the nozzle team. Train together to see what it takes to "feed the line" to the nozzle. Find a building that has some long and cut-up hallways and stairways to work in.

16. **If only the person on the nozzle is holding/supporting the hose, then your volume is probably *less* than desireable.**

Unfortunately, this is too often a teamwork issue. Under fire attack, members of the hose team should be on the hose line relieving the nozzleman of any back pressure. If available firefighters are not helping manage the hose line, then the nozzle operator must do everything hieself, possibly working harder than necessary. Consequently, the call goes out to "lower" the pressure in the hose line — which in turn will lower the volume of the stream. Not a good thing! Remember, it's gallons per minute that puts a fire out.

17. **If heavy smoke and high heat conditions force you to the floor, cool the area to prevent flashover.**

Don't worry about water damage, especially in this situation. The fire has already ruined things around you. Don't let it ruin you! Cover as much of the area as you possibly can, including over your head with a full flow straight of solid bore stream.

18. **Gases igniting at ceiling level (rollover) are a preceding sign of flashover.**

Don't play with rollover. In a few seconds, it's FLASHOVER!

19. **Don't oppose hose lines, especially exterior vs. interior!**

Opposing hose lines and/or the mixing of tactics in this manner may result in injury, death, or the loss of property.

20. **The first-due engine should always look for its own water supply in the event the second-due engine doesn't make it.**

It's good practice and procedure to "back yourself up" with a hydrant supply or other water source. Remember, in firefighting nothing is for sure, except….

21. **If people assigned to engines are stepping "off" at the scene of a working fire (especially the first- and second-due engine companies) with hooks and axes in their hands instead of doing engine work, your department has organizational problems.**

Engine companies are responsible for the "water work." If you want to break things, go to a truck company!

22. **More lives are saved by the proper placement and operation of hose lines than all other life-saving techniques in firefighting.**

Placing a hose line in service quickly between trapped occupants and the fire will act as the quickest rescue effort possible because you are now attacking the fire, creating a safer environment for the victim(s) and firefighters, laying a "lifeline," and removing the problem.

23. **Know the VOLUME, FLOW RATES, and DISTANCES of your water sources.**

A thorough knowledge of water resources available (*i.e.*, hydrants, mains, tankers, static sources, etc., and their limitations will make for a much more effective attack.

24. **Your first-attack hose line should be placed to protect life and/or property from the threat of fire.**

Follow your Incident Priorities.

25. **The "drop point" for the working length is generally the floor below the fire floor or outside of a ground floor or lower level fire.**

Each fire is different with different hose length requirements. Know how to estimate proper amounts.

The nozzleman should always have the working length in his possession — 50 feet of hose with nozzle. This is usually enough to cover the fire area and then some. Take this amount to the drop point and flake it out, charge it, remove kinks…move in.

Basic Engine Company Operations:

First Due, Private Dwellings

By Jeff Shupe, Firefighter
Cleveland Fire Department

It's 2:45 a.m. and a 2½-story private, single-family dwelling is on fire in a typical urban/suburban neighborhood. The structure is wood frame construction. The first-due engine company is just pulling into the block, and the members recognize a familiar odor of smoke and see a slight glow over the rooftops in the distance.

As the first engine arrives, each of the members makes his own personal size-up, noting the car in the driveway, the swing on the porch, toys in the yard, and the air-conditioning unit in the window — all good indicators of an occupied structure.

The engine-company chauffer/pump operator (ECC/PO) pulls the apparatus slightly past the far corner of the house until the tailboard is aligned with that corner, applies the brake, and engages the pump. The firefighters in the cab have now seen three sides of the structure before getting out of the cab, noticing fire showing on the second floor — "B" (or No. 2) side of the building. The front of the building is now open for the ladder (truck) company to occupy. The truckies won't have to carry their ladders and tools from half a block away, meaning quicker access for them to do their duties.

Members of the first-due engine are starting to "lay it out" — (1¾-inch attack line with a solid-bore nozzle with 15/16-inch tip) when a lady screams out of the building that her husband is trapped upstairs. There is only fire and smoke showing, nobody else calling for help or in distress at any of the windows; but you know this frantic lady is "the real thing!" The officer quickly asks the woman where the man is supposed to be and if anybody else is inside. The firefighter assigned "nozzle" keeps heading toward the house with the working length (the first 50 feet of hose), reaches the drop point and flakes out the hose. The firefighter assigned "backup" plays the hose out of the static bed from the rear of the engine, estimates how much hose is needed to "make" the rear of the upstairs, breaks the coupling, hooks into the wye on the rear discharge, opens the wye and water is now flowing to the nozzle. As the nozzleman and officer head up the stairs, the backup firefighter will now "de-kink" and straighten the hose and feed the line to the nozzle and officer, lightening up on the line as needed.

While the hose was being played out, the ECC/PO charged the outlet with booster tank water. He is now starting to hand stretch a 4-inch supply line to a nearby hydrant. In a minute or two, the second due engine will arrive; that ECC/PO will help complete the stretch; and the hydrant supply will be established. The officer and firefighters of the second-due engine will be assigned to a second hose line because of fire extension into the attic.

The first hose-line nozzle is on the second floor hallway. Smoke is heavy — down to within a foot of the floor — and the heat is banking down too. Flames are coming out of the fully involved room and into the hallway. As the nozzle is opened, the stream from the solid-bore nozzle is aimed initially at the ceiling, and then works the upper walls. The stream is rotated around quickly, and then shut down. "Lighten up!" That is the command given to feed more line to the nozzleman as he moves toward the

fire room. Staying low, the same action is repeated until the fire is darkened down and control of the fire has taken place. The officer and backup firefighter are conducting searches, and the victim is found … burned but alive. He will recover.

Overhauling, checking for any fire extension, completion of ventilation, secondary search and rescue, salvage, and all other duties are completed.

Question: Was the first-due engine correct in attacking the fire first? Or should the members have "gone for the rescue?"

Answer: The first-due engine was correct in attacking the fire.

Reason: More lives are saved by the quick and proper placement of hose lines to protect trapped occupants than by any other means of rescue. The quicker a fire is brought under control, the quicker people are made safe.

In the fire service, it is the mission of the engine company to gain control of the fire situation. The engine company is the basic unit of service for fire extinguishment. Every member of every fire department should be familiar with the different tactics and operations of the engines within their organization.

In this scenario, which is repeated throughout the country, firefighters need only fall back on training and experience to understand the decision made by the first-due engine.

Fire Department Organization

From the time firefighters begin their careers as probies, cadets, recruits or candidates, they must be taught that engines are the units responsible for extinguishment and trucks (ladders) support the operation. Plain and simple. Fire departments that do not have ladder truck apparatus still must conduct those support functions.

In the case of engine operations, generally the first-due company will attack the fire using a line sufficient in volume to go after the fire. To do this efficiently requires position assignments and a certain discipline that everyone must follow so that the mission is accomplished in a timely manner. Not following assignments or having a plan that is deficient in organization will result in an ineffective fire attack that lacks safety and accountability. If firefighters arriving on first- and second-due engines are stepping off with tools in their hands instead of performing engine related duties, there is an operational problem. In the scenario presented, each member of the first-due engine company had a job to do and carried it out. The end result was a hose line in service quickly to extinguish the fire, paving the way for rescue of the occupant. The second-due engine concerned itself with first helping to establish a water source to the attack engine, then stretching a second line to deal with fire extension.

Attacking the fire first gave firefighters the ability to control the situation while at the same time making for a safer environment in which to operate. It also afforded the occupant a better chance of

survival. If the first-due engine company had "gone for the rescue" and not for control of the fire, it is likely the fire would have flashed over throughout the upper floor thwarting any rescue effort, perhaps trapping firefighters.

Positions/Assignments

Engine companies, whether career or volunteer, must have an organizational plan at emergencies that all members understand. The fireground is not the place to debate task assignments. In most instances, fire departments already have a system in place that designates positions and assignments. The following are four basic job assignments for a four-member engine company:

- **Company Officer/Acting Officer** — Usually this position is covered by a lieutenant or captain, or even a senior firefighter. Responsibilities for the engine officer include size-up, crew accountability, apparatus positioning on the fireground, determining proper actions on the fireground which generally means following department SOP's, selection of appropriate size attack hose and nozzle type, gathering information, communicating with the incident commander and other units on the fireground, monitoring crew performance and ensuring their safety. If the engine company is in the attack mode and little or no progress is being made, it becomes the company officer's duty to troubleshoot and determine the problem and how to correct it (*i.e.*, insufficient flow or pressure, kinks, etc.)

- **Engine Co. Chauffeur/Pump Operator** — One of the best questions asked at the 2002 Fire Department Instructors Conference (FDIC) Hands-on Training (HOT) engine company operations drill site was: "Do you have drivers, or do you have people who know pump operations, proper pressures, friction loss and how to read gauges?" The position of the ECC/PO is so important that one must realize that if he or she cannot get water AND keep it flowing, extinguishment efforts will fail or, worse, lives may be lost. The ECC/PO must first be able to drive the company to the scene quickly but safely. If we don't get to the scene safely, we can't help anyone. Second, if responding units expect you to be first, but your response is terminated or delayed due to an accident or unforeseen reason, it places units in a different position in response order, creating a delay in suppression, not to mention one less engine on the scene. Any delay in response should be communicated to all units responding by the officer of the delayed unit. This minimizes any surprises upon arrival. When the engine arrives on scene, the ECC/PO should place the engine apparatus so as not to block any other apparatus, particularly ladder companies, from getting into position. In many cases, the ladder company and how quickly they can get to work, paves the way for better engine operations. This would include getting to the roof, throwing ladders to vent and gain access/egress to the fire building. The ECC/PO sets the brakes, engages the pump, throws the wheel chocks, and moves to the pump panel to open the "tank to pump" valve and throttles to the starting pump pressure. The pump pressure will be determined by the hose line pulled and the type of nozzle used. For a hose layout of 150 feet with a 100-psi fog nozzle, a starting pressure of approximately 150 psi to 160 psi will produce sufficient volume to initially attack the fire but will need adjustment as a water supply is established. For handlines with solid-bore nozzles, a starting pressure of approximately 100 to 110 psi will provide an ample stream. Once again, the pressure will need adjustment as a water

supply is established. After these steps are completed, the ECC/PO can start to hand lay a supply line to the nearest hydrant or water supply point. In some cases, the back-up firefighter can help with this task, depending on the severity of the fire or location of the hydrant or the time anticipated of the next engine or unit to arrive. After the supply line is ready, the ECC/PO should adjust the pump pressure as necessary, set the relief valve (if your department requires it), and monitor gauges. This does not mean the ECC/PO needs to be glued to the pump panel. With today's more efficient pumps and a reliable water supply, the ECC/PO can change air bottles, chase kinks out of hoses, and perform a variety of tasks in close proximity to the apparatus.

- **Nozzle Operator —** As with any position on the engine, the person operating the nozzle must know how to properly operate the nozzle to get full capability to knock down the fire. Companies should train regularly with various nozzles to familiarize themselves with the type and volume of streams produced. They should also understand the operational techniques of each nozzle in order to ensure proper use in the heat of battle. The person on the nozzle should be responsible for the first 50 feet of hose along with the nozzle. This amount of hose is taken to the "drop point" where it is flaked out, straightened, and de-kinked to prepare to move into the fire area. The hose should be moving into the fire area in a straight line because it will have less reaction, whip, and less chance of kinking, and is easier to control. The drop point is generally the floor BELOW the fire floor. If the fire is on a first-floor level or basement, the drop point may be outside where it can be straightened and made ready to move into the fire building. The nozzle should always be positioned between any trapped occupant and the fire. In other situations that are not life-threatening, the nozzle should protect the most severe exposure both internal and external.

- **Back-up —** Without a doubt, this is the most unglamorous position on the stretch, but it is as important as any other position and should not be disregarded. Without this person estimating the proper amount of hose, the nozzle may not reach the seat of the fire. Without someone to make sure all kinks are removed, the nozzle may not get sufficient water, resulting in firefighters getting burned. Without someone positioned by the door or corner to "feed" hose to the nozzle team, more strenuous effort will have to be exerted, hastening the fatigue factor. Everyone wants a piece of the action and wants to feel the heat, but if the back-up person does not follow the plan and decides to join the nozzle team, crowding occurs. In the event the nozzle operator needs to back out because of danger or high heat that those crowding behind do not feel, he or she may get burned because of it! Once the hoseline is in position, the back-up can move up to within a few feet of the nozzle operator and relieve some of the back pressure. The back-up person should always be ready to replace the nozzle operator or assist in maneuvering the hoseline when called for.

Conclusion

Following an organizational plan will increase fireground safety and provide better accountability, resulting in a smoother flow of control efforts. Company efficiency is increased when there are guidelines or standard operating procedures to follow. It builds teamwork and is reinforced when

members see positive results such as rapid line deployment, easier maneuverability and rapid extinguishment.

With each member performing his or her designated role, the company officer concentrates less on what individual tasks are and more on the function of the unit as a whole, whether they are first, second, third or twelfth to arrive. These basics apply to any size, type, or kind of fire department.

Lessons Learned

1. Getting water on the fire is the duty of the engine company. Failure of the engine company to perform this basic task means the entire operation suffers resulting in the lack of coordination, accountability and safety.

2. Training. Each member must understand the duties of each position and the tasks involved in accomplishing their goals. One day you may be the back-up; the next you may be in charge. Different situations require different actions such as highrise fires, buildings with standpipes, those without, those requiring long stretches and those situations with poor water supplies all require a different set of guidelines to follow. Plan for them. Train for them.

3. When operating from the booster tank initially, remember that there is only so much time to operate with a limited water supply. Everyone must move quickly to get their jobs accomplished before the tank runs dry. Drill regularly so that everyone knows where water sources are and how long it takes to get supply lines in service. Effective use of water is accomplished by proper nozzle placement — in other words, where the water will do the most good. It is sometimes surprising to see how much fire can be controlled with a limited amount of water. But always get that supply established!

4. Organization and teamwork. The fire scene can be very complex at times, especially where there is an out of control fire and life is at stake. An individual firefighter may try to do several different tasks at one time or may feel the need to accomplish all tasks at once. This environment can lead to chaos and freelancing resulting in firefighter injuries, fatalities, loss of civilian lives or extended property loss. On the fireground, company organization and a disciplined approach that requires each member accomplish assigned tasks, results in greater efficiency, accountability and provides for a safer environment.

Training

The importance of "Training to Learn . . . Learning from Training"

By Jeff Shupe, Firefighter
Cleveland Fire Department

Talk to any firefighter who has twenty or more years in any urbanized area in the U.S., and I'll bet he can talk of the "old days" when you didn't wonder when the next fire was going to happen. In many cities there were neighborhoods where the next "all hands" was just a few hours away!

Reading the annual fire statistics from both local and national reporting systems, there is no doubt that the number of working structure fires is down considerably from ten or twelve years ago, and the number of serious or extra-alarm fires has also decreased sharply. All this is good for our communities, and we probably owe this fact to a number of programs the fire service has put in place over the past decade. Of course, our people (firefighters) are safer than they were during the "war years" or are they? What about the lack of experienced personnel today?

Take a look at the annual death and injury surveys, and you see that even with fewer actual fires, we still see a steady number of fatalities and injuries occurring. With the fire service becoming so involved in providing different services to the communities, I wonder if we have given up time to train in firefighting because of our need to be available to respond to non-fire emergencies or if our administrators look at training as being a costly thing to do? Sound familiar?

Like many of you, over the years I have been and continue to be involved with several training programs. I know from my experience that any opportunity to train should be taken advantage of. This will keep your skills sharp and you safe. I'm going to go out on a limb here by saying that probably the best training you can get is hands-on...agree? I hope so.

A sad fact is that many fire firefighters don't have live-burn training opportunities except maybe those in a "clean burn" building. (This has been a subject of discussion by many people in our profession, and I won't address it here. But in my opinion, the acquired structure live burn is best, especially if managed properly.)

Recently, I coordinated live fire training in two large structures, one a vacant three-story high school slated for demolition and the other an 11,000-square-foot mansion, single family residence. Yes, that's right, an 11,000-square-foot mansion! (It was given to us to train in and burn and has since been demolished to build a 15,000-square-foot home!) Each one presented a unique type of fire training opportunity and fire problems to drill on.

In this presentation, I will cover the mansion.

The "mansion" was built in late 1970's by a major builder in the Cleveland, Ohio, area. It had all you would expect and more, including full live-in maid's quarters and the type of library you see in movies — 25 feet high with the ladder to reach the upper levels. The structure was two stories in height, approximately 100 feet long. It was situated in a suburban setting, about 400 feet from the main

street, with only a single driveway leading in. Ironically, the main hydrant to supply the scene was also located at the street (two hydrants were used — one for fire attack and another for safety supply).

Our plan was to go over firefighting basics, *i.e.*, attack, ventilation, rollover/flashover, RIT, command, MABAS, and something my partner had taught in a previous class — the "commercial-size" residential structure. After the classroom presentation, hands-on training was conducted with 1¾-inch and 2½-inch hand lines, going over hose line management, nozzle mechanics, pressures and flows. Solid bore nozzles were the nozzle of choice for the attack lines.

In the evening, after a walk-through and familiarization, the structure was filled with "smoke" for search and rescue drills using thermal imaging cameras (TIC's). One of the interesting learning lessons was having a search team use a camera in their evolution while members not participating used the other camera to watch how that team performed.

The actual live-burn training lasted 3 days — you can do that in a place that big! Each day members of four fire departments worked together under the scenarios that would be representative of real mutual aid situations. A minimum of six good "all-hands" fires were set each day, with nine happening one day and seven on another.

If you're wondering about how the structure withstood all the burning, it actually did very well! What we found in the "familiarization" was a building that was over-built. In one room, we found one-inch thick tongue-and-groove oak boards with one-half-inch plywood as a backer, making quite a substantial wall thickness! On more than one occasion the fire did extend and gave the members an extra challenge, but the building availed itself to more of our "abuse"!!

At the end of all training, we looked back at our work and listed what went on and discussed everything at a full critique four weeks later.

What did we accomplish?

- Good live-burn, hands-on training for over 75 firefighters from four fire departments
- Thermal Imaging Camera training — learning that the camera is a tool with limitations
- Recognizing the need to look at fires differently because of buildings, their construction, characteristics and potential problems
- The need for fire departments to train together on a regular basis
- The understanding that if you work together with other fire departments, you MUST standardize your operations
- That the IC of a small fire department cannot think small — you must think BIG in major operations

- In each evolution, attack crews stretched lines from the hose beds of apparatus after ignition. This adds to training realism working with your equipment — learning its weight and other characteristics and being able to put an attack line in service quickly.
- Recognizing strengths and weaknesses in mutual aid systems and working with different personnel from other fire departments

What did we learn?

Engine Company Operations

The open area in a structure of this size will allow for large fires to develop and spread rapidly. Be prepared to use 2½-inch hose lines for attack.

1. One well-placed hose line of the right size and volume can control a large amount of fire, especially with a solid bore nozzle. However, never let that lull you into thinking you do not need a second line...or more!

2. In large structures, large fires occur. Firefighters should never get lazy and think that 1¾-inch attack lines are the only size hose line needed. In one scenario, we had fire spread so quickly and create such a volume of fire it required a 2½-inch hand line for knockdown, and two 1¾-inch hand lines for extension. Large volume structures need heavy streams that have reach and volume.

3. Engines should have hose beds that provide for multiple attack hand lines ready to be put in service quickly by personnel when an incident calls for it. Once again, standardization of fire apparatus should be a point of consideration among departments that work together.

4. Engine crews should always stay with their hose lines. Don't drop them or leave them unattended after knockdown — this is for accountability and safety; and always have the nozzle ready for water just in case something "weird" happens!

Stay low in smoke and heat, and look up to see what is overhead.

5. The crew with the attack line.... Make the call for water QUICKLY and make sure someone (like the pump operator!) heard you and acknowledges. (Take the hose as close to the fire as possible, make the call for water, then "mask-up." Too many times we noticed people putting masks on at different intervals of the

hose stretch and then trying to talk through the handie-talkie to someone. In a lot of cases, the message sent was unclear and nobody replied. Remember, you're on the attack line! You must have water.)

When stretching in, keep your hose lines straight and firefighters spaced.

6. Look up when entering the fire area and you are in heavy smoke and heat conditions. Looking up at the ceiling while staying low to the floor is a good practice because this is where flames will likely show themselves through the smoke. In a couple of scenarios, we noticed firefighters looking down at the floor as they took the line in. In one particular scenario, the fire was progressing toward rollover and actually drafting for the door we entered, thus cutting off egress before extinguishment took place. The nozzleman was looking down at the floor, crawling around blindly and had no idea of what was happening overhead.

7. Keep attack hose lines STRAIGHT! Do not push excess hose toward the attack crew until they call for more line. Feed or lighten-up the hose when the attack team calls for it. Do not force hose towards them. Keeping the hose straight makes the hose more manageable. Piling hose in the entrance to the fire area can create a hazard leading to kinks or tripping or other problems. If firefighters should have to retreat and follow the hose line to safety, wouldn't it be better to follow a straight line out rather than figure out a pile of hose?

Ladder Company Operations

1. Placement of apparatus. Right away, with arrival of the first due companies, the truck needs the choice of placement on the fire ground. In this case, with only a single-lane driveway, you only get one chance to do it right!

2. Good apparatus placement means ladders and tools get to their places on the fire ground more quickly. However, because of the size and length of this structure, ladders and tools had to be carried a considerable distance to cover the fire building. From this we learn that we must be in good physical condition for this job!

Ventilation can be as important as putting water on the fire.

3. Tools. Tool assignments are imperative. The fire ground is not the time or place to determine what tools are needed for a particular job. Firefighters should receive tool and fireground position assignments at roll call. Volunteer and part-time departments can address this by having tools

assigned to seats in the cabs of the ladder trucks, like a seat with the “irons” or the “roof” seat or the “OVM” seat. Departments without ladder apparatus can have tool check-off cards for the job being assigned.

Water Supply

It goes without saying, a structure like this needs pre-planning, and water supply is one of the items. As the first-due engine goes into the fire building, the second-due engine must be thinking relay or second water source. It was discussed on site about the best options to get water secured. In any case, time will be a critical consideration; and, under real fire situations, firefighters must guard against putting themselves in precarious positions especially under heavy fire conditions.

Incident Command

Each member participating in this training was made aware of the role of the incident commander. All members had previously been trained in ICS. It seems, in so many cases, that the IC is taught to stay stationary and NOT to move. However, in a structure of this size, it becomes necessary for “command” to move around and see what’s happening, especially early in the incident when resources are few. Here are some of the items we noted.:

1. Lack of fire ground communications (not enough radios, not enough talk, etc.)

2. Poor coordination of strategy and tactics (how the IC can see and correct if possible)

3. Misinformation, lack of understanding — terminology!

4. The IC can now see for himserlf/herself what is happening rather than piece together a picture of what is happening. And now the IC’s plan for the incident can remain or be changed based on the needs of the incident.

5. ALL units that respond to an incident must report to the IC and WAIT for orders. If the IC is not within sight, just call him by radio and announce your presence! Do not self-assign or freelance. Hold fast in an obvious fireground location.

6. The IC should not be concerned with collecting name tags! If the IC is doing that, then he is not commanding the fire! Someone else should be assigned this task.

Breathing Apparatus (SCBA)

It was noticed that some firefighters with mask-mounted regulators (MMR’s) would have their face pieces on outside of the structure without having the regulator

hooked up. This was discouraged because of the fact that the face piece can fog over internally, and, more importantly, this causes reduced vision. The firefighter looks out of the fogged-up face piece through the little regulator hole and can miss trip hazards or other unsafe situations. In our wintertime, this problem is multiplied! Plus, there is no guarantee that the seal will still be good when the regulator is hooked up. Any air use outside in clean air was discouraged — use only in smoke. Thus firefighters taking the line in were encouraged to “mask-up” together after the hose was in place and the call was made for water. Also, that time of putting on the face piece near the fire lets you make any last-second observations of the immediate fire area, rather than putting you in mode of having to “rush-in” and maybe missing something important.

These are just a few of the many points we covered in this training. There are more, but too numerous to list. Hope you enjoyed reviewing them and maybe use a couple to help you out.!

Please keep in mind there are three items necessary for successful firefighting: **Training ... Teamwork ... Experience!**

Remember, stay low and stay safe!

Don't Rely On That Pre-Connect All the Time

By Jeff Shupe, Firefighter
Cleveland Fire Department

Does your fire department, like many around the country, use pre-connected hose lines exclusively? Have those pre-connected hose lines become the "go-to-line" for practically every fire situation you come across? Do they have an impact on where your engine stops and sets up at a fire scene? Do you feel that you are able to put this line in service quickly because it is already connected to a discharge outlet? Have you ever had to pull all of the hose out of a pre-connected hose bed when only one or two sections were needed? (unless you have a trash line!) And

The two crosslay pre-connects each contain only 200 feet of 1¾-inch hose. The hose beds on top, each carry 300 feet of hose. This arrangement and amount may hinder fire attack capabilities. When different length and different size hoselines are employed (with different types of nozzles) the pump operator needs to be proficient at hydraulics.

lastly, have you ever "come up short in your stretch?"

Chances are, if you answer yes to the first question, you will probably answer yes to the rest.

Truthfully, there is nothing wrong with a pre-connected hose line on your engine. The idea of having an attack line that can be put in service quickly with a minimal amount of effort should have everybody's attention. However, a hose line like this is not without some drawbacks, even in cities and towns where the structures are right up to the sidewalks.

If you rely on pre-connected hoselines, have a couple of donut rolls on the engine. Here two firefighters add a section of hose to a pre-connected line that came up short of the fire.

Let's take a quick look at pre-connected, cross-lay hose beds, the kind that sit on top of the pump panel and/or below it (speedlays!). Many departments will have two or three cross-lays, maybe more and have a couple of different sizes of attack lines, too. The concern we should have here is the length and diameter hose carried in each bed. Some departments carry various lengths of attack lines like 150-, 200-, and 250-foot lines.

When firefighters arrive at a fire they select whatever size and length they need for the job, play it out, call for water and go have fun! It only takes two firefighters to do this. But if the fire you're working at requires you to pull your longest pre-connect as your initial attack line, and a second line needed (and maybe quickly, for whatever the reason), what is the length of your next pre-connected line to be stretched? It may be that your reliance on pre-connected lines have you at a disadvantage of getting this important second line in service quickly. In

this scenario you now have to add one or two lengths of hose to the second line to meet with the first. And the time supposedly saved by pre-connected lines is gone, too.

This crosslay is a static hosebed designed to accommodate up to 400 feet of hose. Note the "wye" connected to the outlet. Another "wye" is on the officer side of the engine.

Is there an answer for t his problem? Sure is! Why not consider using a STATIC hose bed? The static bed can eliminate some of these problems and is easy to deploy — even with only two firefighters. A simple change in the amount of hose and arrangement and you have an attack line where you pull off what you need, break it, hook it into an outlet and open the gate — you have water flowing! EASE and SIMPLICITY.

The static hose bed is nothing more than a flat load of hose that is not pre-connected to any outlet. The last 50-foot length loaded on can be put in a small coil of 6- or 7-foot loops with the nozzle attached. This is called the working length. This working length is for your 1¾-inch and 2½-inch attack lines and should give the nozzleman enough hose to make the fire area and a little more.

The length of hose in each bed is not any set amount and should be determined by local conditions. However, as a rule of thumb, a 1¾-inch attack line should not be stretched more than 300 feet without having a larger hose line to supply it. This is because of pressure (friction loss) and volume considerations. Our target flow for this size attack line should be 180 gallons per minute. If your department uses combination or automatic nozzles, you must also factor in the 100 PSI nozzle pressure they might require.

A bed of 2½-inch attack hose can have a much greater amount of hose for longer layouts and still meet or exceed its flow potential because of its lower friction loss as compared to smaller diameter hose lines. Hopefully, your fire department will have a solid bore nozzle on your 2½-inch attack line. After all, when you pull this line, you're saying you need lots of water with penetrating power!

Another thing that the cross-lay / pre-connect hose beds seem to foster is stopping the engine directly in front of the fire building so the hose can be pulled right to the front door. Congratulations … if you have a ladder company responding, you have successfully blocked the first due truck from gaining their fire ground position. With a limited amount of hose in each pre-connected bed, the concern is to get a "front row" seat by the front door to guard against a possible "short stretch." With static beds of greater hose capacity, this should not be a problem anymore. In most cases, one extra length of hose is all that necessary to get the engine away from the ladder truck's spot.

Cross-lay hose beds can be used as static beds. If they are, all you need for water supply is to have a "wye" connected to each side of your engine, so no matter what side the hose is pulled to, there will always be at least two outlets for that size hose.

Many fire departments work from the rear of their engines. The primary 1¾-inch on the right, along with 2½-inch attack lines are folded to create the "working length" that the nozzleman will take to the fire.

Many urban departments such as the Cleveland Fire Department, run with attack lines coming from the rear of the apparatus.

There, a single 2½-inch discharge outlet gets a wye to handle the 1¾-inch hose that comes from the rear hose beds. Any 2½-inch hose also comes from the rear, but is connected to a side discharge outlet.

The last thing I'll hit on is the thinking …"if we can get a 1¾-inch pre-connected line in operation quickly, it'll have the power to knock down any fire!" WRONG! No matter how little time it takes to get your attack line in service, each fire has its critical water flow requirement necessary for extinguishment. If we don't meet or exceed that flow, the fire will continue to burn and just walk away from us. Have you ever witnessed a large multiple alarm fire with all the big guns working and there was a firefighter holding a line of 1¾-inch hose by himself shooting water in a window from across the street? He was probably looking good for the news camera, but having no effect on the fire whatsoever! Our departed brother Andy Fredericks reminded us of the acronym "ADULTS" that serves as an aid in determining when to use a 2½-inch attack line. The National Fire Academy has an easy formula for computing initial flow volumes for structure fires. You just need to figure out what size attack line will accommodate the flow.

Editors Note: The acronym "ADULTS," refers to scenarios requiring the use of 2½-inch handline(s):

- ***Advanced fire on arrival***
- ***Defensive operations***
- ***Unable to determine extent (size) of fire area***
- ***Large, uncompartmented areas***
- ***Tons of water***
- ***Standpipe system operations***

The National Fire Academy Formula is a quick-calculation for determining Needed Fire Flow (NFF). It is as follows:

NFF = Length x Width ÷ 3

Estimate the length and width of the building. Multiply the two estimates and divide by 3. This gives you the needed fire flow for 100% involvement of that floor. If the area is not fully involved simply multiply the percent involvement times the 100% involvement figure. For interior exposures, add 25% of the 100% involvement figure, for no more than 5 floors. For exterior exposures, add 25% of the 100% involvement figure for each side of the fire building that has an exposure facing it.

Perhaps firefighters need to be trained and schooled more in fire ground operations, tactics, hose-line placement, the all-important second line, the third line, when to select a big hand line, etc. Has the fire

service come to think that because the majority of fires we respond to requires only one attack line the need for additional lines of equal size and length is not necessary?

I am not advocating that you run exclusively with static hose beds.

You may feel there is no need to even consider this concept. Or you may be satisfied with your present system. That's fine! But if you think it is something to consider for your engine company's efficiency, then give it a shot. Do your research and field-testing. Maybe having one static bed would complement your pre-connected lines (so your second line won't be a short stretch!).

As for questions on the ease of putting a static hose line in operation, you might be surprised at just how simple it is, and how little time it takes — even with two firefighters! Back when I was a little ol' new kid (a couple of years ago!) my much experienced senior man told me that for most structure fires, "our company strives to get a 200-foot line of hose in operation within 90 seconds from the time the brakes are applied!"

That has stuck with me during my career, and I have used that timetable for teaching evolutions at basic fire training schools, conferences, and classes throughout the years. I have demonstrated the evolutions with two firefighters and three, and more, deploying multiple lines.

Another thing that gets hose lines in operation quickly and efficiently is teamwork and company organization. We'll save that for another time!

Thanks again for your time. Stay safe!

FIGHTING FIRES IN “MONSTER HOUSES”

02/01/2005
By Jeff Shupe

A TREND IN TODAY’S RESIDENTIAL CONSTRUCTION and one that has been growing for some time throughout the country is the development of single-family dwellings of extreme size and volume. In some areas, these homes have been nicknamed “monster houses,” and rightly so. These structures have the size and volume of some large commercial buildings. The potential problems these dwellings can pose during firefighting warrant special attention.

(1) Monster houses like this one can pose gigantic hazards and challenges for firefighters. (Photos by author unless otherwise noted.)

Just what is a “monster house”? Where are monster houses found? A loose definition of a monster house is a single-family dwelling of approximately 8,000 square feet or greater of livable space. Many of these homes are in suburban areas, especially near large metropolitan cities. However, many rural communities also have these homes in their jurisdictions. It is noteworthy that building codes in some communities require a commercial structure of much less square footage to have a sprinkler system on-site but not this single-family monster.

HOME FEATURES

Some of the important features of these of homes include the following:
Lot size, setback. These houses may be situated on land ranging from a 100-foot by 200-foot plot to an estate setting of many acres. The smaller lots may be found in suburban developments; the larger lots may be found in rural areas, where large tracts of land are abundant. There are also irregularly shaped lot configurations. The land's character may range from a gentle slope to a hillside tract. What may appear to be a large two-story house from the street-side elevation may in fact be four stories in the rear. Some communities allow lots to be far back from the street by using a long easement or "right of way," and it is possible that several monster homes may use this single access road to get to their properties. This could create an access and placement problem for responding fire apparatus.
Many communities have enacted codes and ordinances to regulate where a building may "sit" on its land. A "setback" is a code process that determines where a structure is allowed to be erected within the lot limits. Further, "setback" defines how far back a structure must be from the front, rear, and side lot lines. This is done to protect property values. It's also done to stop encroachment on property lines so neighboring structures don't impose on each other. The lot itself may be on the street or may sit back a considerable distance from the road or street, accessible by a narrow lane or even a private driveway.

2) Single family homes of extreme size, like this one, have living areas that span more than 150 feet in length and an elevator servicing three levels.

For an example of how setback works, take a lot measuring 200 feet in width by 400 feet in depth. Using our example of a particular city's setback criteria, the front of the house must sit 85 feet back from the front lot line and the rear no closer than 60 feet to the rear lot line. The sides of the structure can be no closer than 20 feet to each of the side lot lines. Theoretically, a monster house of 40,000 square feet could be constructed within these boundaries. Although it's not likely you will see a house of that size built on a lot of those dimensions, this gives you an idea of just how large a structure could be put on this particular sized lot, using setback criteria.

(3) From the corner, this house appears to be an extremely large 2½-story single-family home, with good access from the street. A living area of approximately 1,000 square feet is over the double two-car garage.

Some homes will sit back quite a distance from the street or road. In many cases, the water supply is located on the street. Long hoselines may have to be supplied from the street. Other areas may not have a nearby municipal water system, so an alternative way of getting water to the structure would have to be preplanned.

(4) The back corner of the same house reveals a third-floor living area above the living area over the garage. You must be aware of unique floor layouts and floor levels common to these large structures. Preplanning during construction and neighborhood tours can alert firefighters to these and other potential problem areas.

A narrow, single-lane driveway will have an impact on apparatus placement and how they gain access to the building. If you have an aerial ladder or tower ladder responding, you must consider access and placement during the preplanning of these homes. In this case, you get only one chance to place apparatus for maximum efficiency and safety.

Unusual floor plan. Because of the uniqueness of these homes, their floor layout is not the typical right-angle style found in most smaller residential dwellings. In fact, firefighters should expect hallways that will run at different angles and have other intersecting halls leading from other areas of the building. Balconies and open staircases are very common, adding to the cavernous interiors. Basements likely will be finished and may have living areas, kitchens, spas, pools, and/or exercise rooms. However, exercise areas can also be found on the upper floors, adding a “weight concern” for firefighters. Also, unusual floor layouts may have the rear of the house as the focal point or main entranceway, along with the main entertaining area, such as outdoor pools, spas, patios, and the like.

Firefighters operating in heavy smoke in this type of building can become disoriented very easily because of the hallways, floor levels, and cavernous interiors. Use of lifelines is advised, or hoselines if fire is suspected. A lower-level fire can create other concerns, especially where spa chemicals are involved. This could lead to a complex fire situation involving hazardous materials.

Sleeping areas. These structures, even though they are termed “single-family dwellings” have more than one area where people may sleep. This is especially true where there are live-in workers who have their own living quarters, separate from the family. In many cases, the parents have their own sleeping area separate from the children’s sleeping area. The owner’s master bedroom quarters are large and have a master bathroom, several walk-in closets, a dressing area, and a spa or exercise room. The children’s sleeping areas may have rooms together, or there may be a separate sleeping area in another part of the home for older children. Whatever the situation, in a smoke condition, firefighters will have numerous areas to account for. Numerous firefighters will be needed for search operations in a severe fire situation.

Living area. Typically, much entertaining takes place in these homes. Because of this, these structures may have two or more complete living areas under one roof. This means possibly two kitchens and two separate living areas, along with dens/studies, sleeping areas, and other facilities. Internally, the living areas may have ceiling heights of nine feet or higher. Atriums and “grand” staircases with wide-open foyers are common; they provide openness to several floors. One such structure had an overhead sky-walkway connecting two areas of the home. The walkway overlooked a two-story library on one side and a grand foyer on the other.

(5) The back side of this house shows several roof styles and floor levels not visible from the front elevation. Landscaping and other obstructions may hinder placement of ground ladders during fire operations. The steep roof angles preclude safe roof ventilation using ground ladders.

Features such as tall cathedral ceilings are common. You may even find an elevator in the house, especially if the house is three stories or higher. The same hazards found in

taller buildings are present in these houses. Fire, heat, and smoke from a lower-level fire can enter the shaft and travel throughout the structure, quickly spreading fire to all upper floors. The elevator car may become incapacitated in the shaftway, trapping anyone using it. Firefighters should not use the elevator for access during firefighting operations. A dumbwaiter shaft is another vertical artery that might be found in these homes. Firefighters should be prepared to lay hoselines to cover these points of extension in a fire.

(6) Because of the length of these houses, firefighters may have to carry ground ladders and tools a considerable distance to the point of their use. Fighting fires under these conditions require firefighters to be in good physical condition and of sufficient strength to meet the demands of this fireground. (Photo by Greg Gettens.)

The volume of fire, its location within the structure, and its internal extension will affect firefighting operations and personnel resources. You must have enough firefighters on the scene to cover the critical areas. With higher ceilings and areas beyond the reach of normal hand tools, firefighters may need to bring ground ladders inside to reach some areas within the structure.

Roof. Roof styles in these structures vary. However, one thing is certain: They will be large and dramatic. In building construction classes for firefighters, we are taught that the job of the roof is to keep the elements out of the interior and that the roof is the “cheapest” part of the building. That is not the case here. Many local regulations or deed restrictions call for roof angles to “decorate the sky” by reaching as high as possible; thus, steep pitches are the norm. The roof will be a large, heavy dead load overhead. Of concern to the firefighter are the roof-supporting system, most likely a network of trusses, and, of course, how much weight is overhead. If this system is being attacked by the fire, expect collapse.

If your fire department does not have an aerial apparatus, it's time to start thinking about it. Access to these roofs creates an operating hazard for personnel, especially under firefighting conditions. Many fire departments are now carrying 35-foot ground ladders on their engines because of what is being constructed in their communities. In the meantime, you need to have a good mutual-aid or automatic response system in place. Nothing takes the place of working safely from an aerial ladder or a tower platform, especially at the angles and heights of these structures.
Security. Of course, security will be a concern. In most cases, security forces are encountered before you enter the structure. Fire apparatus may have to go through a gateway to get into the property. Iron gates at the entrance will stop apparatus from entering the property until they are opened. This slows your response into the structure and may give a small working fire the chance to develop into something much larger, even if fire departments are notified by an automatic fire alarm system. Doors to the house are substantial and may have heavy-duty locking mechanisms. Some of the doors are solid wood and larger than those normally found in average-size structures. Windows may be sealed and nonopening, made even more substantial because of glass thickness and the number of panes. Many homes may have a courtyard to access before entering the house. Decorative wrought-iron gates may be covering windows and doors.

(7) Large, open spaces and lack of compartmentation can lead to a quick-spreading fire that will easily extend to other areas of the home. During live-burn training, this fire in its beginning stages grew with lighting speed to involve the open foyer, spreading to the second floor, over the skywalk, and into the two-story library on the other side of the house. A 2⅟2-inch attack line with a 1⅛-inch

solid bore nozzle and two 1¾-inch attack handlines from interior positions were used to achieve knockdown. (Photo by Greg Gettens.)

In some parts of the country, "hurricane shutters" are installed over windows and doors so the residents can literally encapsulate the home to protect from severe weather conditions. When in the operating position, these shutters act like security doors found in inner-city neighborhoods; they create forcible entry concerns for firefighters. Because they are designed to keep out the environment, a fire could burn unnoticed for some time, creating for arriving firefighters the potential for a backdraft or a quick-spreading fire when the structure is opened up. Appropriate tactics should be used to protect firefighters and deploy a large handline should the situation deteriorate.

This is not the typical frame structure where you might be able to beat your way in through an outside wall. (On the other hand, a firefighter should think about what is needed to get out of this structure should a self-survival situation arise.) Doors are thicker and heavier and may have several lock mechanisms that might present a challenge to unprepared firefighters. Preplan the tools and methods you will need to gain access to these structures. Another thing to watch for is the four-legged security systems.

BUILDING MATERIALS/CONSTRUCTION TYPE

In most cases, these homes will be of type V construction, but that is not to say that a different type may not be used. Some of these houses have been built utilizing steel structural framing systems. Exterior walls of wood frame may be of 2-inch by 6-inch studding, sheathed in plywood or oriented strand board (OSB). In some cases, metal studs are used instead of wood. The exterior finish may be of any material such as brick, stone, stucco, wood siding, vinyl, or any combination thereof. The interior wall finish will probably be of ⅝-inch drywall, but rooms finished in wood, oak or maple tongue-and-groove boards, may have a backer like ½-inch plywood, which can create a substantial wall thickness. Framing in some areas of the home may be solid wood joists, box beams, or wooden I-beams; other areas may include trusses, especially when spanning open living areas or living areas above home gyms or racquetball courts. Wooden glue-laminated beams and arches may be used in libraries, ballrooms, and other areas of the home that host large numbers of people. Heavy masonry finishes on floors are common, as are large masonry fireplaces. These items can be a collapse potential especially if fire is underneath and burning their supporting systems.

FIRE LOAD/POTENTIAL

In most cases, fire load should be keyed to the type of building occupancy. In residential fires, we expect a class A type of fuel, in both the contents and structure. Because of the size and volume of the interior living areas, there is a good chance for a large fire to develop, especially if a fire is undetected for an extended time. Because of the lack of compartmentation, fires will have a ready fuel supply and can grow quickly and involve several areas internally in a short time. Some local governments are looking at requiring

residential home sprinkler systems in these structures because of their size. Attached garages may house as many as six vehicles, creating another type of fire/fuel concern. There may also be storage or living areas over this space.

Like the many different types of building fires to which the fire service responds, tactics should be specific to that problem. Firefighters need to look at these buildings as a new fire problem to deal with and develop appropriate strategies and tactics for them. These structures require special firefighting considerations. When encountering a working fire in one of these structures, attacking the fire with large handlines should be considered. A small developing fire could quickly spread and possibly overpower a smaller handline because of the type of fuel, surface area, and size of the structure.

Training and experience in fighting fires in a monster house are going to come along slowly because of the low number of fires in them. It may be hard for firefighters and officers to understand the potential that exists should such a fire occur. Should you be given an opportunity to acquire a monster house to train in, it is something you must do. If there is a chance for live-fire training, by all means take advantage of it, but do not get carried away with how much fire you can create. The speed and volume of fire can surprise even the most experienced firefighters.

AN OPPORTUNITY TO TRAIN

During the summer of 2003, a monster homeowner went to his local fire department in Westlake, Ohio, and asked the officers if they would like his home for training, Of course, the answer was a resounding yes. It just happened that the owner needed his 11,000-square-foot home demolished so he could build a new 15,000-square-foot home on the same site. The fire department obliged and secured all proper paperwork and permits to conduct live-burn training.

This type of opportunity comes along once in a career, and a plan was put in place to maximize the training, making it available to as many firefighters as possible from Westlake and surrounding departments. In the end, 75 firefighters from four fire departments participated in the training.

The structured training had all participating firefighters take classroom sessions first, which covered basic fire attack principles, hoseline selection, incident command, fireground organization, rapid intervention, and a discussion on the “commercial-size” residential structure.

When the classroom sessions were completed, firefighters moved outside to work with 1¾- and 2½-inch attack handlines, each equipped with solid bore nozzles for attack. Nozzle pressures, friction losses, nozzle mechanics, and hoseline management were covered in the hands-on training.

There were also evening training sessions during which the firefighters performed walkthroughs of the entire structure, noting the home’s features and floor and room layouts. Afterward, firefighters participated in search drills using thermal imaging cameras after the structure had been filled with theater smoke created by two smoke machines.

The live-fire training was conducted over three days and was very successful, much because of the size of the structure. Each day saw at least six good “all hands” fires, with seven fires on one day and nine on another. On several occasions, the fires extended and gave firefighters a run to contain them, but they performed admirably. In

one evolution, the fire grew so quickly that interior-attack operations called for one 2½-inch attack line and two 1¾-inch lines for knockdown and containment. And, of course, the building availed itself to more of our abuse.
In the end, a critique was held to discuss some of the things we noticed regarding the training sessions.

LESSONS LEARNED

The lessons learned included the following.
Apparatus access/placement: This home had a single-lane, 400-foot-long driveway coming from the street, which was the only access to the property. It was realized early in our planning that apparatus placement was an important issue.
With actual structural firefighting, the arrival of the first fire company must consider the other responding units. If you are the first-due engine, you must think about truck placement along with the potential for fire travel or spread.
The driveway may be a long, narrow lane. The ground on either side of the pavement may be soft and unable to support heavy vehicles moving about or turning around.
Another question is how will you get water to the fire building? In actual fire situations, the water source may be several hundred feet away and may have to be pumped or relayed to an attack engine. The supply hose may have to be hand-stretched, which would be a labor-intensive, time-consuming part of fire attack. If the fire is large and spreading quickly, heavy streams will be needed. Again, this is an apparatus placement concern.
The incident commander's (IC) position: Because these homes may be in communities where fire forces are lacking in resources, a good mutual-aid or automatic response system is imperative. In any case, initially, a good working fire in a building of this size is going to require between 25 and 30 firefighters organized into several engine and truck companies just to cover the basics. If you compare this size building with a commercial structure of equal size, you can better understand the personnel requirements needed for coverage.
The IC needs to be mobile, especially in the early part of the fire, so that he may see all sides of the fire building. During our live-fire training, we clearly saw two different pictures of the same working fire between side A and side C in some scenarios. There was a medium smoke condition and no visible fire at side A, while at the rear (side C), fire was venting heavily from the windows, indicating a much more serious condition. Visually seeing this is important for an IC so that he has a better picture of what his firefighters are going into and so he can gauge the effectiveness of their attack and safety. Along with that, the IC may be able to read the fire's travel potential and see if water is reaching the fire by looking for changes in flame and smoke conditions.
Communications are critical, as with any structural fire; but because of the size and area to be covered in this fire, good, factual information must be relayed by radio to all members so that they can stay in touch with what is happening.
As for other fire units responding and arriving, simply to find the IC, they should maintain company concept and notify the IC by portable radio that they are on the scene and are located at a certain spot on the fireground. In this disciplined manner, no freelancing takes place, and the IC can assign resources easily, knowing their location.

Fire attack: Statistically, most fires in residential or commercial structures are handled with one or two 1¾-inch handlines. Minimum flow per attack handline should be at least 150 gpm. Although this size of attack is very effective on most fires (180 gpm when a 15/16-inch solid bore nozzle is used), firefighters must never become lulled into complacency thinking that the 1¾-inch attack line can handle any size fire that comes along. Remember, large buildings can make large fires!

Looking at the depth and volume of these houses, a large fire may require fire streams that discharge far more gallons per minute than firefighters are normally accustomed to. Along with greater gallons per minute is the need for streams with greater reach and penetration. Firefighters should be capable of deploying 2½-inch attack hand-lines quickly and easily when necessary. The solid bore nozzle should be used for these attack lines.

Along with more powerful streams, the larger-diameter handlines can supply larger flows over greater distances, as longer stretches may be necessary. Keep in mind that fires in these structures, like many other large buildings, may require several attack hoselines to confine and extinguish all fire spread. The need for multiple attack hoselines affects a fire department's engine company apparatus and the number of attack hosebeds. Attack lines should be loaded to play out easily with the nozzle attached and no adapters. Local fire departments need to look at their community's fire potential and see if their engine hosebeds can provide multiple attack lines of sufficient diameter and length that can be put into service quickly at a fire.

Greater fire attack flows require large-diameter supply lines capable of supplying water to the fireground over longer distances. Fire departments need to train and preplan on the most efficient and time-saving ways to get water on a fire.

Other points to consider are the number of engines available for response and coverage of the fire building, exposures, and water relays and estimated response times.

Ventilation/forcible entry: Any structure fire requires truck work. Because of the nature of these houses (i.e., size, type of materials, construction methods, building security, for example), these homes require extra forcible entry considerations. As mentioned before, operating on a peaked roof will most likely require a platform or an aerial ladder from which firefighters can work. Again, apparatus placement is going to be a concern, so preplanning these structures in advance is necessary. If ground ladders are needed to accomplish ventilation of the rear or sides of a structure, keep in mind that firefighters may have to carry ladders and tools a considerable distance from the apparatus to the point of operation. Longer ground ladders may be needed to reach some areas.

These structures may be "overbuilt," meaning that there will be more mass and density of materials. An example we found was in a party room where the walls and ceiling were finished in tongue-and-groove oak planking. Firefighters using hand tools were having trouble trying to open them. As we finally opened a small hole after some extra effort (along with some accusatory language), we found the oak planking was one-inch-thick tongue and groove backed by ½-inch-thick plywood. Any fire running behind walls or ceilings is obviously going to have some headway before openings large enough to get water through are made. In this case, getting ahead of the fire and opening up are imperative.

Search and rescue: Depending on the extent of fire and its location, firefighters will have a larger than normal area to search compared with other residential structures. It may

take a couple of search crews to cover those areas closest to the fire. With that in mind, consideration must be given to the number of personnel who will be available for the tasks required. With a low number of personnel initially available, it may be necessary to perform only extinguishment at first. As the numbers of personnel and resources build, priority assignments would then be given until all areas of the structure have been accounted for.

Tools that may enhance rescue efforts, such as thermal imaging cameras, will help firefighters to cover larger areas; however, training to learn the camera's limitations and how the searching firefighters will coordinate and maintain themselves must be determined in training drills before any active firefighting with the camera takes place.

Automatic aid/mutual aid: Most fire departments do not have enough personnel to properly attack a fire in a structure of this size-or any other structure of comparable size, for that matter. It is imperative from a safety standpoint that good response agreements exist with neighboring communities. If these agreements are not in place, they need to be developed so that adequate resources can be brought together to handle these situations. Fire officers need to know how many personnel are available to respond, along with things like how many engines, ladders, or other types of apparatus and equipment there are.

After resource and response plans have been agreed on, training is the next important item to establish. It is one thing to cover for another community's EMS calls, but it's an entirely different thing to work with other fire departments at working fires. One incident command system for all departments in the participating response system must be established. Communications and terminology along with standardization of radio hardware must take place. (A large percent of fireground problems are related to communications.)

Fire apparatus should be looked at for standardization of attack capabilities so that when firefighters from different communities work together and are given assignments, they will have some degree of familiarity with the equipment. A couple of examples are hosebeds and their capacities, along with types of nozzles. Body styles and cabinetry are other things that can be considered. Future apparatus and equipment specifications could be developed jointly by fire departments. Again, nothing takes the place of training together with other departments on a regular basis.

The monster house is not a new fire problem to the American fire service. It has been around for decades and is actually growing in many new areas, especially those cities, towns, and rural areas that have not seen them before. It may pose a serious potential problem for fire departments, especially those with limited resources and knowledge or training. As with most fire situations, good, coordinated, aggressive fire operations can be the difference between saving lives and property and not saving them. However, because of the nature and size of these residential homes, fire departments need to take a look in their own communities to see if these houses exist, and, if so, to determine how to overcome these potential operational problems before they happen. Preplan, and have discussions, on-site inspections (perhaps with owners present), and hands-on drills. ■

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Fire Engineering 02/01/2005

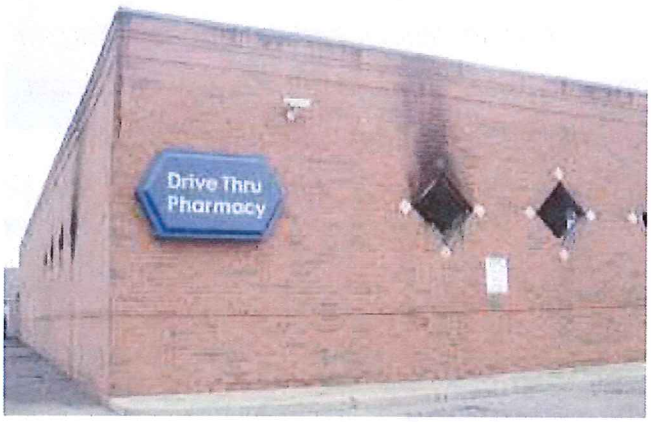
Fire Engineering

FIREFIGHTING IN "DISPOSABLE BUILDINGS"

04/01/2005

BY JEFF SHUPE

"DISPOSABLE BUILDINGS" ARE EVERYWHERE, IN CITIES and towns across the country, from rural hamlets to crowded urban centers. This term, coined in the fire service, refers to newer buildings, especially those built using Type II Noncombustible construction, and that employ lightweight structural materials. These buildings meet code requirements and may be required to have internal fire protection systems. However, the materials used in their construction are lacking in size and mass. This lack of structural mass or density will have a direct correlation to the building's time to failure under heavy fire conditions.



(1) The fire was located inside the building's B/C corner. The upper left corner of the wall shows a long vertical crack resulting from the movement of structural members distorted by exposure to heat. The presence of such unsafe conditions must be communicated to all hands operating at the scene. (Photos by author.)

Click here to enlarge image

One example of lightweight material is the open-web steel bar joist, commonly used in building structural systems, specifically in floor and roof applications. These metal structural members, with a high surface-to-mass ratio, are manufactured from ordinary structural steel. During working fire conditions, they will absorb and conduct heat and begin to lose much of their strength at temperatures of around 1,000°F. This loss of strength may be indicated by sagging roofs or floors, bowed metal exterior walls, or brick or concrete block walls that have cracked from structural movement. Of greatest concern is the possibility of structural failure or collapse, especially while firefighters are operating in or near these buildings during fire conditions.

(2) Windows used in these structures have two thick plates of glass with a plastic membrane sandwiched between them, making ventilation difficult and time-consuming. In this fire, firefighters noticed that the glass panels did not break and fall out as would most conventional windows. Instead, the material just ripped or tore, leaving glass pieces in place and inhibiting the ventilation of heat and gases. Here, some of the membrane can be seen between the glass panels.

Click here to enlarge image

Building construction and its terminology can be misleading and deadly to the unsuspecting or untrained firefighter. Take, for example, the terms “fire resistive” construction and “noncombustible” construction. Without understanding these terms or knowing how building materials will react during fire conditions in one of these buildings, firefighters may think they have whatever time is needed to get their job done and need not concern themselves with collapse, flashover, or other associated hazards. Actually, just the opposite is true, especially where lightweight structural members are used. Even a

quick fire department response to a fire in this type of building may find early signs of weakening structural members.

One particular type of "disposable building" that needs to be looked at closely for its fire potential is the chain drugstore building found in every community across the country. These structures are built using Type II construction methods. Fires in these buildings have the potential to kill or injure firefighters. Good, relevant training in fireground strategies, tactics, and building construction can help make for a safer fireground when confronted with fire in one of these buildings.

A LEARNING EXPERIENCE

During the early morning of July 14, 2004, at 0134 hours, a box alarm assignment consisting of two engines, one ladder, and one rescue squad, commanded by a battalion chief, was transmitted for fire in a drugstore at the intersection of Fulton and Clark Avenues in Cleveland, Ohio. The dispatcher stated the call was for "fire in the Rite Aid drugstore." Engine 24, the first-due engine, located only eight blocks away, arrived quickly to find a well-advanced working fire with heavy fire venting from windows on two sides of the building. Dense black smoke was also pushing out of the building under pressure. The fire dispatch center, on receiving Engine 24's initial report of a well-involved drugstore, dispatched one additional engine and one additional ladder company to the scene.

(3) Firefighting strategies and tactics for large-area commercial buildings are not the same as those used in day-to-day fire operations at residential dwellings. A greater volume of water is necessary for cooling and covering a larger floor area, which will hold a much larger volume of fire. Consider fire stream volume, reach, and penetration when selecting the attack hoseline size.

Click here to enlarge image

The building had closed hours earlier (approximately 10:00 p.m.) and had a steel roll-down gate over the only entrance door-typical for an inner-city neighborhood. Engine 24 positioned itself in the parking lot adjacent to the B side of the building, and firefighters stretched a 2½-inch attack line. At the same time, the officer looked for another way into the structure, but this was the only feasible one. A squad company or ladder company would have to cut the roll-down gate first.

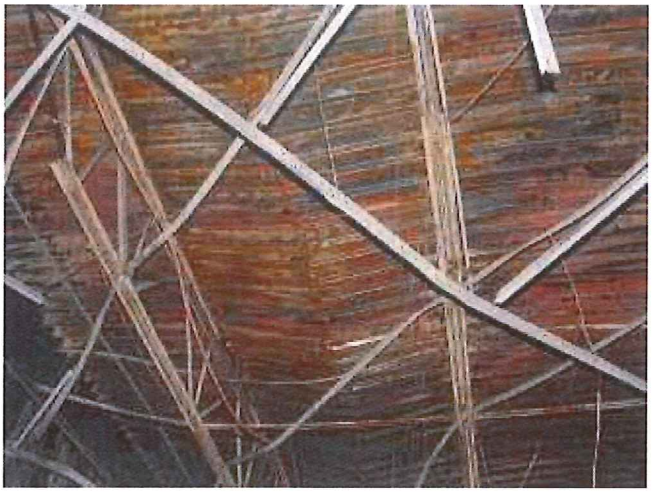
Fire was now showing above the roof. At this point, firefighters noticed that a large vertical crack had opened up in the B/C corner of the building where the fire was located, running downward from the roof approximately 10 feet. The building's structural system was beginning to weaken.

As Squad 4 used a power saw to cut the roll-down gate, Engine 24 hit the fire on the B side through two small windows to slow the fire's progress. The size and configuration of the windows required that the attack team come close to the wall where the crack had developed. Once the roll-down gate was opened, the attack line was brought into the entranceway, and the attack was finished from there.

This building was saved despite heavy fire damage and has undergone extensive repairs. The drugstore chain reopened the store for business. Total loss was estimated at $1.3 million, with structural loss set at $200,000. As stated before, this "disposable building" is typical of others like it across the country. The building is constructed of materials that will not support combustion, so it receives a Type II building "Noncombustible" rating.

TYPE II BUILDING FEATURES

The interior of this kind of Type II structure is wide open with no compartmentalization. The only thing that occupies the floor area is the shelving for merchandise, in-wall coolers, and business transaction counters. The fire load consists mainly of the merchandise, which depends on the type of business operating in the store. However, that is not to say there won't be any highly flammable products found! The newer chain drugstores carry a wide variety of products for all kinds of needs, making them more like a large convenience store.



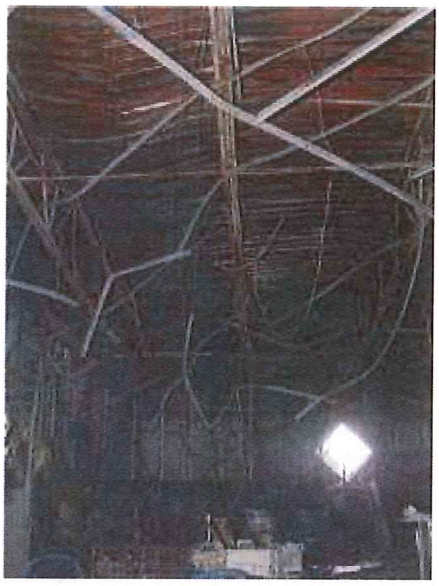
(4) This is the underside of the roof deck, made up of sheet metal Q-decking and supported by open-web steel bar joists. The decking sags downward because it lost its normal strength when exposed to heat.

Click here to enlarge image

The framing system for this type of building consists of unprotected thin structural steel columns; they are not wrapped in gypsum board, drywall, or any other material that would protect them from heat or flame. Between the perimeter columns are metal studs to which the interior walls are attached. The exterior masonry walls are of brick veneer.

The roof supporting system consists of girders and beams with open-web bar joists spaced between four and six feet apart. This network will support the sheet metal Q-decking for the roof, which will most likely be a finished, built-up type. Atop the roof will be air- conditioning units, a weight and collapse concern under any fire conditions.

Inside the store, the ceiling (if there is one) will be suspended with drop-in or lay-in tiles or panels. There are some ceiling assemblies with flame spread ratings that may act as membrane protection. However, under any appreciable fire conditions, they will do little to resist heat or flame spread. If there is no ceiling at all, fire will directly attack the roof-supporting system, causing it to weaken quickly and possibly fail early in the incident.



(5) Note the distorted open-web bar joists with remains of the suspended ceiling assembly hanging loosely. Notice also the amount of deflection in the bar joist in the center of the photo and the one to the immediate left.

Click here to enlarge image

The windows installed in this particular structure were small and square but positioned at an angle to resemble a diamond. The approximately 36- by 36-inch window glass panels, engineered for energy efficiency and strength, each consisted of two ½-inch-thick glass panels, with a thick plastic membrane sandwiched between them. During this fire, firefighters venting windows were having trouble breaking these windows; it seemed the glass was just "tearing" open, making venting a slow, incomplete process. As a result of these factors-window size and positioning and lack of total vent area-it was evident that the building was retaining a lot of heat.

Sprinklers or other types of fire protection systems may or may not be found in these structures, depending on local code. Although the floor area may exceed 5,000 square feet, a sprinkler system may not be present. If there is, sprinkler heads will most likely be positioned below the ceiling or the roof-supporting members. In the case of a severe fire or other problems such as heads blocked by stock piled too closely to them, any fire getting above the sprinklers and into the ceiling plenum will affect the roof's stability.

FIRE ATTACK AND STRATEGY

The strategy at this particular fire was to regain control of an out-of-control situation. There were no exterior exposures to worry about, and internal exposures were covered by hoseline placement. The 2½-inch attack line was selected for the job and proved itself again for its obvious knockdown power, primarily because of the volume of water it discharges and its cooling capability. More important, however, is the safety factor it provides firefighters-large-area buildings like this one need powerful streams with reach to get to the fire, knock it down, and absorb the heat. Here, the 2½-inch line reached all points of the fire area from a safer location in the vestibule, and the fire was extinguished. From the doorway to the fire area was approximately 60 feet. Other floor areas of the store where stock was heating up were cooled quickly and effectively.

Attacking a large fire offensively with a small- or low-volume hoseline makes firefighters work longer to gain control and perhaps at a closer distance than necessary. Streams with inadequate volume will soon put firefighters in defensive mode, since they will not be able to get enough water on the fire. In this particular fire, however, knockdown occurred quickly because stream volume and reach were adequate for the job. If a body of fire is not knocked down and heavy fire continues to burn, personnel must consider that structural members are weakening.

With respect to the crack that had developed in the corner where the fire was located, after overhaul firefighters noticed the distorted open-web bar joists and that the roof overhead was sagging over the area where they had been working. Because of the 2½-inch stream's power and ability to blow apart the ceiling and penetrate the fire area, water cooled down the steel members and stopped further loss of strength.

LEARNING FROM EXPERIENCE

When it's time for fire attack, remember, size does matter. Every fire has a critical flow rate that must be achieved for extinguishment; big fires need big fire flow.

(6) This close-up view shows the crack that had developed from the fire, the result of weakness in the steel structural members. Firefighters noticed the crack on arrival and communicated its presence to everyone to make them aware of the hazardous operating conditions.

Click here to enlarge image

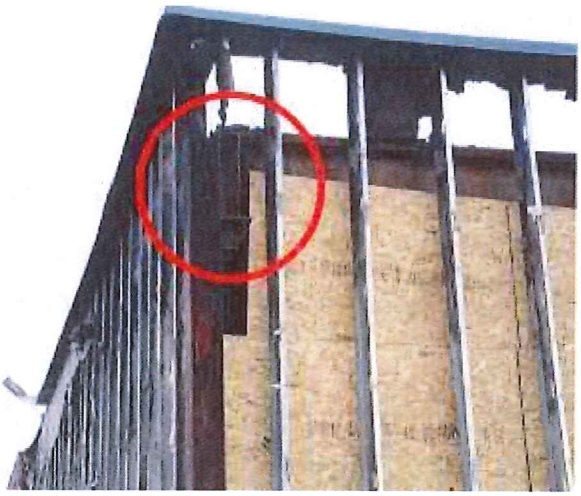
This means fire departments should deliver big water in a big way! Several hoselines with less volume on a large fire do not add up to large-volume fire flow! Fighting a large body of fire in a structure with less than adequate streams will not extinguish the fire in a timely manner-in fact it may make fireground operations defensive!

(7) The extensive fire damage required the store to be completely rebuilt. Here, you can easily see the amount of distance between the thin steel columns and metal studs used in

the construction of this type of building. Less mass and density, coupled with a lack of "in-place fire protection" can lead to greater damage and a greater potential for structural collapse.

Click here to enlarge image

An old fire service adage says, "As the first line goes, so goes the fire!" Under intense, growing fire conditions, using a low-volume attack line first and then trying to put a larger line in service later will put fireground operations in a reactive mode in which the incident now dictates to the fire department. Many fire departments are unable to rebound from a bad tactical decision early in the incident. This is when control of the situation is lost. This can be the result of any number of reasons, such as a lack of resources, poor training, or poor fireground control. In any case, loss will be greater, and the longer the fire burns, the less stable the structure becomes. More importantly, however, fireground safety could be jeopardized.



(8) This corner of the building shows a thin, steel column that supports two intersecting steel I-beams that act as girders. They were located directly over the fire area. As the steel members conducted heat from the fire and distorted, the resulting movement caused the wall to crack.

Click here to enlarge image

For large fires at which handlines are needed, the 2½-inch attack line should be the handline of choice. It has excellent knockdown power because of its superior flow volume and stream reach. Coupled with a low-pressure, high-volume solid-bore nozzle, it can increase the fire attack efficiency of an understaffed fireground. After the fire has been

brought down in size, the fire department can then use smaller, more mobile handlines to finish the job.

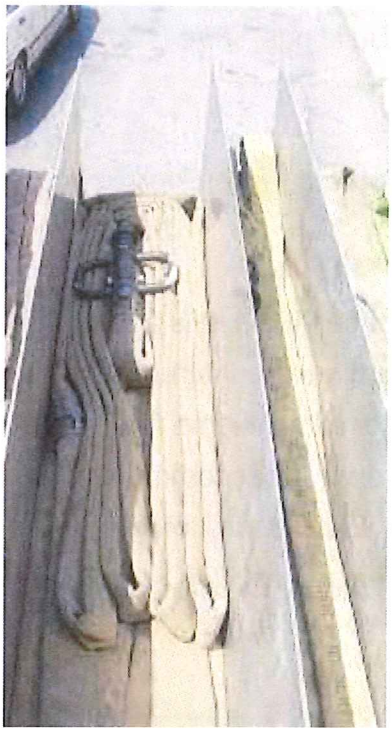
Smaller fire departments and those with poor staffing should not be intimidated by the large handline. Use the large line when the situation requires it! Departments should train to know when and how to initially stretch a 2½-inch attack line and where to position it for maximum effectiveness. Because it is heavy, it does require that personnel are trained in its use and how to make it an offensive tool. Firefighters must keep in mind that the 2½-inch handline is not just for defensive operations-it can be a mobile attack line.

(9) Fire departments should arrange their engine company hosebeds to provide multiple attack lines of different diameters. Attack hose should be loaded with company staffing in mind: It should play out easily and with minimal effort so firefighters can get water flowing quickly on a fire.

Click here to enlarge image

A Type II building may have no fixed interior walls to break up or compartmentalize the main floor area. Without a sprinkler system or detection system on-site, a fire that starts after hours may get a good head start before it's noticed and reported. Heat from the fire can flow freely throughout the building; as it does, the building, its structural components, the contents, and stock will begin to heat also. Because of the high amount of plastics, synthetics, and other man-made items, along with paper products and wrappings found in these stores, there will be plenty of fuel for the fire to feed on. Firefighters arriving at a working fire where there is high heat and heavy smoke conditions must recognize the fire potential that exists. These buildings can also present numerous collapse hazards to personnel. That crack in the outer wall noticed soon after the first company's arrival was a

warning sign of collapse, a result of steel structural members moving after being weakened from the heat of the fire.



(10) Attack hoses should be loaded with nozzles attached, ready to go to work. The last length loaded on should be folded in such a way as to give the nozzleman 50 feet of hose, a working length providing enough hose to cover the fire area and a little more.

Click here to enlarge image

Well-trained firefighters make good, informed decisions that lead to smooth fireground operations. Regular training in fireground strategy and tactics, along with knowledge and respect for building construction, allow for safer firefighting operations. Fire-ground awareness and cognizance also in-crease firefighter safety. Watchful eyes and ears must constantly look for signs and sounds of a weakening building. If you see an unsafe situation on the fireground, pass the information on to everyone as soon as possible. Your safety and that of everyone else depends on it! ■

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Fire Engineering

THE INITIAL ATTACK HOSELINE

11/01/2005

BY JEFF SHUPE

ENVISION THE FOLLOWING SCENARIO: A LARGE 2½-story residential frame structure is on fire and has flames coming from the second-floor windows. The volume of fire and the building's age and condition tell us the fire involves a couple of rooms and is extending to other areas within the structure. There are plenty of fire and smoke for everyone.

The first fire department unit, a four-member engine company, turns into the block. As the company arrives on-scene, the officer calls in a "working fire" and gives other information by apparatus radio. It is now the beginning of another American fire service bread-and-butter operation, the same scenario played out by our nation's fire departments in cities and towns across the country.

The engine company chauffeur positions the engine past the fire building so the first-due ladder company can get its fireground position in front of the fire building. After the apparatus comes to a stop, the members go to work.

Our engine company members have their job assignments. On the fireground, members of the company perform their jobs independently of each other but as part of a disciplined team so that the initial attack line can be put in operation quickly. For many fire situations like this one, here is where the old fire service adage "As the first line goes, so goes the fire" applies.

The engine firefighters are now starting their stretch of the initial attack line from a static hosebed. It is a 1¼-inch hoseline equipped with a solid-bore nozzle capable of discharging more than 180 gallons per minute.

1) Fire is traveling throughout the second floor and attic area in this structure. Two lines are needed for extinguishment. The stairway to the second floor is straight ahead as you enter the front door. The drop point for the attack lines is the front yard. The nozzleman will take the nozzle to the stairway and call for water while the backup firefighter flakes and straightens the hose; he will then feed line to the attack team. (Photo by Steve Nedrich.)

Click here to enlarge image

The firefighter with the nozzle has the "working length" of hose on his forearm and is heading to the "drop point," where the hose will be prepared for attack. The officer heads toward the fire building, helping with the stretch as needed, equipped with his radio and hand light. The backup firefighter is playing hose from the bed. He will estimate the amount of hose needed, break the hoseline, and then hook the coupling to an already charged outlet. The pump operator/chauffeur has charged a preselected outlet with booster tank water and is now starting to hand lay his supply line to a nearby hydrant.

The whole operation of getting the initial attack line stretched out, charged, and made ready to go to work should take no more than 90 seconds if executed properly by company members.

GETTING THE INITIAL ATTACK LINE IN SERVICE

Let's examine a couple of items that may help our engine crew get the initial attack line in service easily and quickly.

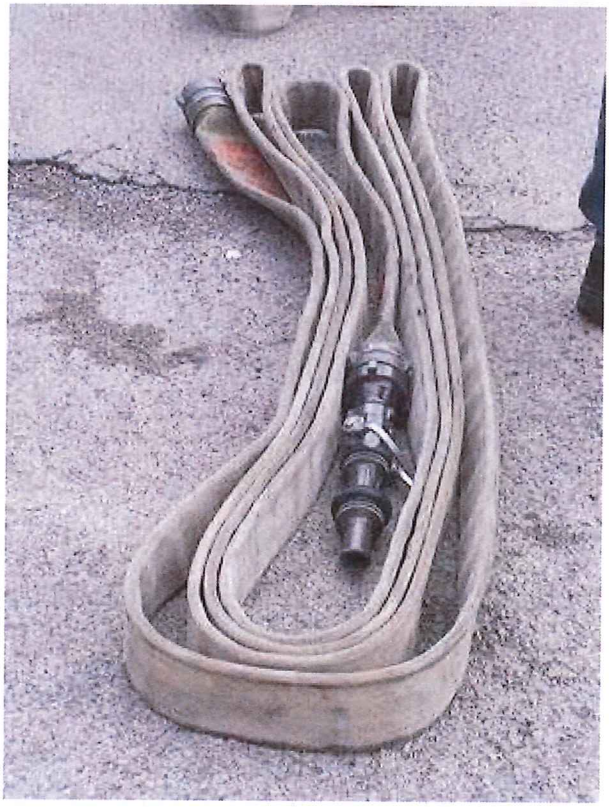
Attack Hose

The engine company is the basic unit for fire extinguishment in the fire service. The firefighters-the end-users-should determine the type of equipment the department should buy. Engine apparatus hosebeds, as you have heard before, should be designed to be

user friendly. That means attack hoselines should be easy to put in operation, with only a minimum of personnel. Complex hose loads or other loads that may work for some departments may not work for yours.

(2) The reverse horseshoe fold can be used to create a "working length." It gives the nozzleman 50 feet of workable hoseline at the threshold of the fire. This fold can be used for wide or narrow hosebeds. (Photos 2-4 by Greg Ricker.)

Click here to enlarge image



In the above scenario, the attack hose is coming from a static hosebed, meaning the hose is not preconnected to any outlet. With this type of hosebed, there is no limited or fixed amount of hose, as in the case of a preconnected line. Many fire departments rely exclusively on preconnected hoselines for fire attack and feel they are quick and easy to get in service. This is true to an extent. And there is nothing wrong with having a preconnected hoseline on an engine.

(3) A narrow 2½-inch preconnected attack hosebed. In this configuration, a reverse horseshoe is laid on its side so it will fit.

Click here to enlarge image

However, many fire departments have had fires where they have come up short in their fireground stretches because of the limited amount of hose in their beds. Some departments have only two preconnected beds of 1¾-inch hose and one bed of two 2½-inch hose for attack. Others have three or more preconnected hosebeds of 1¾-inch hose on an engine, each with a different amount of hose. For example, one bed may have 150 feet, another 200 feet, and the third 250 feet. Let's say there's a fire in a location where the longest preconnected hose (250 feet in length) is needed. The initial hoseline is stretched to the fire, and a second line is needed to help the first line. Do you see a problem here?

The belief that preconnected hoselines save time in getting in service is not going to prove true here because the firefighters assigned to the second line will have to break the hose and add a length or two so it can meet with the initial attack line. No time saved.

(4) The working length, after having been folded on the ground, is loaded on its side into a narrow hosebed.

Click here to enlarge image

Using a static hosebed gives the engine crew the versatility to stretch a little bit or a lot, depending on the amount of hose needed for the stretch. This hose load also creates a user-friendly load that works fine even with only two firefighters making the stretch. It is quickly deployed and put in service, and it works with small- and large-diameter attack handlines.

The type of hose load used in our scenario is a flat load. Many departments across the country use this load. It is the kind of load that will play out easily in a single straight line when it is deployed. Some hose-load arrangements are loaded so that two or three pieces of hose come out of the bed together when the attack line is pulled, whereas other loads have all the hose in the bed being unloaded or "dumped" next to the engine. Doing this is not going to get this hoseline in operation any more quickly than hose from a static bed,

simply because no water will be able to flow through it until the hose is straightened and all kinks are removed.

The keys here are simplicity and ease of stretching. Attack hoselines should be loaded and finished so they play out easily by the least number of firefighters available for the operation.

Working Length

After the attack hose is loaded, the hosebed is finished with the last section of hose folded in such a way so that when the hose is deployed, the firefighter with the nozzle will also have 50 feet of hose with him. This amount of hose is called the "working length." This will guarantee that the attack crew will have enough hose to reach the fire area and more and will not be confronted with a short stretch-an embarrassing and frustrating occurrence that can let a fire gain headway because the attack crew cannot move in on it.

The type of fold used to make a working length can vary, and this can be determined by inspecting the height, width, and depth of your engine's hosebeds. It does not matter if the hosebeds are crosslay type (transverse) or come from the rear of the apparatus. The working length can also be used on 1¼-inch or 2½-inch attack hose. If your department uses preconnected hosebeds exclusively, the working length can also be used in this application.

There are several types of folds:

- The reverse horseshoe with the nozzle tucked in the center of the shoe when finished.
- Flat loops that hang approximately a foot or so over the edge of the hosebed.
- The continuous loop of hose on edge with the nozzle stored in the center of the loops.

In all three folds, the nozzle is put in the center of the working length. When the nozzle firefighter pulls the working length toward him, the nozzle comes along with the hose. Now, the nozzle firefighter can have the nozzle in one hand and carry the working length of hose on his forearm. It is preferable to carry the working length of hose on the forearm instead of over the shoulder for a number of reasons:

(5) These three attack hosebeds all employ static hose loads. The 1¾-inch hosebed on the far right contains a working length made from loops of hose about six or seven feet long, laid on edge. The 2½-inch attack hose load employs a reverse horseshoe working length. When a 1¾-inch hoseline is used, firefighters stretch the amount needed, break the coupling, and hook it into the rear outlet. While the hose is being stretched, the pump operator/chauffeur charges the outlet with booster tank water. The hoseline is then ready to be charged. Pump discharge pressure is adjusted for the line□s length. A supply line is now stretched to a nearby hydrant. If a second line of 1¾-inch hose is needed, the second-due engine or crew assigned to the line has another bed ready to be stretched. Since both beds carry equal amounts of hose, a short stretch should be avoided. This line gets its water supply from the wye also. (Photo by author.)

Click here to enlarge image

The 50-foot working length of hose, whether 1¼ inch or 2½ inch, is light enough to be carried comfortably on the forearm.

(6) The nozzleman carries the working length of 2½-inch hose on his forearm. (Note the compact size of the folds.) The backup firefighter stands at a distance from the engine hosebed and plays out additional hose for the stretch. His positioning helps to keep hose from piling up near the engine, keep it moving straight to the nozzleman, and minimize kinking. (Photo by John Whitinger.)

Click here to enlarge image

As a firefighter carries the hose on his shoulder and makes a couple of turns around stairways and corners, the hose has a tendency to fall between the firefighter's air tank and his neck or back. When it's time to "drop the line," the firefighter has to twist his body around trying to get all the hose on the ground.

The working length, when folded properly, creates a neat, compact hose load six or seven feet long a firefighter can carry on his forearm. This is important especially when the hose must be stretched down narrow hallways, stairways, alleys, or corridors.

(7) For upper-floor fires in large buildings, the drop point should be the floor below the fire floor. Here, the working length is dropped along with extra hose. The nozzleman will advance the nozzle up the stairs midway between the fire floor and the drop point and call for water, thus ensuring that the attack team will have a water supply before entering the fire floor or area. (Photo by Greg Ricker.)

Click here to enlarge image

The working length carried in this fashion avoids the "wedding-train" effect, in which a couple of long pieces of hose are being pulled behind the firefighter, they do not play out well, and they get caught while going around corners and under doorways.

Drop Point

This is the point before the fire where the working length is dropped, flaked out/straightened, and charged. It is generally as close to the fire as safely possible without the fire's endangering firefighters (after all, there is no water in the hose yet).

The drop point location is generally the floor below the fire floor. This gives firefighters a safe area to play out the line, charge it, and bleed the air. It is also a refuge area should the fire intensify, extend into the hallway, and push firefighters back.

For first-floor, ground-level, basement, and lower-level fires, the drop point is usually outside the structure, especially if access to the fire area is close to the building's entrance. However, the location of the drop point can vary according to the fire's location, the type of building occupancy/construction, the intensity of the fire, and what the fire building is giving you to work with. An example of this would be a fire in the lower level or basement of a large commercial building. In this scenario, the drop point is the floor above the fire's location. The building, because of its construction, is confining the fire at this point. Here, the working length is brought inside and dropped, stretched out, charged, and made ready for attack.

Should there be heavy smoke or high-heat conditions on the floor above, and there is a possibility of the fire's extending upward quickly through the structure, then, for the safety of the firefighters, the drop point probably would be in a more predictable area-perhaps even outside the structure if necessary. (Remember, although it's not always possible, it is preferable to locate the fire and the best access to the fire area before committing your attack line.)

Another illustration of a drop-point location is when a fire is on the upper floor of an apartment or office building that is five stories or less in height. The stretch might be made from the apparatus hosebed, depending on the fire's location and access. Again, the drop point should be the floor below the fire floor. The hose is stretched out down the hallway, and the nozzle is taken part way up the stairs to the fire floor and then charged. Firefighters should not drop extra hose on the stairs; this will only lead to kinking of the line as it is "pulled" instead of fed to the attack crew. It will be a tripping hazard, and the hose will not be any easier to move up to the fire floor.

A secret to successfully advancing hoselines from one floor to another is to keep the hoseline as straight as possible and to have firefighters spaced at intervals along the line, especially at the "bend points," such as around stairway railings. Doing this will minimize kinks and keep the hoseline straight, making it easier to manage and advance. Firefighters should feed hose to the attack crew only when more hoseline is called for. Simply pushing hose toward them will cause kinking and make for an unmanageable line. Firefighters wanting a "piece of the action" and crowding toward the nozzle will try to pull the hose with them; this will not work either, as someone will have to go back and feed the line.

A frequently asked question is, When is the right time to charge the hoseline with water? Keep in mind that in this fire situation, where we are stretching from our engine hosebed, our goal is to get this line "working" quickly, preferably within our chosen time frame. As soon as the hose is dropped, the officer or acting officer should call to the pump operator to charge the hoseline. This will start water going into the line quickly. At the same time, the hoseline is also being flaked and straightened. The pump operator should acknowledge that water is on the way. Once water is received, the line should be bled and the line pressure and stream checked.

Again, it is a smart practice to find the fire's location and the best access path to the fire area before stretching any hoselines. Premature stretching or committing of hoselines without knowing the fire's location can lead to operational problems. There have been cases where firefighters have rushed in blindly with the hoseline, not knowing where the fire was, only to have the fire "light up" between them and their egress.

Determine the best location for the nozzle. It should be placed with three criteria in mind: locate, confine, and extinguish.

(8) Firefighters, wearing their face pieces, make their stretch. Notice one firefighter is hooking up his regulator. The firefighters need to keep air management in mind. The attack crews should don face pieces together at the drop point, after the call for water has been made and acknowledged. This practice helps firefighters consume their air supply at roughly the same rate. (Photo by Greg Gettens.)

Click here to enlarge image

• Locate. As was mentioned before, it is best for the attack crew to know where the fire is. This will help determine things like access to the fire area and issues related to getting to

the fire, such as forcible entry and hazards to personnel. Knowing the fire's location helps protect attack personnel, since hazards sometimes can be identified along with the fire's potential. Locating the fire and determining its size, volume, potential for extension, and hazards can help firefighters choose the proper size of attack.

• Confine. After locating the fire, try to determine its boundaries. By identifying the fire area and estimating the volume of fire, you can choose the proper size of attack, one that will enable you to confine the fire to as small an area as possible. Sometimes, in our haste to get a working hoseline on a fire, we select a line that is easy to put in service but has no extinguishing capability because it is undersized. User-friendly hosebeds and hose loads common to the firefighter will help you get the necessary flow whatever the size of the fire.

• Extinguish. Put out the fire! Regardless of the size or type of the fire department, all firefighters should be taught about the extinguishment process. When it comes to fire attack, size does matter. Minimum "target flows" for 1¾- and 2½-inch attack handlines need to be established and trained on; you must know your department's extinguishment capabilities. The fireground is not the place to find out what it is like to use a large-diameter handline at a big fire. Quick extinguishment, not playing the fire-like game, should be the goal of attack personnel. This process will save property; make firefighters safer; and, most importantly, give anyone trapped in a burning building a better chance for survival.

DONNING FACE PIECES

In some areas there seems to be some confusion about when and where firefighters should don their face pieces. One of the more common misconceptions is that firefighters need to have their face pieces on their face, ready to go, as they step out of the cab at a fire. Some departments want their people to have the face piece donned but not "on air" at that point. (Fire departments that don't monitor this practice may find their members breathing from their air supply as they are responding.) In some situations, we have observed firefighters with their face pieces donned, trying to see their way through the regulator hole where their mask-mounted regulator hooks up. In some cases, firefighters have tripped over things because they were excited or told to hurry up. In other cases, their face pieces fogged over on the inside. All of this can create an atmosphere of excitement and chaos. This is where fireground injuries can manifest themselves, and you haven't gotten into the fire yet.

Another situation I have witnessed is firefighters' from the same company "going on air" at different times. For example, one firefighter starts breathing his air supply as he steps from the cab, another firefighter goes on air while carrying hose to the fire building, and a third company member waits to get to the fire threshold to go on air. Our firefighters (all from the same company) are using their air at different times on the fireground so that we should expect each member to run out of air at different times. This could lead to the breakup of the company (or team) or the breakdown of accountability for that particular unit.

Generally, engine company firefighters "stretching in" should not don their face pieces until they have reached the drop point. If there is a large amount of smoke or toxicity, or if the fire is rapidly gaining in size, the danger of the situation will define where the drop point should be.

The officer or acting officer should be responsible for calling the pump operator/chauffeur by portable radio asking that the attack line be charged while the hose is being flaked out and straightened. This call should be made without a face piece on so that the radio transmissions are clear and easy to understand.

Another reason is that the attack crew should receive an acknowledgement/reply from the pump operator/chauffeur that water is "on the way." If no reply is received, there may be a pumping or water supply problem, and that message should be transmitted to the attack crew. Save your air when you can.

After acknowledgement that water is on the way, don your face piece. While doing this, observe the immediate area of your location, study any details of importance, look back at the hoseline, check each team member to see if the team is ready, and so on. These last-second observations should slow down the crew and help them to control their breathing rate-they know they are moving in together, as a team.

When all company members go "on air" together, it can be assumed that they will have nearly the same consumption rates. In a serious fire situation, the incident commander can have another company or crew ready to replace the whole crew if it is important to keep the line working. This will improve company accountability in that individual crew members will not have to leave by themselves.

This all takes just a few seconds to accomplish, but it helps to slow down that "rush" to barge right in. Many firefighters have a thing about hurrying as much as possible to get in quickly. That's good. However, many firefighters have had the fire overpower them or have gone through a hole in the floor or had something else they might have prevented happen if they had taken a moment or two to slow down, collect their minds, and observe the conditions of the fire and the building.

TRAINING AND DISCIPLINE REQUIRED

The role of the first-due engine company at a typical bread-and-butter fire operation should be to get the initial attack line in service within an acceptable time frame-preferably under 90 seconds. Regardless of the type or kind of fire department working at a fire, this is an achievable goal, but it does require training, education, and discipline.

Fire departments should do their homework and look at their operations to see if they can meet certain goals on the fireground. In today's fire service, it is common to work with fewer resources than in the past, as many cities and towns are taking fire companies out of service or reducing company staffing because of budget constraints. Because of these and other problems, it is more important than ever that fire departments make training their number-one goal and ensure that every member understands the basics of engine company work and what is required of each assigned position. Many departments have researched their operations and improved their procedures, which have paid big dividends in how they now perform on the fireground.

Things like company position assignments and classroom training involving strategy, tactics, and company operations give fire officers and firefighters a better knowledge of fireground operations, accountability, communications, and personal responsibility for completing the jobs on the fireground.

Simple things like changing the way hose is packed and finished can increase personnel's efficiency and speed and dramatically improve a company's time for getting water on the fire. Training is the most important component for developing the caliber of teamwork necessary for successful fire department operations. ■

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The Attack Hose Line:
Three Things You Need to Make It Go!

By Jeff Shupe, Firefighter
Cleveland Fire Department

"We're getting farther away from the job everyday" is what I heard just the other day from a conversation with a chief officer and I agreed with him. I had to, because I know I've said the same thing myself! But what is it that causes us to say something like this? I know the attitudes are the same in many departments all over the country. Is it how the older firefighters view the changes in their departments, their workload and the changing needs for the fire service to be something more than just a fire department? Is it because these non-fire calls (that now dominate many departments' workloads) take firefighters away from the mental aspect of firefighting, meaning they are not in the right frame of mind? Or, is it that the fires just aren't there like they were in the '70's and '80's? Only the older, senior members on the job would know about that era!

Is all this having an impact on fire-company and fire-ground operations? In many departments it is. There are officers in the job who possess a mindset to answer every non-fire emergency and "customer service" call their fire department receives. Consequently, the "frame of mind" may not be right when a structural fire comes in. I'm sure the firefighters can be very effective if conditions allow them to be. However, they must have a plan; and they must have three things going for them: **Training, Teamwork,** and **Experience!**

But wait! We're talking about the fire-attack hose line and the three things necessary to make ***it*** work. Those items are:

1. Proper Nozzle Pressure.

2. Nozzle Mechanics.

3. Hose Line Management.

PROPER NOZZLE PRESSURE

The engine company chauffer/pump operator is the only person in the engine company who should be responsible for getting water, and keeping water flowing to the attack team. This person is also responsible for obtaining the right nozzle pressure. Too much pressure and the hose line will be unmanageable and possibly dangerous. Too little pressure and the attack team might not have enough water to do the job, with the possibility of being over-powered by the fire and burned. This means that the chauffer/pump operator needs to know the kind of nozzles being used, their operating pressures, and flow characteristics. Here's a quick synopsis of a few different nozzles and their properties:

Different Kinds and Sizes of Nozzles

- **Solid Bore —** These are fixed-stream nozzles. Whether this nozzle is used on a 1¾-inch or 2½-inch attack line, the nozzle pressure is the same: 50 pounds per square inch. That's all you need — no more! The nozzle pressure remains 50 p.s.i. no matter what size tip is being used. It is just a simple, uncomplicated nozzle that gives an excellent stream at 50 p.s.i. Firefighters and officers should know the different flows from the different size tips — and yes, at 50 p.s.i.! This will determine your friction-loss calculations. You can even make a mistake in calculation and under pump it by 5 p.s.i. and still achieve excellent flows. Some departments will use only 45 p.s.i. nozzle pressure with good results, but it should not be any less than that. Stick with 50 p.s.i. nozzle pressure, and do your own field testing with a flow meter to see the results for yourself. Remember what District Chief Dave McGrail from the Denver Fire Department said about the solid bore nozzle: "It creates a LOW-pressure, HIGH-volume attack line!"
- **Low Pressure —** Low-pressure nozzles are fog type or combination nozzles that have a lower operating pressure than standard fog nozzles. Some are manufactured to give their flows at 75 p.s.i. while others will work at 50 p.s.i. There are low-pressure break-apart nozzles in the field too, where the low pressure fog tip can be removed and then the nozzle becomes a solid bore. It has a "slug" in the valve assembly for a solid stream. The diameter of the bore (3/4-inch, 7/8-inch, or 15/16-inch) is chosen by the fire department making the purchase.
- **Standard Fog Nozzle —** This nozzle is different from other newer-style fog or combination nozzles. This is the old adjustable stream nozzle that requires 100 p.s.i. nozzle pressure. Most have a "fixed" gallonage or "set" gallonage at 100 p.s.i. An example of this is a 1½-inch nozzle designed to flow 125 gallons per minute at 100 p.s.i. That's what it is designed to flow. Not meeting the correct nozzle pressure means a nozzle not flowing its potential. "Over-pumping" will put a tremendous amount of back pressure into the nozzle that will make it hard for the operator to control. There will not be a corresponding increase in gallons discharged.
- **Automatic Fog Nozzle —** This too is an adjustable-stream nozzle and has been the topic of conversation in the fire service for some time now. The belief in many cases is that all the pump operator needs to do is produce 100 p.s.i. pump discharge pressure at the outlet! Salespeople told the fire service that the nozzle would adjust itself to 100 p.s.i. nozzle pressure. In some areas, this was called the thinking nozzle. It was said that *it* would do the work for the pump operator, and hydraulics became something we didn't have to worry about anymore. Consequently, there WAS and still ARE a lot of low-volume fire streams out there! The promise was that this nozzle will flow any volume of water in a pre-engineered flow range like for example 50 gallons per minute to 350 gallons per minute. It may be true, but the pressure needed to achieve those higher volume flows (especially when using 1¾-inch or 2-inch hose) might be too much for a couple of firefighters to handle. And the pressure in 1¾-inch hose approaches your annual service test pressures, too! That brings about a safety concern. Once again, do your own flow testing for results.

- **Select Flow Nozzle —** These types of nozzles require 100 p.s.i. at the nozzle but have a flow selector ring where the nozzleman can choose what volume he wants to discharge. This selection needs to be communicated to the chauffer/pump operator so he can determine the friction for the volume of water flowing and thus get the right pump pressure. An example might be a nozzle selected to flow 150 gallons per minute. However, the pump operator only pumps at 125 p.s.i. for a 200-foot-long hose layout. What do you think the flow will be? There have been situations where firefighters have taken a 1¾-inch attack hose line into a structure and have not had enough water to do the job. After they were driven out of the structure, their nozzle was examined and found to have been set at the lowest possible flow setting on the selector ring, which was letting them flow in the neighborhood of 30 to 40 gallons per minute. That is the equivalent of taking a booster line in to a working fire!

As you can see, if you're the pump operator, you need to know your nozzles. The next thing is to determine friction loss in your hose lines. Friction loss is predicated on flow. It's as simple as that! And flow and friction loss varies in different size hose lines.

So, the first part of our hose-line equation is *proper nozzle pressure*. Know the kind of nozzle being used, the flow (volume) wanting to be discharged, and the hose layout — the length and size of hose used to flow water through.

NOZZLE MECHANICS

The second item is for the nozzle operator to hold and support the nozzle and hose line properly. In doing this, it will allow the nozzleman to be more effective in fire control efforts. This is what we call ***nozzle mechanics***. In too many instances, people attending basic fire training academies are not taught this very important function. Older firefighters who have developed their own habits or bad habits will need to have open minds about learning this method. Once everyone is on the same page, they will see the importance of and how beneficial it is to use good nozzle mechanics. The results will be better control and safety.

When making an interior attack on a fire and the heat is so intense that you must lie on the floor, you must first get the nozzle out in front of you. Your body will most likely be lying on the hose line and that will help you to control it. There shouldn't be much of a problem controlling the hose line here — only that the stream may be restricted in its movement until the heat is reduced and you can get up onto your knees or into a squatting position and then move the nozzle stream around more.

However, when making an attack from a standing or kneeling position, the key is for the nozzle operator to first make sure he has the nozzle supported and that there is about 1½ feet of hose in front of him. Then he holds the hose under his arm and pulls it into his body. The hand on the side of his body being used, grasps the hose line about a half-foot to a foot back from the coupling. After a quick check to see if his back-up firefighter is ready, he then leans slightly forward, grabs the bail with his other hand, opens it gradually, and once the nozzle is fully opened and discharging, takes his hand off the bail and grabs the coupling. This positioning of hands allows the nozzle operator to move the nozzle without any restrictions, keeping it out in front of his body. Now he can let the stream do as

much work as possible. Should there be a surge in pressure and the nozzle is tearing away, the bail is readily accessible to throttle down to regain control.

The proper method of holding and supporting the hose line and nozzle is illustrated here. The nozzleman has mobility to maneuver the nozzle stream and be more effective on attack when the nozzle is out in front of his body.

Many departments use "pistol" type grips on their nozzles. The inherent problem with them is that when the nozzle operator uses the grip he usually lets the nozzle pull back into his body, thinking it is more comfortable. Just try holding a nozzle with the grip using one hand for an extended period of time! With the nozzle drawing in close to the operator's body, it thereby reduces nozzle mobility and access to the bail. It has also been witnessed many times where the nozzle operator had too much pressure and was struggling to control the nozzle. He was using the pistol grip to try to control the nozzle, but it was pulling back into his body. As he was struggling, the bail was becoming partially closed. This too, is a bad situation.

Nozzle mechanics allow the operator to make better use of the fire stream by being more mobile. In many challenging fire situations the operator cannot make a good knockdown of the fire because the stream is not moved about the fire area. I'm sure you've been in the fire where the location of the fire was just around the corner. There was probably a lot of flame and a lot of glow and a lot of brightness and the nozzle stream was shooting straight ahead! And yet the flames weren't darkening, nor was the heat subsiding. Nozzle mechanics must be emphasized starting in basic training and that simply shooting a stream of water into flames will not always achieve control or extinguishment. The operator of the nozzle can be more efficient, but *he/she* must make the stream do the work!

HOSE LINE MANAGEMENT

This the third part of our equation. Managing the hose line is simply having somebody in place on the hose line to relieve the nozzle operator of back pressure.

Proper nozzle mechanics coupled with good hose line support mean a very manageable hose line." Notice the position of the hands on the nozzle. The back-up firefighter is using the "tank-to-tank" method of supporting and managing the hose line.

For the most part, this is a teamwork/discipline issue. How many times have you witnessed a fire where two or three firefighters were standing around while one firefighter was holding a hose line by himself, squirting water into a fire? What's really interesting is at a large fire where this takes place and the size of the hose line is 1¾-inch diameter! Talk about "high volume flow" for big fires! After a while, the firefighter doing the work is probably going to get a little tired and ask his officer to have the pressure reduced so the back pressure is not

so much to hold! So much for volume of water!

Hose-line management is extremely important to the success of the attack line because, without it, mobility, safety and control can be lost. Teamwork is broken, and the work load becomes greater for the one person holding the line — the nozzleman.

Supporting the hose line can be done in several ways. With two people on a 1¾-inch attack line, it most likely will be a nozzle firefighter and the company officer. In this case the officer has a dual role — supervising the attack and backing-up the nozzle operator at the same time. The officer must also monitor the radio for communications from other companies or the incident commander. To support the nozzleman when he is kneeling, the officer can simply put his knee on the hose line about three or four behind the nozzleman, keeping it straight and pinning it to the ground/floor. Keeping the hose line straight and lower than the nozzle is good, because the nozzle will be shooting upward most of the time. Supporting the back pressure will be easy.

This back-up firefighter is keeping the hose line straight while feeding it to the attack crew as they call for it.

Another position for the back-up firefighter or officer is to grab the hose behind the nozzle operator with both hands, hold the hose against his body and lean towards the nozzle operator, keeping himself in a position to look ahead and over the shoulder of the nozzleman and over the entire fire area. This position is known as “shoulder-to-shoulder.” Remember, you must keep the hose lower than the nozzle, otherwise it will work against the nozzle and the operator will have to struggle to keep control of it.

The back-up firefighter or officer should also remember to keep the hose line as straight as possible behind the nozzle operator for five to 10 feet. This will make the line easier to control because much of the back pressure will be “absorbed” into the hose. I am sure most of you know what it’s like to have a sharp bend in the hose right behind the nozzle. The pressure wants to counter the bend and that causes the hose to want to pull away from the nozzleman. But once the hose is straightened again, that force releases.

When it comes time to advance the line or move it about, simply shut or throttle down the nozzle bail and communicate with those on the line what you want to do. Those members on the line should be spaced at intervals along the line and at bend points, like at stairway landings or corners or posts to help “feed” the hose line to the nozzle team. Once the line and nozzle are in the new location, simply take your positions, check to see that back-up member(s) are ready, then open the bail gradually, and resume attack. Too many times, nozzle firefighters have rushed to get to a new location, and without checking to see if their team was ready, “ripped” open the nozzle bail, only to lose control and have the pressure throw them about. Sometimes a situation does need quick

application of water. However, for your safety, try to slow the process down a little to avoid losing control.

Another reason to avoid opening a nozzle quickly (besides wanting to avoid water hammer) is that sometimes the pressure in a hose line can climb upward during the time the nozzle is closed. This may be due to any number of reasons or factors, such as another line shutting down. Opening the bail gradually will let you know if there is too much pressure in the line for you to handle. Before you have the bail completely open, you will be able to tell, so you can now close it back down to maintain control of it.

So, there are the three components of putting an attack line in service. It requires teamwork, training, and experience. Efficient fire attack is the basis for good fire control efforts. With every member doing their job, there's no reason why an attack line cannot be managed properly and be mobile and effective on the fire ground.

Remember, stay safe!

Fire Engineering

BIG-CITY STRATEGY AND TACTICS FOR SMALL-TOWN FIRE DEPARTMENTS

12/01/2006

BY JEFF SHUPE

Envision this situation: Your city covers about 10 square miles and has a population of approximately 38,000. The daytime population skyrockets to more than 125,000 daily because of the amount of commerce located in the city. Your city has all kinds and types of buildings and occupancies, ranging from small one-story taxpayers to residential high-rise structures, some reaching 20 stories or more.

Your fire department has 40 career members and operates from two fire stations with minimum staffing of 10 members on duty at all times. Placement is five members on duty per station. Like many suburban fire departments, EMS and other service-related incidents make up the largest percentage of calls. Since structure fires don't occur regularly, there is not a great deal of emphasis on fire service training-it is especially noticeable by the amount of money allocated for it in the fire department budget. Your firefighters want to train on fire related topics because they know they need it and that someday that "big one" will come. Paramedic recertification and other nonfire training programs have the spotlight.

Your department doesn't have a dedicated ladder company. The on-duty personnel staff two engines, a 75-foot quint and a standard triple combination apparatus, and two medic units. The number of firefighters on the fire suppression units is well below what it should be.

SCENARIO

You are the shift commander. At approximately 3:25 a.m., the dispatch center (which is shared with police) receives a call for "smoke in the hall on the 14th floor of a 19-story residential high-rise structure" about one and a half miles from the closest fire station. Turnout time is usually good; however, the medic unit from the other fire station is tending to someone with "difficulty in breathing." Three firefighters answered that call, leaving only two firefighters to respond with the engine from that station. You're down to seven people now.

(1) High-rise structures like this one are found in small cities and towns across the country, presenting a potential for big fires and monumental challenges for local fire departments. Residential high-rises can house as many people as a small village at certain times of the day or night, creating search, rescue, and accountability nightmares for responders. In many cases, local fire departments are not staffed or equipped to handle a major working fire and need to rely on help from other fire departments. Departments must plan ahead. If they wait until an incident develops and then try to manage, they will not be successful. (Photos 1-10 by author.)

Click here to enlarge image

As you travel the short distance, your dispatch operator informs you that the center received a couple of more calls reporting heavy smoke in the hallways. You think to yourself that civilians don't really know heavy smoke conditions and that it's probably burned food on the stove. As you arrive at the front side of the building, there isn't much to see and no real excitement. You radio to dispatch: "We're on the scene of a 19-story residential high-rise. Nothing showing. We'll be investigating." You and your station members are heading into the building when the second-due engine, responding by way

of the rear of the building, excitedly announces on the radio that there is a "working fire" and people at the windows!

Using your portable radio, you ask the second-due engine officer to repeat his transmission, thinking you didn't really hear what you thought he said. He repeats it, this time with more urgency.

You are now thinking about what needs to be done. You begin to mentally revise your initial size-up. It's more than food on the stove! Things like size and type of building, occupancy, and resources are flooding your mind along with time of evening. (If it isn't flooded, it should be!) On what floor did he say the fire was? He didn't.

In the main lobby, the fire alarm panel shows activation of smoke detectors on several floors. When this building was constructed, sprinklers were not required, but standpipes are located in the stairwells. This is a Type 1 Fire Resistive structure, so you think that this building will help to keep the fire in check.

Within the past year, the communities in your area decided it was time to work together to develop an automatic response system that would increase the resources available for these types of situations. However, it is not a true automatic response system; it is more like an organized mutual-aid system in which assistance still must be requested by the on-scene incident commander (IC). Before that, fire departments would have had their dispatchers call other communities for help, and they would send whatever they had available. The ICs had no idea of what was available, how long it would take for the resources to arrive, or how those responding units would fit into the fire attack plan, especially with no prior training or operating plan among any of the units.

THE FIRE BUILDING

This high-rise apartment building is located in a smaller suburban city setting, but it would be considered big even by "big-city" standards. There are no laws on the books or codes or ordinances in this town that say we won't see another building built just like it in the future. When built properly and with full fire protection systems, these giants are not bad things. On the contrary, they can be very good to a city. They can define growth or other positive aspects about a town, plus bring in tax dollars to the local government coffers.

Dimensions and statistics for this structure are as follows. There are 19 stories. Each story has a floor-to-ceiling height of eight feet. Total height of the building is close to 213 feet.

There are 300 single-family apartments on 18 floors, and the roof penthouse. The overall length of the building is 340 feet; the width is 105 feet. The apartments range from one to three bedrooms. Suites with one bedroom contain about 700 square feet of livable space; the two-bedroom suites have approximately 950 square feet of floor area. The three-bedroom suites contain at least 1,250 square feet of area. There are 20,000 square feet of livable area on each floor. A bank of three elevators is in the center "core" of the building. All floors are serviced from a common shaft. Stairways are in the core and at the ends of the hallways, hidden at right angles. Ceilings in the public hallways are suspended and have cables and other kinds of wiring running through them.

IN THE LOBBY

As the elevators are captured by the operation of the smoke detectors, you get the distinct aroma of smoke. It's not the "food on the stove" kind, either! You're thinking about the occupants and how many might be in immediate danger. In the lobby, a couple of occupants who made it downstairs report that the fire is on the 14th or 15th floor and there's a lot of smoke in the hallways. Because of this information, you want your initial attack crew to go two floors below the lowest reported floor and walk up from there. They have an elevator under fire control and will take their standpipe kit and tools with them. Only four firefighters are available for fire control efforts in this big, occupied building. The two engine pump operators, who are securing a water supply and stretching hoselines to the siamese connections for water pressure and volume, and you constitute the seven initial arriving firefighters. You need help NOW!

Since there are no sprinklers in this building, quickly placing an attack hoseline is imperative and most likely would be your best strategy, because there is no other method of fire control. By assigning your only available firefighters to take a hoseline up now and to get it in place, the initial fire attack team can start to address simultaneously fire attack and rescue on the fire floor. The attack team *will* need help as soon as possible, and that must come from the next group of firefighters to arrive. They must be assigned to help with the attack line. This is called "pairing" companies. The safety of occupants and firefighters will be enhanced by getting fire control efforts underway.

WHAT DO YOU DO NEXT?

You now have a big-city fire problem on your hands: a residential suite heavily involved and extending in this occupied high-rise structure. What do you do next? Your on-scene resources are all working. Even if you had all of your shift members available on arrival,

there wouldn't be enough of them for the tasks that need to be addressed. You quickly think to yourself about high-rise fires in other cities that have employed 50, 60, 70, and more firefighters, because of extreme fire conditions and complexities. Where are you going to get those numbers in a hurry?

You call your dispatcher to strike a MABAS (Mutual Aid Box Alarm System) to bring more fire crews and equipment to the scene. It will be several minutes before any help arrives, and some communities will need about 12 to 15 minutes to respond. Dispatch now notifies you that it is receiving numerous phone calls from occupants describing conditions on their floors: heavy smoke in the halls and they are trapped and can't get out of their apartments.

Size, building construction, occupancy, time of incident, and fire location have already told you this is going to be a labor-intensive operation. However, simply calling for more people is not going to guarantee satisfactory results.

THE "MUSTS"

There *must* be a fire attack plan for this incident under which all resources will work.

Your fire department *must* have a high-rise firefighting standard operating procedure (SOP) or plan if it doesn't already have one.

Your fire department *must* have preplans for structures like this-with high life hazard and threat potential. To expand on this point, each fire department that participates in your MABAS/auto response system must have the same SOPs or standard operating guidelines.

Each fire department in your MABAS/auto response *system must* have been trained on it before this incident.

The incident commander *must* run a disciplined fireground. Everything must go through command. This is accomplished by having all fire departments in the MABAS/auto response system use one command system and one system of accountability. (Luckily, in this case, these departments have worked together on smaller incidents before and have done some limited training together also. Everyone here understands the severity of the incident and knows that the plan *must* be followed accordingly.)

If you do not have things in place and you have not trained and worked together before an incident, things aren't going to work when the real show happens.

STRATEGY AND TACTICS

In putting your strategy together, think of all the variables and "what ifs" of a high-rise fire incident. Elevator usage would be a concern. If the elevators fail, your firefighters would have to walk up the stairs, and you know what that can lead to. If an elevator fails with firefighters in the car, you would have a real complex problem.

There are many ways and ideas for formulating an incident strategy. Some fire service authors have come up with techniques fire officers have been following for quite some time, and with good success. Let's look at a few of those ideas:

• William E. Clark, in his book *Firefighting Principles and Practices*, 2nd edition, defines *fire service strategy* as the overall plan developed for an incident by the incident commander. Clark said a general plan can be developed by considering basic factors and asking three questions: (1) What is to be done? (2) What is needed to do it? (3) Who is to do it?

• Noted former Parkersburg (WV) Chief Lloyd Layman developed a way to gather information for a fireground strategy by listing and following the basic steps of firefighting, which yielded the acronym RECEO VS, with which the majority of the fire service has become quite familiar: **R** - Rescue; **E** - Exposures; **C** - Confinement; **E** - Extinguishment; **O** - Overhaul; **V** - Ventilation; **S** - Salvage. The first five steps follow a general order of the things considered at a fire. Ventilation and salvage can begin anywhere within the priorities of the incident-generally early on. These steps have been used by the American Fire Service for years to help determine an orderly flow of events on the fireground while protecting lives and property regardless of how big or small the department is.

• If you have been a student of the National Fire Academy Outreach Field Programs such as the Managing Company Tactical Operations (MCTO) series and Incident Command System (ICS) courses, the basic steps of putting a plan together are discussed in detail. For example, students review steps for developing size-up information, analyzing the incident priorities, and setting goals for the incident:

1. Life safety,
2. Incident stabilization, and

3. Property conservation.

The sequence of thought should flow something like this:

Size Up + Incident Priorities = GOALS, OBJECTIVES
(that is, Strategy or Incident Action Plan-what needs to be done).
From there, we come up with Tactics, and then Tasks (who is to do it?).

This thought process follows a general progression from information gathering to the actual "doing," firefighting.

In each of these three steps, the strategy is the overall plan for the incident, which must be developed *first*. Tactics and tasks are then to be assigned in order of priority for the incident and are to accomplish the strategy. The common denominator is having enough personnel on the scene to address the tactics and tasks that need to be done.

Regardless of whether the incident is taking place in a suburban or rural setting or a dense urban neighborhood, if enough firefighters are not on hand for the job, of course, strategic decisions will be made regarding the safety of personnel and citizens as priorities. Without the right number of firefighters to do certain jobs, the IC must decide which tactics will receive priority based on the safety of the operating members.

APPLICATION OF CLARK'S QUESTIONS TO THIS SCENARIO

Let's follow Clark's questions for developing strategy and personnel requirements and see how closely they parallel Layman's work and the National Fire Academy's course material:

1. What is to be done?

A. Extinguishment of the out-of-control fire.
B. Rescue of the trapped occupants.
C. Confinement of the fire to the point of origin or to stop its extension.

2. What is needed to do it?

A. Rescue: one search and rescue crew per affected floor.
B. Extinguishment: one attack line for fire floor, maybe two lines if necessary.
C. Confinement: one attack line to the floor above, for extension.

3. Who is to do it?

A. Rescue: three firefighters per crew, one crew per affected floor.
B. Extinguishment: six firefighters per attack line, one hoseline to fire floor.
C. Confinement: six firefighters per attack line, one line above fire floor.
D. Salvage: two crews-one to fire floor, one to floor below.
E. Logistics: four firefighters.
F. Operations: one fire operations officer to direct fire attack.
G. Water supply: two pump operators.
H. RIT/RIC/FAST: four firefighters.
I. Medical care: four firefighters.

For accountability, Command should use a chart or "command board" for illustrating this incident to show who is on the scene, where they are, and what they are doing.

As you can see from what is being addressed here, you are going to employ between 30 and 40 firefighters for the necessary "basic tasks." For cities or towns that have limited firefighters available, there needs to be a recall system to supplement the MABAS/auto response system.

SO MUCH TO DO, SO FEW FIREFIGHTERS

We called for a MABAS box that will bring more firefighters and equipment to the scene. Since the communities in this region do not have an automatic response system, there will be a considerable loss of time before enough firefighters arrive, get assignments, take their tools and equipment, and get to their fireground positions.

How many firefighters will eventually be needed for this incident is yet to be seen. Regardless, there must be a system in place to call whatever number of personnel is necessary so that those firefighters already working don't get overstressed or fatigued or spread too thin for their safety and health. We haven't mentioned setting up a medical sector for occupants or firefighters, have we? Nor have we talked about relief for the troops. As stated before, we're addressing the basic needs for this incident right now. As IC, your hope is that the initial suppression efforts will be effective enough for a quick knockdown of the main body of fire. If that can be done, everything else will start to get better.

BEFORE THIS FIRE EVER HAPPENS...

Where do you start? Any fire department with limited resources that has big fire potential in its community cannot afford to sit back and say, "We can't fight fires like a big city does because we don't have their resources." Your department needs to take an aggressive attitude toward research and training for potential incidents like this. (Note: Even bigger fire departments need to look at their operations to determine if any changes have taken place in their capabilities, especially departments that have suffered budget cutbacks that have resulted in fewer companies and people in the street.)

Before anything else, examine the present status of your community and any planned or projected growth. Look at the changes the city administration, zoning, and community development offices are contemplating and how they will impact the department's resource levels. Survey the community to identify all potential large-scale incidents, especially those that could affect large numbers of people at one time.

Next, honestly assess your department and community fire defenses. What this boils down to is that all fire departments have limitations, especially in complex, large-scale operations. No fire department can completely handle by itself any and all incidents that might happen. Department leaders and firefighters must realize that their limitations and abilities will enable them to handle only so much; anything beyond that level will necessitate obtaining help from other departments and outside agencies.

After you have identified the potential problems and your department's capabilities and limitations, you can now determine what it will take to develop the resources to deal with a possible future crisis.

PROBLEM IDENTIFICATION

When beginning to research your community, use a format that will help you determine potential problems and your department's ability to handle them. An example of this format can be found in Fire Protection program courses, like those in the Open Learning Fire Service Program at the University of Cincinnati. In the "Disaster and Fire Defense Planning" course, for example, students study potential problems or disasters that may challenge the community's fire defenses and try to come up with solutions for bolstering them. One area studied is "HICA/MYDP" (Hazard Identification Capability Assessment/Multi-Year Development Plan).

Think about any unusual or complex businesses or occupancies with high life hazards in your jurisdiction. Throw in a problem like the environment or a couple of other potential possibilities and other size-up information, and come up with a realistic scenario. Think about how your own department might fare by itself. Grade the incident potential to see if it is "not likely," "likely," or "very likely" to happen. If you think your department is not capable of handling an incident in an efficient, safe manner or it cannot reasonably address occupants' life safety with its resources, then you most likely will have to come up with a plan to get adequate resources and equipment together for such an incident. This process is not just for anything you can dream up; it is for potential incidents that could "likely" happen in your community.

Many smaller cities and towns have been aware of disasters waiting to happen in their communities for years and have been very proactive in planning and training for such incidents. Automatic responses have also been in place. These response systems are designed to increase the number of resources responding on the *initial call*. If an incident goes beyond first-alarm capabilities, successive multiple alarms can be struck to increase the number of personnel and equipment as needed. This system is a good approach, especially for the scenario at hand, where the hometown community has a crew of firefighters already handling a routine medical call. It is also good for the safety of the firefighters and the citizens.

On a sad note, there are communities that will not "buy in" to automatic-response systems because the mayor, town manager, or even fire chief doesn't want the resources leaving the area unprotected by responding to other's calls. Education is key here; it is imperative that all concerned parties be aware of how a true automatic-response system works.

Another point to address, should it arise, is concern about taking so many resources from different departments for a full first-alarm assignment for an unconfirmed incident. Generally, it should take the hometown's first-due unit only four or five minutes to respond to the location and to give a clear initial report on the conditions found. If it turns out to be a working incident, then the rest of the assignment will be there shortly, and the IC can plan for their timely arrival. If the incident is minor or false, the hometown will handle it, and the other units can return to service in their own towns.

Today, there is a wealth of information, knowledge, and experience available to use in upgrading fire protection services. In many cases, it just takes a desire to know more and

do better. No fire department should be allowed to use the excuse that it was not prepared or it was not familiar with or trained in problems or hazards in their localities. When a fire department identifies a potential incident, it needs to plan for what could become a future reality.

Follow Murphy's outlook (maybe he was an optimist!): Plan for the worst; if it happens, you won't be surprised. If it doesn't happen, you'll be prepared for it-at least to the best of your ability.

PREINCIDENT INFORMATION

Many of us probably have been at a working incident where we had no information about a particular building, its floor layout, or its contents. And maybe there were some bad conditions-lots of heavy smoke and fire and a whole bunch of noises. Maybe it was an old factory, a multistory commercial structure, or an old rundown, two-story mixed multiple occupancy. As you were going in, I'll bet you wished you knew more about what was waiting for you. This is where preincident information comes in. It's probably also safe to say that the more we know about our communities, the better off we'll be when called to take care of an out-of-control situation. This is an undisputed statement. The knowledge we have before an incident happens can give us the edge in making decisions that may impact our or occupants' life safety or help us to know what it takes to control an incident and need to do to save whatever we can. These are our incident priorities.

(2) Firefighters from the North Olmsted (OH) Fire Department and surrounding departments recently completed high-rise classes using an occupied 19-story residential structure. The drill simulated an elevator malfunction (which coincidentally did occur one day). The firefighter is ready to begin the climb to the 10th floor with his gear, SCBA, spare

bottle, and a length of 2½-inch hose. Notice that his helmet is clipped to his turnout coat so that his head and upper shoulder region can dissipate body heat to minimize fatigue.

Click here to enlarge image

• Preincident information is the first phase of size-up. Its preparation begins with firefighters' being conscientious about their jurisdiction's structures, occupancies, neighborhood layouts, water supply, and so forth. Think about what you see as you drive to and from work or when you're out and about. There might be something unusual about a building or what is inside it that gets your attention. You might be doing business in a store and notice a dangerous feature. It might be something you want to remember for future reference, or you may want to take it to your fire company to make everybody aware of it. Whatever it may be, it could be important in the future.

(3) This firefighter carries his 2½ hose length draped over one shoulder and his SCBA tank. Different methods were tried; most members found this to be least stressful and most comfortable method for the climb-a big concern in such situations.

Click here to enlarge image

Let's look at two examples of preincident information concerning our high-rise incident scenario. One is water supply. The municipal water system for this community comes from the "big city." Even though the big city is old, our suburban city is newer and has a good to excellent water delivery system in practically all neighborhoods. That is not our concern. Our concern is getting water from the hydrants to the building and then to the fire floor. Here's why.

(4) During one evolution, firefighters found a real problem with the building's standpipe outlets. A contractor who had recently worked in the building left outlet caps so tight that hand tools had to be used to loosen them.

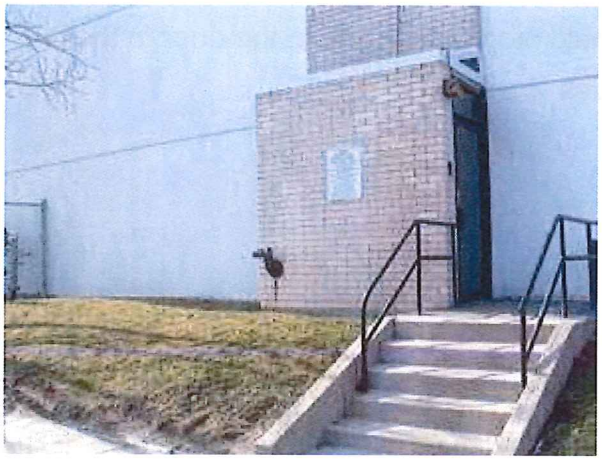
Click here to enlarge image

Our fire building was built in the late 1960s and followed modern, up-to-date codes. However, there was no sprinkler requirement code because at that time it was believed that Fire Resistive construction (Type 1) was superior and would be able to contain a fire, if it developed, to the area of origin. The thinking was that firefighters would just "take a ride up in the elevator, hook up their hoses to the standpipes, and squirt just enough water to put out the burning contents. "It sounds so simple and elementary. So, sprinklers weren't required back then. This was back in the times when it was believed a little bit of water in a fog pattern would go a long way in controlling a confined fire. All this was perceived under laboratory test conditions for building materials and, of course, with the belief that occupants fleeing their apartments would stop to make sure the door to their suite was closed securely as they ran for their lives.

(5) Water supply problems were discussed, and firefighters came up with ideas and ways to counter them. Here, firefighters use appliances and adapters to supply this siamese with two supply lines in a hypothetical problem situation. Other methods such as taking a second supply line inside to a lower level standpipe outlet were also covered.

Click here to enlarge image

The problem is that each of the standpipe risers in the stairwells has its own siamese, and the entire system is not interconnected. This is extremely valuable preincident information firefighters must know. Having this problem means that the initial attack crew must first locate the fire, then identify the stairwell to use for attack, and then notify Command and the pump operator(s) of that stairwell so they can pump into the correct siamese. As you well suspect, anything that delays getting water on the fire can lead to fire growth and extension, regardless of whether or not you are dealing with Type 1 construction.



(6) Each fire department participating in the response plan should have a preplan of the structure, its water supply and standpipe system, and any critical information, since it

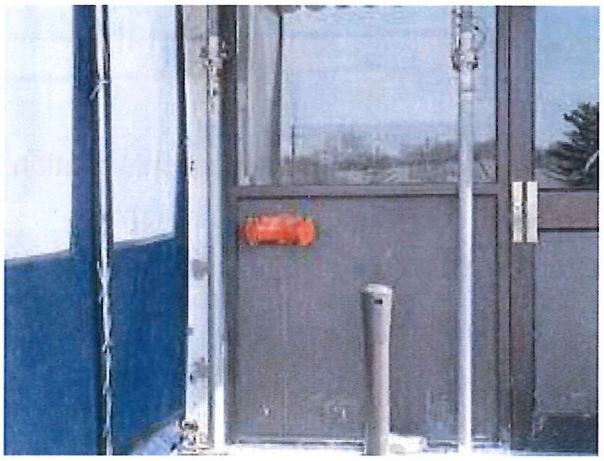
might be one of the first-arriving units and may have to supply the water to the system. The standpipe riser shown here is one of three in this building. Its location in an outside stairwell subjects it to freezing in cold weather. A small amount of water in the piping can make it inoperable. Smaller fire departments should train together on alternative methods of supplying water for a fire attack in such a building.

Click here to enlarge image

The other preincident information deals with our building size, floor layout, number of suites and their sizes and square footage, and other features. This information is important because it will certainly affect strategic decisions made by the IC, especially when determining the size of the attack. We'll discuss them in a little bit.

PREPLANS

The examples of preincident information above should be turned into hard copy preplans and kept in notebooks or binders in the cabs of all department apparatus. Further, each fire department participating in the MABAS/auto response system should also have a notebook.



(7) This siamese standpipe riser is on the other side of the building in an entrance way. It protrudes through the foam core wall of the door assembly. Its unassuming position and lack of identification signs limit visibility of and accessibility; automobiles or other objects can easily block it from view.

Click here to enlarge image

Place in the notebook information about the building-its construction, floor plans or layouts, utilities, street access, and maps or plots. If there are any unusual aspects or suspected

hazards or something that could become a hazard under fire conditions, note that information as well. Include the suite locations of occupants who are nonambulatory or handicapped who would pose a special rescue concern for the IC.

(8) This standpipe outlet is in an interior stairwell. There is no hose for occupant use or reducer or pressure regulating device. If the fire department uses it for firefighting, it will attach a pressure gauge to the outlet and stretch the attack hoseline. The gauge will enable the attack crew to set the pressure for its hoseline, eliminating the need for the pump operator to "guesstimate" the right pressure.

Click here to enlarge image

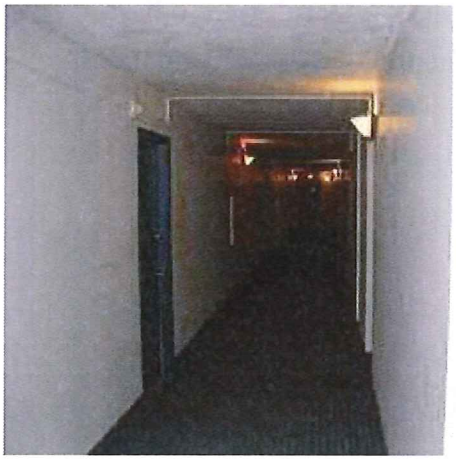
Mapping or plots can show the building and its proximity to streets and access information. Hydrant locations can also be indicated and hydrant flows penciled in to let firefighters know what to expect from their water system. Placement of fire apparatus can also be predetermined, to expedite matters.

(9) The potential for quickly changing fire conditions in high-rises warrants an increase in

fire attack capabilities. One way to do this is to use 2½-inch hose for the fire attack. Fire departments should standardize their fire attack operations and train on them regularly with neighboring departments that will be responding to such fires. Shown are the hose, solid bore nozzle, and pressure gauge needed for a high-volume, low-pressure, standpipe attack line.

Click here to enlarge image

Dedicate a page or two to brief details such as what certain responding companies should do, the special tools they may need, and the location of utility controls. These data can save time, eliminate guesswork, and make operations more efficient and safer.



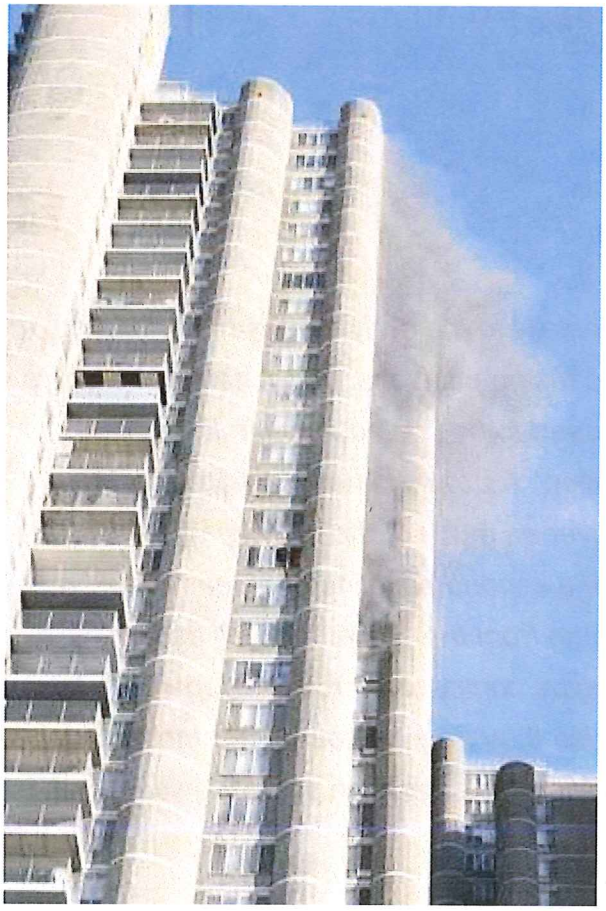
(10) Ventilation may be poor to nonexistent, especially in the early stages of firefighting, when units are arriving, getting assignments, and taking positions. Long, narrow hallways that have heavy heat and smoke conditions will need to be cooled down to keep them under control and to prevent them from "rolling over." A powerful hose stream that has reach and volume is needed to penetrate and cover as much of the hallway area as possible. If conditions deteriorate for the first line, a second hoseline of at least equal or larger size will be necessary. That line should come from the same stairwell as the initial attack line, to prevent opposing hoselines. All engine companies (from all departments) should bring their standpipe kits with them because they may be needed for more and longer hoselines. Large-scale fires in small jurisdictions warrant the same logistics as a large fire department operation.

Click here to enlarge image

Revise preplan information on a regular basis. Review it every six months to see if there were any alterations were made to the building or there were occupancy changes that might endanger firefighters. Preplans should be up-to-date so you can use the information in classroom or on-site drills. You can review them when responding and use them as reference data at the scene of a working incident. Some fire departments have had this type of data readily accessible through mobile data terminals in their fire apparatus cabs and command vehicles.

FIRE ATTACK

Conscientious fire departments do their homework to determine their fire attack capabilities. They look at things like size of attack (hose sizes and nozzles), how much water they can deliver (flow volume in gallons per minute/target flow rates for different size hose lines), and how fast they can start attacking a fire (efficiency, training, and teamwork).



(11) Time: 1605 hours. This photo was taken shortly after the fire department arrived at this high-rise fire in the Bronx, New York. Note that no flame is visible; however, there is a medium to heavy smoke condition showing. The wind does not appear to be a concern at

this time. The fire originated in a bedroom of a unit on the 24th floor. (Photos 11-13 by Nate DeMarse.)

Click here to enlarge image

Note: Several years ago, the Columbus (OH) Fire Department was fortunate to be able to conduct live-fire training in an acquired high-rise structure in the downtown area. Every company on each shift was put through scenarios and developed certain data and information. They studied the results and found certain things that needed attention. One was fire attack capabilities for high-rise operations. Because of that training and conversations with other fire departments, they adopted 2 1/2-inch attack lines for high-rise operations.

(12) Time: 1630 hours. Heavy fire is now visible on two floors. As the fire caused the windows to fail on the windward side, high wind conditions pushed the fire inside the suite and caused it to intensify and extend to the suite on the floor below.

Click here to enlarge image

In our fire scenario, the IC has a crew of four firefighters taking the initial attack line up to get it ready for fire attack. They will stretch the hose from the standpipe on the floor below the fire floor in the public hallway and up the stairs to the landing above the fire floor and back down to the entrance door. Doing it this way will help the firefighters advance the line, because gravity will cause the hose to come down the stairs more easily as they make their push down the hallway. The size of their attack line is 2 1/2 inches and is equipped with a solid bore nozzle that has a 1 1/8-inch tip, a standard U.S. fire stream.

(13) Time: 1634 hours. With heavy fire in two suites and heavy wind conditions intensifying it, a third alarm was transmitted to bring more than 100 firefighters to this incident. Three 2½-inch attack hoselines, operating from standpipes, were needed for extinguishment. Smaller fire departments with structures like this could find themselves confronted with similar conditions and problems. High-rise fires can present many complexities, not to mention the logistical nightmare of trying to get enough people to transport equipment to their proper destinations. Preincident planning along with aggressive training can help to prepare firefighters but still is no substitute for the large numbers of personnel needed for an incident of this type, especially for heavy fire conditions and other situations.

Click here to enlarge image

You may be thinking four firefighters cannot handle a 2 1/2-inch hoseline. Although this is not the ideal number for handling the hoseline, the key is to get the standpipe line in place, laid out properly, and charged with water. The IC knows he has to assign newly arriving firefighters to "pair up" with the first team to make this line work. The goal is to have help there when the line is ready to go. Four members can start the line working.

The suite on fire is a three-bedroom unit and is well involved. Its size and volume are equivalent to a medium-sized ranch house. You are going to need a fire stream that delivers a large amount of water for heat reduction and that has the penetrating force to get "into" the seat of the fire.

Think about this perspective: If you are to arrive at a working fire where a house of this size is well involved and you're going to use handlines for attack, isn't it prudent to use a large handline to knock down the fire as quickly as possible? And, of course, you have the advantage of being outside when you begin your attack. However, in a high-rise fire, you are going to be in a narrow hallway with no place for the heat or smoke to go. If the fire

starts to come out of the suite and into the hallway, you will need all the water you can get from the hoseline for your protection. The nozzle you use should be a low-pressure, high-volume type that will not upset the thermal balance in a radical fashion.

Every fire needs a certain volume of water for aggressive extinguishment-the critical flow rate. Fire departments across the country are accustomed to working with a 1 3/4-inch or, in some cases, a 1 1/2-inch attack line for firefighting. These hoselines are not capable of handling all types and sizes of fires.

Delivery. We have been saying it for years: "Big fire, big water." That translates into every size hoseline has its limitations, especially when it comes to gallons per minute. Using eight smaller handlines to surround a structure does not add up to big water. Think about your last large defensive operation. Was big water delivered through several 1 3/4-inch handlines surrounding the building or through 2 1/2-inch handlines and larger appliances with greater punch and effectiveness? What about large interior operations that require flows larger than 1 3/4-inch lines can normally deliver? Employing the same tactics here most likely will end up in a defensive operation.

In most cases, and this is for all fire departments, working with 2 1/2-inch attack handlines is a matter of knowing and working with your equipment, training with it, and exercising the discipline of using it on the fireground when the situation calls for it. As Chief David McGrail of the Denver (CO) Fire Department teaches: "When you go into a fire, you should go into it with the intention of overwhelming it." Simply stated, "Big fire, big water."

So, when is the right time or what are the right conditions for deploying a large handline-the 2 1/2-inch line with a solid bore nozzle? The late Lieutenant Andy Fredericks of the Fire Department of New York gave us the acronym ADULTS to help us determine when to use this line:

A-Advanced fire conditions on arrival

D-Defensive operations

U-Undetermined location of the fire, especially in larger buildings

L-Large, uncompartmented buildings, like stores or warehouses, or the like

T-Tons of water for extinguishment (big fire)

S-Standpipe Operations, large hoseline with solid bore nozzle

FIRE ATTACK UNDERWAY

The first mutual-aid engine crew to arrive was given the assignment to "pair up" with the initial attack crew. There are three people on the team. That gives you seven firefighters on the initial attack line. They will remember to space themselves along the hoseline, as they were previously trained. Since these fire departments have trained together with this size handline, they know the positions each member should take on the line. For example, they know how to position themselves at the "bend" points and not to crowd behind the nozzleman. They also know what commands to listen for as the nozzleman or officer calls for more hoseline.

As the attack team gets ready to start its attack from the stairway, one firefighter positions himself to open the door. He braces it with his foot at the bottom and then asks the nozzleman if he's ready. The officer, positioned behind the nozzleman, looks at everyone for a final check and then says, "Let's go." The firefighter controlling the door opens it slowly to see if the hallway is involved with fire and if it's going to need to be washed down from the protection of the stairway, using the door as a barrier. As the door is opened, smoke rolls over the attack team and up the stairwell. Everyone is staying low. The hallway is black. The heat is a medium condition initially, but it seems to be getting hotter as the seconds go by. The order is given to "lighten up" on the line, which means to feed more hose to the nozzleman. This must be a slow, methodical process so the hose doesn't get pushed to the nozzleman and forced out of his grip. If that happens, he will lose control of the nozzle, and the fire will then have a chance of taking over and burning the firefighters.

A few feet into the hallway, the nozzleman stops and opens the nozzle fully at the ceiling, using it like a big deflector. He rotates the stream in big circles, then in an up-and-down motion around the hallway to wash it down completely. The smoke is blinding; the heat is increasing, but this is a smart, protective move done to protect the firefighters and to reduce the chance of the hallway's becoming involved in fire.

Note: This tactical move may run counter to what many firefighters have been taught in their careers, especially in basic training classes. However, in the real-world situations of

firefighting, it has been learned from experience that when firefighters are in a room or an area where heavy smoke is banked down to the floor, and heat is pushing downward and not allowing firefighters to move in, it is time to open the nozzle fully and to move it in such a way as to cover as much of the area as possible. This is done to reduce the amount of heat and prevent flashover.

After a few seconds go by, the nozzleman moves in a little more. He gives it one more good washdown before coming to the fire apartment. He can't make the turn and enter because of the amount of heat coming from the suite, so he's going to let the nozzle stream do its work from the doorway. Here is where the solid stream excels with its ability to penetrate heavy fire. It is a rough position to be in because once attack on the main body of fire is started, it must be continued until the fire is knocked down. Firefighters may need to be relieved on the line, especially at the nozzle and backup positions. This is another reason to have companies "paired" on this line.

While fire attack is underway, you assemble another crew to take the second attack line to the floor above. This crew is primarily responsible for ensuring the success of the first line. In this case, however, the first line is gaining control of the fire, thus allowing for the quick deployment of the second line. The second crew will connect its line to the standpipe outlet one floor below where the initial attack team hooked its line. Because of this, the second crew will need extra hose to make the stretch. Fire departments should keep this in mind for all standpipe operations and mandate that all engine companies have their hose packs and tools with them as they report to command for assignment.

COORDINATION AND CONTROL

As time goes by, more and more resources have arrived so that you now have a small army of firefighters to work. The position of operations officer has been staffed. Command will review his incident action plan with Operations and see what is being done and by whom. It is a continual "sizing-up" process. You must also review what still needs to be done in order of importance. As mentioned, things should follow a priority order. Here, fire attack (incident control) is the main concern, since there are no other fire control systems in the building. Once the fire is knocked down and brought under control, the better off everyone in the building will be.

You have concentrated the efforts of the initial firefighters for attack. In your thinking, it is the logical way to provide for the safety of the occupants and firefighters at the same time.

There simply are not enough firefighters available to cover the multitude of things that need attention. Knowing before the incident the layout of the building, the size of the suites, and their characteristics, the decision to use a large handline was made months before in preplanning and training for this fire.

The next available crew of firefighters was assigned to take the attack line to the floor above. This is being done to cover vertical extension as flames are showing out the windows and extending up the side of the building.

Four three-member search and rescue crews are being assembled. The first crew will go to the fire floor. The next crew will be sent to the floor above the fire floor. The third crew will go to the top floor to check for people and mushrooming and ventilation. The fourth crew will check the floors above the 15th floor.

These crews and others assigned to various duties will first report to the operations officer located on the floor below the fire floor. He is the officer directing fire control, search and rescue, ventilation, and other duties necessary at this level. He is responsible for coordinating all the crews and maintaining their accountability. Although these departments have been schooled in incident control in classrooms, this is a completely different situation: People's lives are involved.

The operations officer must be able to communicate with all the functions being performed and with the IC. Operations monitors the firefighters and sets up a staging and medical area two floors below the fire floor. He then discusses with Command getting extra air bottles and equipment brought up.

YOUR STRATEGIES ARE IN PLACE AND UNDERWAY

Fire attack crews are knocking down the fire in the original fire apartment and the fire directly above. Reports from the operations officer are positive. Attack firefighters have done a great job under rough conditions and will need relief very soon. Command should have planned for relief early and should have assigned firefighters who are waiting in the staging area two floors below the fire floor.

The search and rescue crew on the fire floor had to wait until conditions improved in the hallway and the hoseline moved in before they could search each apartment. This crew started its work at the apartments closest to the fire suite and worked progressively outward. They found no fatalities; there were some smoke inhalation victims because

smoke had pushed into their suites around the door jambs. Firefighters vented the suites through the windows as they went along, which helped tremendously.

The search crew above the fire floor reported a medium to heavy smoke condition in the hallway and some apartments. Some occupants tried to make it to the stairwells and also received smoke-inhalation injuries. Other occupants found in their suites were left there. This is known as "rescue in place," and it can be used for situations like this where not enough rescuers are available to remove people to safer areas, especially when it has been determined that the occupants are safe in their units. The greatest amount of heat on this floor was in the unit directly above the area to which the fire extended. The fire came in through the windows of the room directly above the fire below. The room and its contents were damaged, and smoke was throughout the apartment. The occupants made it out before it got to them.

The fourth search crew had good reports from its area, the intermediate floors. There was some smoke in the halls, but nothing heavy, and there were no reported victims. But the third crew, assigned to the top floor, had a heavy smoke condition and heat buildup on that floor. They knew there were roof hatches on top of the stair shafts; they tried to open them in near-zero visibility from inside the stair shaft but were unsuccessful. To get to the hatches, the firefighters had to climb an access ladder straight up and "feel" for the locking devices. This caused one firefighter to use a large portion of his air supply, reducing the crew's speed in completing the search. This was transmitted to the operations officer, who dispatched two firefighters for air and relief. Ventilation was then achieved by opening the suites and their windows.

After the fire had been knocked down, there were no other areas of confirmed extension. Fans were used as blowers to clear out as much of the remaining smoke and heat as possible. To clear out such a large floor area would take some time. Firefighters assigned to the support function were assigned to get the equipment upstairs and then coordinate with the operations officer to get the operation underway.

After conferring with your operations officer and other company officers, you declare the fire under control. The firefighters are taking their well-deserved breaks. From this point on, there will be a lot of work involving identifying people, assessing injuries, and estimating the damage. There will be more than 75 people suffering from smoke inhalation. Most will be transported to area hospitals; some will be admitted. Some people

will be complaining of chest pains and other medical problems. The strain on fire departments will show in that there are not enough medic units on the scene for quick patient transportation (triage, treatment, transportation).

There will be the investigative process where investigators will ask questions and try to reconstruct things before the fire. The hometown fire department called in its off-duty firefighters because of the amount of pickup and cleanup work ahead and, of course, relief. There will also be the job of identifying the equipment from the different fire departments used for the incident.

This incident was a hypothetical disaster, like a mock disaster drill. Even though it is hypothetical, it could be an actual situation faced by a real community and its firefighters. In fact, this community has a couple of high-rises of this height and several other large-scale structures with high life hazards. The information given about the structure is mostly factual; the fire situation and problems were taken from actual high-rise fires from across the country.

There are hundreds of cities and towns across the country with similar potential incidents like this facing them. For some, it is like a time bomb-they know it's going to happen; they just don't have any idea of when, where, or how. If you have this knowledge, preincident preparation is absolutely mandatory if you and your fire department want to reach a successful ending. It must be kept in mind that small fire departments must meet, discuss, and train together before anything takes place. That will be the beginning of the small department's being able to perform like a bigger department. The strategies and tactics not considered "doable" before may now be achievable with more resources working together as one.

LESSONS LEARNED

• Large-scale incidents require large commitments of personnel and equipment. Small fire departments trying to handle a major incident alone will be quickly overwhelmed and unable to control the incident. It will control them.

• Smaller fire departments in a region or an area need to join together and develop standardized fireground operations and incident command procedures and accountability.

• Experience and training are among the most important things in a firefighter's career. An incident commander needs to know the personnel's experience and capabilities when

operating at an incident that is large, complex, and out of the norm of daily incidents. When several departments work together at major incidents, it is all the more important that departments train together so they can learn each other's strengths and weaknesses.

• Standard operating procedures or guidelines should be developed and distributed to all fire departments participating in a regional response system, and all must follow them.

• Don't let building construction terminology fool you. Even though a building is Type 1 Fire Resistive construction, fire can and will travel, especially if no sprinkler system is on-site. All you need to do is study our country's history of high-rise fires in residential and office buildings, and you will quickly realize these buildings can create deadly fires that have taken many civilian and firefighter lives.

• Firefighting is a not a science, nor will it ever be. It is a physically demanding job that employs "learned" ways of doing things. Technology will help us, but firefighting will always need firefighters to perform the tasks necessary to save lives and property.

• There are no "big city" strategies and tactics. Strategies and tactics are the same for all fire departments-big or small, career or volunteer. It boils down to resources (and their capabilities) and how many are available for an incident's needs. Remember, when going into battle, go in and overwhelm the enemy.

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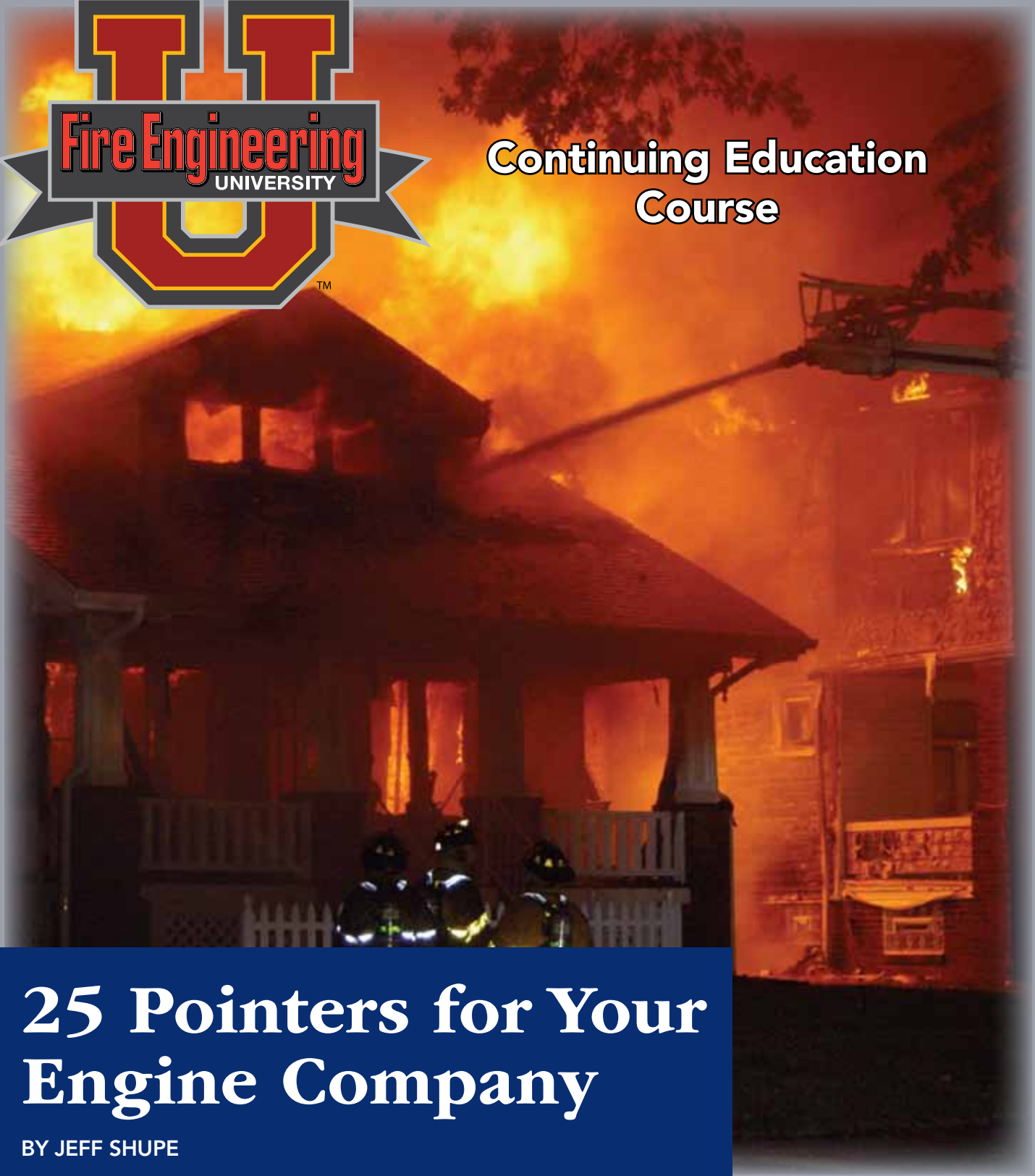

25 Pointers for Your Engine Company

BY JEFF SHUPE

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25 Pointers for Your Engine Company

Educational Objectives

On completion of this course, students will:

- Describe the limits of various hoseline sizes and the appropriate size for specific fires using the acronym "ADULTS"
- Describe proper nozzle operating techniques
- Gain an understanding of the importance of apparatus positioning in terms of hoseline stretching
- Gain an understanding of the importance of proper hoseline pressure and flow

BY JEFF SHUPE

CONSIDER THIS SCENARIO: IT IS A MIDDAY SUMMER afternoon, and a large 2½-story, wood-frame structure is on fire. It is a double-decker style two-family dwelling that has been vacant for a short time. Fire is coming out of all windows and doors on both floors and the attic. The smoke is visible from a mile away. En route, the dispatcher reports that the fire alarm office is receiving multiple phone calls reporting the fire.

As your first-due engine turns into the block, a crowd of people greets you. Many are shouting, "Put out the fire!" The houses on either side of the fire building are also of wood frame, and both are occupied. They are only five feet away from the fully involved building and are starting to burn. As should be expected, their owners are the most vocal in the crowd.

The engine driver spots the apparatus just past the fire building, as department procedure stipulates, allowing room for the first-due ladder truck to take its position in front of the building. It is a narrow street, and cars line both sides. The officer in charge of the first-due engine radios, "We have a working fire in a large 2½-story frame. Well involved!"

The two firefighters in the company start to stretch the initial attack hose. The older, senior firefighter knows the situation and "has been there" many times before. He starts to lay out the 2½-inch attack line. It is equipped with a solid bore nozzle, needed for its high volume stream and knockdown power. The "junior" or younger firefighter hears the officer call for the 1¾-inch attack line—but with a solid bore nozzle. The officer excitedly repeats that he wants to use the smaller hoseline. The 2½-inch line is left in the street while the smaller handline is put into service.

The attack begins. The fire has increased substantially in volume and intensity since arrival. The exposure to the right (D side) begins to burn furiously as the stream is directed at the flames. The officer wants the stream put on the exposure only. No water is being put on the main body of fire as flames pour out of the fire building. The senior firefighter backing up the hoseline tells the nozzleman he needs to put some water on the fire to slow its growth. However, a sheet of plywood is covering the front door. He runs up to the front porch and pulls the plywood covering off the front door. The interior of the structure is now exposed. Solid flames are visible from top to bottom. Flames from the upstairs porch push out horizontally overhead 10 to 15 feet from the structure and into the street with great intensity. The large oak tree in front of the house begins to burn.


1

The officer tells the nozzleman to put the stream on the exposure only! The senior firefighter tells the nozzleman to put the stream into the front door. The nozzleman is getting it

Photos by Steve Nedrich unless otherwise noted.

from both sides. The senior firefighter, positioned behind the nozzleman, yells once more at him to get water on the base of the fire. The nozzleman complies and directs the stream into the front door; the flames coming out of the windows on the side affecting exposure D diminish in volume. From the porch steps, the nozzleman moves the stream around the interior quickly. He then alternates the stream between the inside of the fire building and the exposure and is having much better success at knocking down the flames. He then directs the stream onto the exposure for a good "wet down." However, the fire has damaged the upper part of the wall on the D side of the fire building, causing the wall to bow outward a little.

The second-due engine is now on-scene. Its pump operator has helped the attack engine's pump operator to secure a water supply from a nearby hydrant while the officer and his two firefighters have set up and are now using the 2½-inch handline that was left in the street. The crew has positioned it between the fire building and the B exposure, since that building also has received some fire damage.

The fire eventually dies down, and the size of the fire attack begins to win. The initial attack crew begins to move inside through the front door with the hoseline, but it must be cautious because of the bowing wall. Inside, the floor has weakened so much that a foot of one of the firefighters goes through. All that's left of the interior is char from floor to ceiling. Visibility is poor at best, even though all windows and doors are gone. Part of the second floor has been removed because of a remodeling project underway in the building. This structure has been burned out, and now a dozen or so firefighters are inside prying, pulling, pushing, and smashing the remains during the overhaul process.

25 THINGS TO KEEP IN MIND

1 **Remember the primary mission of an engine company: to get water on the fire**. This is especially true if your engine is first due at a fire like the one described. Engine company members should function as a team on the fireground and should have predetermined jobs or duties. They should maintain the team or company concept—not freelance or wander. In most working-fire situations, they should stretch an attack line of the proper diameter and length with an effective nozzle to the point of operation and attack the fire from there. At other times, your engine company might arrive second due or even later in the fire. Your primary responsibilities as a second-due engine company generally are to ensure a supply of water to the initial attack engine and then stretch a second handline if necessary. In any event, there must be a plan for each engine on the scene, and everyone must understand and implement it.

All firefighters should know the engine company's four primary points of responsibility:

- To attack and extinguish a fire.
- To act as a supply pumper and provide water to other engines engaged in fire attack.
- To supply water to fire protection systems and standpipes.
- To supply water to master stream appliances like those found on aerial ladders and platform tower units.

The engine company has eight basic points of work coverage: rescue, exposure protection, initial attack line, heavy streams, water supply, fire protection systems, second line, and overhaul.

2 **Know your apparatus, equipment, district, and personnel.** Company members (firefighters and officers) should go over their engine apparatus and its equipment daily. Check hosebeds and nozzles to make sure they are ready to deploy at the next incident. Go over compartments to make sure tools and appliances are in their place. Check your SCBA and the spare air bottles to make sure they are full. Discuss any unique buildings, occupancies, and hazards in your first-due area, especially those that have been remodeled or have changed occupant use. Be aware of any street access or water supply problems involving your apparatus. Know who you're working with. Make sure each firefighter understands his job.

3 **Start your size-up before the alarm.** There are three categories of size-up information: preincident, initial on-scene/arrival, and ongoing. Your personal size-up begins before an alarm comes in. It deals with preincident information and any prior knowledge or information that you may have before an alarm. For example, when you are dispatched to an alarm, begin to consider the basic points of size-up along with any prior knowledge you might have about where you are going. You may have been in this structure before for personal business or on an earlier response and may know something about a particular hazard to firefighters. This could be important and might save a life. Pass it on to all members.

4 **Respond with caution.** This is a deadly time for firefighters. Use all warning devices when responding, and

(2) Fire departments should preplan their districts and instruct their firefighters in the importance of apparatus placement for efficient fireground operations and firefighter safety. In this photo, no engines, which might prevent an aerial apparatus from "commanding" the building, are parked near the fire building. A rear-mount ladder tower has been spotted at this building corner for platform use and also for providing quick access to ground ladders. Another ladder company, in the background, has raised its aerial ladder to the roof, providing access for firefighters. In the case where firefighters might need to evacuate a building quickly, it is important to have quick access to ground and aerial ladder devices. Do not let your engines block ladder access to fire buildings.

remember that you are liable for your actions. Drive with due regard for the safety of all others. When entering the block or nearing the address of the reported fire location, *slow down*. Do this to get yourself and your crew calmed and ready to read the arriving conditions and to put together your arriving size-up information. Observe the fire building for any visible fire or smoke; look for access and if there is any obvious life hazard involved. Make an effort to calmly assess the situation to get a clear picture and then determine what needs to be done. As first-due (or acting) officer, you should give a good initial on-scene radio arrival report. Paint a good picture for the other responding units so they have an idea of what you have and what they might have to do to support your actions when they arrive.

5 **"Place" fire apparatus.** The first-arriving engine should slow down when approaching the fire building and position itself to leave the front of the building open for the truck (unless there is heavy fire involvement and a deck gun is to be used for attack). Generally, the first engine should pull past the fire building. Position engine apparatus with ladder company apparatus placement in mind—even if your department doesn't have one. One may be coming from a mutual-aid department. A general rule is to give the building to the ladder/truck company.

In some cases, a ladder company will position its apparatus to cover two sides of a fire building with its aerial device, necessitating that the engines stay away from the fire building completely. The reasons are obvious: Aerial and ground ladder placement takes precedence, along with accessing forcible entry tools quickly. Besides, engine personnel can add another length of hose to their stretch if necessary. Engine drivers should know the kind of aerial device responding; many fire departments are using rear-mounted turntable apparatus, which means it can be placed 30 or 35 feet behind their cab. The second-due engine company should position itself so it does not block any apparatus movement on the fireground and is able to hook a supply line to the initial attack engine, if necessary, and run to a water source to supply it.

Third-due engines and later-arriving engines should position (or stage) out of the fire scene, to avoid congestion and to keep mobile, if necessary.

6 **Stretch in quickly.** An engine company is supposed to function as a team with a mission—to get water on the fire. To do this efficiently, every engine member has to take care of a job or two. Load engine company attack hosebeds with male couplings "out" and nozzles attached so that hose can be played out quickly and easily by the least number of firefighters responding with the engine. For example, an engine company arriving at an obvious working house fire with three or four members should be able to stop and stretch 200 feet of 1¾-inch hose and get water flowing within 90 seconds of arrival. If fire conditions call for a large handline, such as the 2½-inch line, that hose should be loaded so members can get that line in service easily. Company officers, remember: Do not let your members freelance. You will need them to help stretch the line.

If firefighters from the first- and second-due engine companies run into the fire building with hooks and axes in their hands *instead* of working on getting the initial attack line stretched (or a supply line established or the second attack line laid to back up the first line), then your department has organizational and fireground discipline problems. Officers must guard against this, as it will delay hoselines from being stretched quickly and your initial water supply may not be sufficient for the fire. If a second line is not stretched in a timely manner at a serious fire, there could be other consequences.

(3) When confronted with a large body of fire, use large handlines or master stream appliances equipped with solid bore nozzles for maximum effectiveness to knock down the fire and reduce the radiant heat. If nearby exposures become involved, that will add to the already large volume of fire. Unfortunately, too many fire departments rely on small handlines (1½- or 1¾-inch) for attack of practically all of their fires. When they arrive at a large fire, they usually deploy that line as the first line, with the thought that a little water will extinguish a lot of fire. In many instances, the fire grows bigger and extends to other buildings because of this approach. Remember, 1¾-inch handlines will not extinguish a completely involved structure.

7 **Remember: 1¾-inch hose cannot extinguish a fully involved house fire.** Unfortunately, for many fire departments, the 1¾-inch attack line is the "go-to line" for every fire they fight—from rubbish fires to high-rise fires and every fire in between. Every fire has a critical flow rate. To aggressively attack a fire, you must have the right volume of water for extinguishment and in the right pattern or stream setting. Anything less will not put out the fire. Eventually, a fire will consume the bulk of its fuel and die down to the point where it will look as if the 1¾-inch (or smaller) hoseline is controlling the situation. At that point, the fire is lost. For decades, the fire service has had the adage: "As the first line goes, so goes the fire." The mnemonic *ADULTS* can be used as an aid in determining when to use a larger hoseline:

A—Advanced fire conditions.
D—Defensive fire operation.
U—Undetermined location of fire.
L—Large-area structure (big commercial or industrial building, for example).
T—Tons of water are needed for extinguishment.
S—Standpipe operations.

If any of these indicators apply to the fire, you probably need to use a large handline.

8 **Position the hoseline properly.** If a life-threatening situation exists in a structure fire, the attack crew should position its nozzle between the fire and any occupants. The crew should make every effort to push the fire, heat, and smoke away from any known victim locations. Improper positioning could cause the fire to be "pushed" toward victims. When operating the nozzle, throw as much water as possible to knock down the fire and stop combustion products from getting to unprotected victims. If you are the nozzleman, put the nozzle out in front of you and open the bail fully during attack.

When life safety is not a concern, position hoselines to protect property or items of value. Also, consider internal and external exposures.

9 **Ensure efficient working length and drop point.** Fold the first hose length from an attack hosebed in such a way as to give the nozzleman 50 feet of hose to go with the nozzle. The hose can be carried on a shoulder load or on the nozzleman's forearm. This working length is to prevent a short stretch. It can be carried comfortably by the nozzleman. The folds of the working length should be no more than six or seven feet long, so the nozzleman can carry it up or down stairways, through tight spaces or alleys, or up and back, in the case of traversing stairs, without having long strands of hose that can catch on door sills, fence posts, or other objects.

The drop point is generally the area as close to the fire as safely possible where the hose is readied for attack. After dropping the hose, flake it out or straighten it to minimize any kinking. As that is being done, the call for water is given. The pump operator should acknowledge that water is on the way. Now, with water on the way, the attack team members don their face pieces and go on air together while taking a last look at their immediate surroundings and making sure everyone is ready to go. In far too many instances, firefighters step off their fire apparatus with their face pieces on, some breathing their air supply and some not, lenses fogged over, and regulators not attached. Firefighters should not don their face pieces individually but as a team. If the attack team members' air supply runs out at different times, team accountability will break down.

10 **Eliminate all kinks and bleed the nozzle.** When the attack team is at the drop point and water is coming from the pump, listen, if you can, for the sound of the engine revving up to pressurize the hoseline. Give the nozzle a long bleed before entering the fire area, to make sure that you have a good fire stream and the approximate correct volume of water for attack. The long bleed will also help you to know if there are any kinks in the hoseline that have gone unnoticed. A short bleed will only give off air compressed at the nozzle; it won't let you know about that kink 110 feet back in the line that will rob you of water. *Don't walk by hoselines that have kinks in them.* Remove the kinks. One kink can take away more than 40 gallons of water per minute in a 1¾-inch hoseline. That may be the water you need to stay safe during the attack.

11 **When entering a fire area, stay low, look up, and look around.** When encountering poor or zero visibility and a growing heat condition, stay low to the floor and look upward and listen, since that is where the fire is likely to show itself first, like in a rollover. Hold on to your hoseline under these conditions, because it is now also your life line. Maintain voice contact with fellow team members. It is times like these that the value, quality, and quantity of ventilation make themselves evident.

12 **Pump at the required discharge pressures.** It's the pump operator's job to know the length of the hose layout, the diameter of hoses, and the type/kind of nozzle being used so he can calculate the approximate pressure to get the correct gallons per minute (gpm) to the firefighters. Remember, fog nozzles generally require higher nozzle pressure, and solid bore handline nozzles are low-pressure, high-volume tools. A simple street formula for determining pump discharge pressure is EP = nozzle pressure + friction loss +/- elevation. (Note: Fire departments should consider outfitting engines with master gauges and flowmeters or combination flowmeter/pressure gauges for all outlets. Another item to consider is screw-type outlet control valves for all discharge outlets, for smoother valve operations.)

13 **When rollover starts to show, attack it.** Often, firefighters advancing an attack line into a hot, smoky area stay close to the floor and have a tendency to keep focused on the floor in front of them. Don't look down. Look up. That is where rollover will show itself. Remember, rollover is a preceding sign to flashover. If you encounter rollover, don't wait to attack it (or use the ridiculous excuse that you want to get a better angle or see it more fully developed); this is a dangerous gamble, because if flashover occurs, its volume might be more than your attack line can handle.

14 **When you start attacking a well advanced fire, open the nozzle completely.** Use good nozzle mechanics. If you are the nozzle operator, position the nozzle approximately 18 inches (an arm's length) in front of you. That will allow you to move the nozzle around and get the best coverage from the stream. Open the nozzle bail fully, and use the full force of the stream to knock the fire down. Start by aiming for the ceiling and the room's upper parts. Use the ceiling as a big deflector to break apart your stream; cover as much area around you as possible. This is a protective measure for you and your crew. Then work the upper parts of the walls, rotating the nozzle around in clockwise circles and occasionally sweeping the floor to maximize cooling, reach, and effectiveness. By the way, do not believe that "penciling" will enable you to control a large amount of fire with a little amount of water. This is a dangerous belief, and it is not true. Do not do it!

15 **Engine company officer, take charge.** You are responsible for your attack crew, what the hoseline does, and what your company accomplishes. Do not allow your people to freelance, self-assign, or run off with tools, because you are responsible for their accountability and safety. During attack, position yourself so you can monitor your crews and conditions and progress and still maintain radio

(4) Don't wait for the room to roll over completely before attacking. When making an interior attack in high heat and heavy smoke conditions, stay low and look up because that is where rollover will show itself. Rollover precedes flashover. Keep your nozzle out in front of you, and be ready to go to work. If your line has a fog nozzle, be sure it is on a straight-stream pattern, because a wide-angle-fog pattern will draw this environment down on top of you. (Photo by Greg Gettens.)

communications with other companies/units and the incident commander (IC). If anything goes wrong with your hoseline, you are the primary troubleshooter and communicator to the "outside world."

16 **Nozzleman, don't abandon your nozzle.** After the fire has been knocked down, don't drop the nozzle on the floor and do some other task. Some nozzles have been left on a floor and were buried under fallen ceilings and debris. If you must leave the fire area, notify your officer or the person in charge and give the nozzle to another crew or company member (that's accountability!). Never leave a nozzle unattended—just in case the fire you knocked down a minute or two earlier starts to light up around you and it needs attention quickly.

17 **It is a second line—not a backup line.** Always stretch a second hoseline whenever there is any appreciable volume of fire or there is reason to think there is fire extension. The second engine company or a second "attack crew" should always have this job in mind. The primary responsibility of the second line is to back up—protect or reinforce—the position of the first attack hoseline. If this is not a concern, then the second line should be used to check for fire extension.

The second hoseline should be at least equal in size and attack volume to the first hoseline. It should be stretched and positioned behind the first line to perform its primary duties. However, it should not hinder advancement of the first line as long as the first line is making progress. Each hoseline, regardless of how many there are, should have a company officer or someone in charge to maintain accountability of personnel and to coordinate efforts with other officers during attack.

18 **Large buildings can make large fires.** If you arrive at a commercial building (for example, a "big box store") and have a smoke condition but no flame is visible, prepare for something big—the potential is there. Don't stretch a small (1¾-inch) handline for a structure that has a large internal area or a large fire load. If you end up with a controllable incident, that's good, because at least you will be ready. But if conditions deteriorate quickly, as can happen with these buildings, you will at least have a substantial water volume ready to protect you and your people. If you must stretch a large handline and need to move it about the fireground, the IC should consider "marrying" two engine crews together for hoseline advancement, management, and relief.

19 **Big fires require big water: Deliver it in a big way!** When you are confronted with a heavy volume of fire in a bread-and-butter fire, but especially in commercial and industrial buildings, use big lines, or go to heavy stream appliances for knockdown. One 2½-inch handline equipped with a solid bore nozzle is more effective than two 1¾-inch handlines. If the fire is growing and moving, you had better think about a deck gun or master stream operation right now. Don't wait to see what the fire is going to do! Use solid bore tips for fire stream efficiency. Why? Because of the sheer volume of water and the stream character—it's solid with weight and momentum. It has greater heat-absorption capacity. It also has momentum for greater stream reach, which helps firefighters to deliver water from a safer distance under heavy fire conditions.

20 **Pump operators, read your gauges**. Do this especially when you take several handlines from your engine. Know what size hoselines are being stretched from your engine, how long they are, what kind of nozzles are being used, and the approximate gallons per minute (gpm) they can discharge. As the fire goes on, water demands on your water supply system can vary even if you are hooked into a municipal water system, are in a tanker shuttle, or are operating from draft. Watch your residual pressure. If you have a limited water supply and someone is calling for more pressure, turning up the throttle to satisfy the person may put you in cavitation and shut down your engine.

(5) This position on the hoseline is not exciting at all, but it is very important to the attack team's successfully advancing the line into the fire. Notice that the hose is straight, making it easier for the attack crew to manage. When the attack crew calls for more line, this firefighter will "feed" more, keeping the hose as straight as possible. This will help make the hose manageable and the nozzle easier to control. Pushing more hose at the nozzle team than it needs may cause the team to lose control of the nozzle. Engine operations require teamwork and communications among members on the fireground. (Photo by Greg Grettens.)

21 **When advancing ("feeding") the attack line, don't push it toward the nozzle team.** If you are in the backup position (or helping to support the hoseline), move the line forward only, or "lighten up" on the line when the nozzle team calls for more line. Pushing or forcing the line forward may cause the nozzle operator to lose his grip and control of the nozzle, setting the tone for a disaster. When calling for more line, the person on the nozzle should call for what is needed—only a couple or a few feet at a time, maybe five or six feet, for example. Pass this "command" down the line to all members, so everyone understands how much hose to "feed" the nozzle team.

22 **Back out of a tough position safely.** If you must back out because the fire has overpowered your attack, stay low and keep the nozzle flowing—completely open, moving around, and overhead. It's your only protection right now. The firefighter in the backup position behind the nozzleman should keep the hoseline lower than the nozzle; otherwise, it will kink the line and make it hard for the nozzleman to control—something you don't need at this time. If you have a fog nozzle on your attack line, make sure it is on the straight-stream position, because a fog pattern will create a low pressure point at the nozzle tip and draw the superheated environment down on you, possibly causing severe injury to you and those with you.

Conditions like this require that the company officer keep full control of crew members; make sure that the steps or hallway is not jammed with firefighters and the nozzle team's path to safety is not blocked. The person on the nozzle should never roll over on his back to hit anything overhead; it may cause the ceiling or another object to fall on the operator's face. Also, there would be no way this person could move about; he would be stranded in a dangerous position because of lost mobility. Once everyone has backed out to a safer position, take a head count, if necessary, to see that everyone is accounted for and not injured.

23 **Shut down and pick up hoselines only after the IC gives orders to do so.** After the fire is out and overhaul is completed, do not shut down hoselines or back them out of the structure unless the company officer or crew officer has received orders from the IC to do so. Pick up and put away the hoselines after the IC gives the order. In the case of multiple hoselines, the IC should have a plan that indicates the order in which the lines should be picked up. If firefighters or company officers decide on their own when to shut down their lines and put them away, something important may get overlooked, and there may be a rekindle or some other type of reignition. The IC is responsible for knowing the positioning of hoselines, shutting them down, and determining when they should be picked up.

24 **Prepare to return to service.** After the fire has been extinguished, overhaul has been completed, and the order has been given to pick up, firefighters should make every effort to get their apparatus and equipment back in service as close as possible to the condition it was in before the incident. For example, if any booster tank water was used in the initial attack, was the tank refilled? Were used air bottles exchanged or filled? Was the hose rinsed with a hose stream and packed on the apparatus properly so it plays out freely the next time it's used? If you have fog nozzles, were they left on the proper stream setting? If you have select flow nozzles, what gpm setting were they left on? (Solid bore nozzles don't have that problem.) Were any sections of hose damaged from the fire or by mechanical or chemical means? If so, did you roll them up and set them aside so they weren't packed with the regular hose? If the ground ladders or any hand tools or hose appliances were used, were they rinsed or washed down before they were put back in their proper place or compartment?

25 **Perform a company critique.** Before a fireground critique, it wouldn't hurt to make sure everyone is healthy. Usually, it is best for a company officer to hold an informal critique at the scene after everything has been picked up and before you're ready to return to quarters. Things are fresh in your mind, and the scene is still there to jog your memory about things that might have happened in the course of events. Remember, the critique is to be used in a positive manner—to reinforce the good things your company does and to enable you to learn from the negative things that affected your operations in an adverse way, so the next time you can adapt and overcome the problem.

• • •

Fire extinguishment should be the responsibility of the engine company. At most structural fires, all other functions depend on the engine's ability to attack the fire and bring it under control. If this cannot be accomplished, in most cases the fire building will be lost. Any persons trapped by fire, heat, or smoke will have diminished chances of survival. On the other hand, the fire attack team needs the support of the ladder company crews or other firefighting crews to "open up" the structure by performing ventilation and forcible entry.

These pointers are to provide a baseline for engine company operations from prealarm to postincident. Thousands of fire departments across the country have different ways of operating and certain things for their engine companies to consider because of their local conditions. However, regardless of the jurisdiction in which you operate, an engine company's goal is to get water on the fire. Keep in mind the principles of engine company teamwork and the mission. When everyone understands and follows the basics, the team is stronger and more capable of accomplishing its goal. ●

● **JEFF SHUPE**, who has more than 33 years of service as a career firefighter, is a member of the Cleveland (OH) Fire Department and a former volunteer firefighter. He is an Ohio-certified fire instructor and has been a training coordinator for volunteer and career fire departments. He is the lead instructor for the Cleveland Fire Department "Back to Basics" program and an instructor in the Outreach programs for the Ohio Fire Academy. He has an associate's degree in fire technology from a community college and also attended the University of Cincinnati Fire Protection Engineering program. He is an FDIC H.O.T. team member for Engine Company Operations and an FDIC classroom presenter.

25 Pointers for Your Engine Company

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To receive credit and your certificate of completion for participation in this educational activity, you must complete the program post examination and receive a score of 70% or better. You have the following options for completion.

Option One: Online Completion

Use this page to review the questions and mark your answers. Return to **www.FireEngineeringUniversity.com** and sign in. If you have not previously purchased the program, select it from the "Online Courses" listing and complete the online purchase process. Once purchased, the program will be added to your **User History** page where a **Take Exam** link will be provided. Click on the *"Take Exam"* link, complete all the program questions, and Submit your answers. An immediate grade report will be provided and on receiving a passing grade your *"Certificate of Completion"* will be provided immediately for viewing and/or printing. Certificates may be viewed and/or printed anytime in the future by returning to the site and signing in.

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COURSE EXAMINATION

1. The primary mission of the engine company is:
   a. to locate the fire
   b. put water in the fire
   c. rescue
   d. search

2. Size-up occurs::
   a. preincident
   b. initial on-scene/arrival
   c. ongoing
   d. all of the above

3. When entering the block or nearing the address of the reported fire location:
   a. slow down
   b. stop and look
   c. proceed at normal speed
   d. none of the above

4. Generally, the first arriving engine should pull past the fire building:
   a. to leave room for a ground monitor.
   b. to stay out of the collapse zone.
   c. .to leave room for the ladder company.
   d. to leave room for the second engine company.

5. an engine company arriving at an obvious working house fire with three or four members should be able to stop and stretch 200 feet of 1¾-inch hose and get water flowing within:
   a. 30 seconds after arrival
   b. 60 seconds after arrival.
   c. 80 seconds after arrival
   d. 90 seconds of arrival.

6. The "S" in ADULTS refers to:
   a. sprinkler operations.
   b. standpipe operations
   c. severe fire conditions
   d. smoky conditions.

7. If a life-threatening situation exists in a structure fire, the attack crew should position its nozzle:
   a. between the fire and the occupants.
   b. at the stairwell.
   c. at the bedrooms.
   d. none of the above

8. The folds of the working length of hose should be no more than:
   a. 5-6 feet.
   b. 6-7 feet.
   c. 7-8 feet.
   d. 10 feet.

9. In an 1 3'4" hoseline, a kink can take away more than:
   a. 30 g.p.m.
   b. 40 g.p.m.
   c. 50 g.p.m.
   d. 60 g.p.m.

10. Engine pressure (EP) = nozzle pressure + friction loss +/-
   a. elevation.
   b. static pressure.
   c. dynamic pressure.
   d. none of the above

11. Rollover is:
   a. fire moving over a wall surface.
   b. cascading flames.
   c. a preceding sign to flashover.
   d. none of the above

12. As the nozzle operator, position the nozzle approximately
   a. at your side.
   b. under your arm.
   c. 18 inches out in front of you.
   d. 24 inches out in front of you.

13. Always stretch a second hoseline whenever there is any appreciable volume of fire or:

25 Pointers for Your Engine Company

a. the first attack line is an 1 ½" hoseline
b. because there is reason to think there is fire extension.
c. the fire is on the second floor.
d. the fire is in the basement.

14. Don't stretch a small (1¾-inch) handline for a structure that has a large internal area or:

a. is two stories.
b. has only one entrance/exit.
c. has a basement.
d. a large fire load.

15. Pump operators should know what size hoselines are being stretched from the engine,

a. how long they are.
b. what kind of nozzles are being used.
c. the approximate volume in gallons per minute (gpm) that they can discharge.
d. all of the above

16. When calling for more line, the nozzleman should call for what is needed — only a couple or a few feet at a time, typically:

a. 3-4 feet.
b. 2-3 feet.
c. 5-6 feet.
d. 7-8 feet.

17. If you must back out because the fire has overpowered your attack, stay low and keep the nozzle flowing:

a. completely open.
b. moving around.
c. overhead.
d. all of the above

18. Critiques should be used in a positive manner to:

a. reinforce the good things your company does.
b. to enable you to learn from the negative things that affected your operations in an adverse way,
c. a. and b.
d. neither a. or b.

19. Pick up and put away hoselines only:

a. when the visible fire has been extinguished.
b. after the IC gives the order.
c. the truck companies have opened up all void spaces.
d. the smoke conditions have cleared.

20. As an engine company officer, do not allow your people to:

a. freelance.
b. self-assign.
c. run off with tools.
d. all of the above

Notes

25 Pointers for Your Engine Company

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If you wish to purchase and complete this activity traditionally (mail or fax) rather than Online, you must provide the information requested below. Please be sure to select your answers carefully and complete the evaluation information. To receive credit, you must answer at least six of the eight questions correctly.

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First Name

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Please check the correct box for each question below.

1.	❑ A	❑ B	❑ C	❑ D	11.	❑ A	❑ B	❑ C	❑ D
2.	❑ A	❑ B	❑ C	❑ D	12.	❑ A	❑ B	❑ C	❑ D
3.	❑ A	❑ B	❑ C	❑ D	13.	❑ A	❑ B	❑ C	❑ D
4.	❑ A	❑ B	❑ C	❑ D	14.	❑ A	❑ B	❑ C	❑ D
5.	❑ A	❑ B	❑ C	❑ D	15.	❑ A	❑ B	❑ C	❑ D
6.	❑ A	❑ B	❑ C	❑ D	16.	❑ A	❑ B	❑ C	❑ D
7.	❑ A	❑ B	❑ C	❑ D	17.	❑ A	❑ B	❑ C	❑ D
8.	❑ A	❑ B	❑ C	❑ D	18.	❑ A	❑ B	❑ C	❑ D
9.	❑ A	❑ B	❑ C	❑ D	19.	❑ A	❑ B	❑ C	❑ D
10.	❑ A	❑ B	❑ C	❑ D	20.	❑ A	❑ B	❑ C	❑ D

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3. How would you rate the objectives and educational methods?	5	4	3	2	1
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To: Paul Stubbs, Fire Chief
Fr: H. Shupe, Firefighter

Re: High Rise Hose Folds and Securing Straps
Date: February 18, 2009

Chief Stubbs;

During October 2008, all engine companies of the Cleveland Fire Department were ordered to change hose used for high rise firefighting from 1 ¾ inches to a minimum size of 2 inch for fire attack. Four engine companies (1, 4, 10, 17) were to change to 2 ½ inch hose because of the size and complexity of buildings in their districts.

The trend in today's high rise firefighting clearly has been to go to a bigger hose diameter and a solid bore nozzle to allow for greater water delivery. This is being done across the country by big and small departments that have high rise or standpipe equipped buildings and because of recent large and disastrous fires. Two of those recent fires were in Chicago where high fire loss occurred along with civilian lives lost. Since then the Chicago Fire Department has revamped their high rise firefighting operations. High rise firefighting in itself is not the same as a fighting a fire in a wood frame 2 or 3 story structure. Unfortunately, many fire departments have had the mindset that "fire is fire and we shall attack it the way we do all fires!" This is a completely ignorant approach to what can be a complex and deadly fire operation.

The recent history of serious high rise fires in the United States clearly shows that these fires can and will cause both civilian and firefighters fatalities. In Philadelphia for example, a fire in a thirty-eight story high rise building took the lives of three firefighters after burning out nine floors and the entire building was eventually razed because of other problems directly related to the fire. Houston, Texas lost a fire captain during fire operations on the fifth floor of a forty-one story high rise structure. Weather conditions placed a role as did other things the fire department did. Reports afterward noted that firefighters did not implement the department's high rise SOP as it should have been. The same was noted in Memphis where two firefighters died during a ninth floor fire residential high rise. There are numerous documented cases for firefighter fatalities and as they are investigated afterward by governmental and other agencies, there seems to be a recurring theme of several items from the lessons learned. After the reports are filed there are recommendations and they apply to all fire departments that have high rise structures in their response districts.

High rise buildings can house just about any type of complexity and hazard. The occupancies vary and that means a diverse fire load. These fires can create extreme heat conditions because much of the fuel load of today's structures is more like a solid class "B" material, and when burning can create heavy smoke and heat conditions in a short amount of time. Couple this with the associated problems of response times and access to high rise structures and the time necessary to locate the fire and then select the closest stairwell to start attack from. From that, you can see that an appreciable fire will have

great headway by the time the initial hose line is charged from the standpipe. By the way, it is imperative and must be mandated that attack hose lines are stretched from the floor BELOW the fire floor for safety precautions for firefighters. Crews should never hook-up their standpipe hose line to the ooutlet on the fire floor.

When a fire of appreciable size takes place in a high rise structure there is going to be residual heat that stays in the structure long after the main body of fire has been extinguished. However, these buildings must be carefully vented- by either mechanical means using fire department fans and/or the HVAC system under control of the building engineer, or through selected stairwells using roof hatches where no civilians have chosen to take refuge in-this would draw combustion products towards them. Or if windows are to be taken out, then it must be coordinated with the Incident Commander so that at ground level the people and civilians outside can be removed from the concerned area below the windows and down wind so as not to be injured by flying glass pieces-commonly known as the "guillotine effect".

The need for larger diameter attack lines is directly related to the type of building and its contents. First of all, large buildings make large fires. Undersized fire attacks have in many instances let fires overpower the attacking fire crews and thus cause greater damage. The life safety problem becomes a very complex issue one. Another problem associated with high rise structures is when the fires cause windows on the building to fail and thus allowing the winds to drive the fires into cyclonic proportions. Several cities with a history of high rise fires have experienced this and in one city three firefighters were killed when a wind-driven fire turned the hallway firefighters were using into a blow torch. In one report it was estimated the hallway temperature reached over 2000 degrees Fahrenheit.

We have already discussed the fuels being more volatile, requiring more water for control and extinguishment. And to compound the high rise firefighting problems are the Type One buildings which use steel, concrete and other materials that are supposedly fire resistive. A characteristic of Type I construction is that it is supposed to work to confine the fire to a certain area within the structure through compartmentation. However, it is becoming a common problem to see fires extending in these buildings thus telling us that we should not rely on construction features or built-in protection systems to take care of the fire. The truth of the matter is that these fires require large commitments of personnel and are time-consuming and laborious.

All of this and more points to the need for training in high rise operations and the need for heavier fire attack capabilities. With the move toward larger attack hose (which is a move in the right direction for our members-despite their uneducated and unfounded bitching and complaining) it is necessary to use solid bore nozzles for the hose lines. A one inch solid bore tip is recommended to be matched with the 2 inch hose line for good flow and manageability. Another reason for high rise training is to review the SOP and to make sure all members understand that it requires a disciplined approach and that 2 engine companies "paired" on an attack hose line means just that –a team approach!

Since most high rise buildings are sealed or enclosed with little to no ventilation-except for that provided by HVAC systems and limited natural air flow, there is good reason to use as much water as necessary for the effect of water's cooling power. However, it must be delivered in a solid stream pattern – not a hollow tube. The problem with using fog streams is that even when using a fog nozzle on the straight stream setting, the stream is a hollow tube of water that carries air into the fire. That air mixes with the water that turns to steam and expands in volume at a great rate and because it has nowhere to vent ahead of the attack team firefighters, it pushes back at the attack team-remember, ventilation is not going to happen quckly, easily and effectively in these structures. Another thing, since the fog stream is carrying air in with it, that means less water going to the fire, which says we need to have higher pumping pressures to achieve this lost volume of water. This is indeed a safety factor for fire attack efficiency, and is a training issue. Once again, the solid bore nozzle is more efficient because it operates at a lower nozzle pressure than our present fog nozzles and delivers a stronger, more powerful stream with the ability to penetrate into these tougher fire problems-and it won't upset the thermal balance in a heavy fire area like a fog stream will.

Fog streams should not be used for high rise firefighting operations because it is very likely that they will clog with debris from the standpipe. A solid bore nozzle prevents that from happening and gives a good stream at low pressures. One other thing about the reliability on fog streams for ventilation- firefighters who think they can use a fog nozzle from a small hand line (like a 1 ¾ inch line) to exhaust smoke and heat from a 10,000 square foot office area are kidding themselves-that's the equivalent of about 12 two story houses. Once again, here is where firefighters have a mindset that says one type of firefighting applies to all fires! In actuality, we sometimes have trouble venting one or two rooms of a house when the wind kicks up and blows against it just a little bit! At the upper elevations of high rise buildings it has been noted that wind gusts and currents can be much stronger and thus deceive firefighters about their strength and can cause fires to intensify, nullifying any ventilation efforts. In other words, it isn't going to happen in a fire of any appreciable size. And, besides, isn't that what fire department fans are to be used for after the fire has been knocked down?

The Fire Training Academy has been conducting satellite training for all fire houses city wide on the adoption of how to fold hose for standpipe operations. The FTA members show the "Denver" fold for hose. It is efficient, smart, easy to carry, and it helps eliminate any problems of assembling an attack hose line for standpipe operations. The fold allows immediate access to the male and female coupling of each bundle and allows firefighters to quickly attach one length of hose to another. It then allows firefighters to stretch the hose out and down the hallways and prevents any spiraling or twisting like what happens when the hose is carried in a donut roll - like how it has been for several years on the department. This is a most efficient way of carrying the standpipe hose bundles to the floor below the fire, then orienting the bundles to hook-up and stretch them and then 'charge' and operate the attack hose lines easily and quickly and will increase our firefighting safety and capabilities in high rise buildings. It will work provided there

is training for the members and then there is discipline on the fire ground to make sure things are done properly.

To make the folds, firefighters essentially are going to build a modified "horseshoe. What is needed to complete the fold and hold them together is 3 straps per bundle. These straps are placed at the ends of each hose bundle and then one is near the top of each bundle to keep the bundle from falling apart. Sometimes a hose length is not a true 50 feet, so there is need for a fold modification, which is covered for members in the training video.

Three straps are necessary for each bundle and have been used by fire departments across the country. This fold was born from firefighter ingenuity and the straps were designed to complement the fold and keep it from falling apart. These folds, as stated before will help high rise firefighting efficiency. Therefore it is recommended that the City of Cleveland Fire Department purchase the straps which have been brought to the Cleveland Fire Department for examination and testing. They will help to make sure the hose bundles are always ready to be deployed when the time comes at a working high-rise fire or other type of standpipe equipped operation. Our firefighters will benefit greatly from these inexpensive items as they will insure our hose bundles will ready to be deployed at the next high rise fire or standpipe equipped operation.

Thank you for your time and consideration.
Respectfully,

Hayden Shupe, FGF
High Rise SOP Committee

Firehouse Column
2010-2011

THE “EVERYDAY ROUTINE COMPLEX” FIRE

BY JEFF SHUPE

It happens in every fire department–the working fire that you’re familiar with that changes into a complex situation because things didn’t go as you planned! Maybe there were some problems associated with your fire attack like the time taken to get the initial attack line stretched and charged in a timely manner…or maybe the building didn’t act like it was expected to…or maybe the fire was hiding and grew in intensity, unexpectedly fast and caught you off-guard, or maybe there weren’t enough firefighters on the scene initially to stretch and ventilate or lay a second line, or whatever, etc., etc., etc. I’m sure you can add your own experiences to this list and make it a big one. These items point to the need for firefighters to be in the right frame of mind at all times, because if we lose control of our own efforts to control a working fire, firefighters can be seriously injured or they can die.

You hear the same story from so many fire departments around the country about not seeing structures fires regularly-or having enough fires so that firefighters can act calmly enough to think about what they should do. For many fire departments, the call volume can be 70, 80, or even 90 percent EMS or other non-fire related calls. Yet, there are other departments that are responding to just about every type of call that comes in-like a social response agency to justify their existence or prove their need to their community by taking care of every Mrs. Smith, Mr. Jones and whoever. That type of response philosophy leads to overload and leaves no time for training, maintenance or whatever. And if a structure fire happens, it is handled as an unplanned for event.

Without a doubt, it is hard today for fire departments to perform their duties in these times because of less funding, personnel lay-offs, resource reductions and increased call volumes. Never the less, when a structure fire takes place, the fire department *is* expected to handle it at the same level of efficiency and service that their public has become accustomed to. Therefore firefighters need to be in the right frame of mind.

THE MIXED MULTIPLE OCCUPANCY

All cities and towns have their own unique and different types of structures and occupancies. Each presents different operational firefighting concerns and problems for firefighters. However, one particular kind of building and occupancy that is found in just about every city and town across the country, but is very common in older industrial class cities is the old "mixed multiple" or " mixed occupancy". In some places they are called "taxpayers" and in others they are "mom and pop" stores. This term of endearment comes from a time when family-owned little corner grocery stores thrived and provided for their neighborhoods. Not only did these buildings house a vital neighborhood business, they also housed families above and behind them as many of them still do today. These buildings are sometimes located on street corners or they might be lined up along side of each other like in the middle of a block.

Most of these buildings are two stories in height but there some that are three stories. The ground floor level or "street level occupancies are the business or commercial areas, while the upper floor(s) of these buildings are residential living areas. In recent times, many of these stores have closed as cities and neighborhoods have changed. Automobile and public transportation has made travel to remote shopping areas more accessible. Thus, most of the old grocery stores have closed but the buildings have remained. Many of the store occupancies have changed their use, but the apartments have remained.

When these buildings have fires in them, the potential is great for a tough firefight and an extreme life safety problem when occupied. Basic engine and truck work is the order of the day.

Fire departments confronted with a working fire in a mixed multiple should perform their duties in a methodical manner with good coordination and communication. Firefighters should always be mentally ready, reading fire conditions and the fire building for any changes. This state of readiness comes from training, experience and self-discipline.

CONSTRUCTION

Most of these structures are very old, built from **Type V** wood frame construction methods during the late 1800's or early 1900's. Everything used to build the structure is made from wood or other combustible materials. This also means

there will be balloon framing in place-expect plenty of void spaces for fire to travel in.

Exterior walls for wood frame buildings can be covered with wood siding or aluminum or vinyl or even the old asphalt shingles. There may also be brick or other masonry facing on the front walls, but it should not provide any structural support value.

Many other structures were built utilizing **Type III** "brick and joist" methods. This means the outer walls of these buildings are of masonry construction. Floor joists that support each floor rest on an outer wall shelf while the other end of the joist spans the distance across the store to the other outer wall. As each floor is built, floor joists span from each outer wall to the other outer wall on the other side of the building. In the case of wider buildings, floor joists span from outer walls inward to a column supporting a girder or a bearing wall in the middle of the structure. A joist from the opposite outer wall spans inward the same way. Hence, the term-"brick and joist" construction.

(NOTE: In many older Type III buildings, the joist ends have been built into the outer walls creating a joist "pocket". This condition creates a very unstable wall if there is any movement in a joist that rotates or gives way, as the other end of the joist moving will destroy the masonry wall at the connection area and cause collapse.
Also…this type of construction creates both vertical and horizontal void spaces like the balloon-framing)

APARTMENT LAYOUTS

The apartment areas generally have room enough for a small family. A single unit can have a kitchen-dining area, a single full bath, two bedrooms, and a living room. Some units are larger and have more size and additional rooms. There may be only one suite or as many as four units on a floor.

Usually, access to an apartment is through an ordinary entry door from a common hallway. Once inside an apartment, there will be the kitchen area and after that a full bathroom (that is small), perhaps a dining area to one side while there are bedrooms to the other. There will likely be a living room at the end of rooms. There may be a narrow hallway that separates the living room from the bedrooms. In heavy smoke conditions, this will create a maze-like problem for firefighters trying to conduct a search operation.

In general, there can be several different floor and room layouts-not to mention any that can come from remodeling projects. There might even be a front entry door to an apartment over the main store area. In any case, firefighters should expect a confusing situation under heavy smoke and heat conditions and plan their strategies and tactics accordingly.

INTERIOR FINISH

Interior walls in these older buildings will be plaster over wooden lath strips. In many buildings remodeling has seen sheetrock or drywall placed over the old walls, but in some the old plaster and lathe has been removed and replaced altogether with drywall. Some remodeling has seen new walls framed and covered over the old wall creating a double wall cavity.

Ceilings in the apartments above are usually eight feet high and generally are made from plaster and lath, unless they have been altered or remodeled. They can be handled the same as ceilings in a house would be. In some instances the top floor ceilings have an attic floor above them or in the case of flat roofed structures, that space above the ceilings is a cockloft-the open space between the top floor ceiling and the underside of the roof deck.

Original ceilings in the first floor or store areas can be of plaster and lath or they may be impressed tin. Tin ceilings are nailed directly to the underside of the floor joists to the floor above. Sometimes furring strips are used. In either case, this creates an open horizontal void space for firefighters to consider during fire operations. Pulling down tin ceilings is no easy task, as sometimes the tin seems to “tear”, while other times the tin panels come down in small pieces or sections. This can allow fire to travel ahead of you before you can open a hole big enough for a stream. You will note that the ceilings in this area are going to be higher-maybe 10 or 12 feet high from the floor. In many cases, owners or occupants have installed suspended ceilings below the original one. In any event, firefighters will need longer hooks to reach original ceilings during overhaul fire operations.

Floors will most likely be of wood. The wood floors are heavy because there are sub floors over the floor joists and finish tongue and groove planking of at least 2 inches thick laid on top. These buildings were designed and built to support the weight for a specific kind of occupancy use back in their time. It was determined then that wood floors were the material of choice to support the loads of meat

counters, coolers, shelving and stock. Many stores had/have linoleum covering them while many just had the wood planks alone.

Concrete floors have been used in these structures. However, in most older buildings they were not installed originally, only after change of use. Some buildings have tile or terrazzo style finishes added. In any case, an undesigned load presents a very serious concern if no additional support has been added to carry the floor load.

A serious operating concern comes from basement fires and their location especially if there is a gas meter involved. Add any stock or other materials stored there, and you have a recipe for a very well-fueled fire. Add the weight of items on the floor above (especially if the store is occupied) and you can see a problem. Remember, there is not going to be any fire suppression system in there to help you.

ROOFS

Roofs to typical “mom and pop” buildings will usually be of two types-peaked or flat. Peaked roofs sit over an attic space. In some buildings the attics are unfinished and unoccupied but in others, the attic is a tall space designed for apartment use and actually presents another floor level.

A peaked roof will be made from wooden structural pieces perhaps rafters as small as 2” by 4”. There should be a ridge board to tie the rafters together or “unify” them. However in some cases there is no ridge board-the ends of the rafters abut each other; thus a very unstable roof situation. The roof covering boards will likely be one by six inch boards with air spacing between them. In many older roofs this method or style was finished with cedar shingles. Over time, as the roofs began to leak and fail, the original roofs have been left in place and covered with asphalt shingles-sometimes on a few occasions. You might see a heavier than expected roof covering system. This is a concern to firefighters if an appreciable amount of fire involves the attic area. Flames will penetrate into the roof boards, cedar shingles and asphalt covering.

The other style of roof, common to these buildings is the **flat roof**. . The space between the top floor ceilings and the underside of the flat roof deck is well known as the “cockloft” and provides a readily accessible horizontal void space that if fire gets up there and the roof is not opened early enough, flames will spread over the top of the building and destroy it.

These roofs may have a little pitch to shed rain, however they are susceptible to environmental damage, especially rain and snow. Sometimes a new roof such as a “rain roof” or “inverted roof” is laid over the original roof. And, in some cases a new roof system using trusses is installed. In any event, this will provide a new dead load for the old supporting system. Whatever repair work takes place, it does not take away from the fact that the original flat roof is still there and it spans over the entire top floor of the structure

If it is necessary to open one of these roofs for ventilation it is preferable for firefighters to access the roof with ladders for safety. If there is a ladder or platform truck on the scene, it should have priority positioning on the fire ground over other apparatus so the stick or bucket can be used. If ground ladders are to be used, check the roof pitch for safe operating angles. Chain saws are preferable for cutting wood roofs because they are quicker and more efficient than old labor intensive ways using axes. Plus, they get the ventilation process started quicker for any trapped occupants or firefighters working inside.

The buildings with flat roofs will have a parapet walls for the building. Remember, a parapet wall is unsupported above the roof line and becomes free-standing. These walls have a bad history of collapse at fires.

ACCESS

Generally**, interior stairways** lead from a ground or first floor entrance door to the upper floor(s) of these buildings. These stairs lead up to a common or public hallway where apartment access doors are located. They may be located in several areas: The middle of the building, from a side entrance that leads to the upper level hallway that has apartments on each side; or they may be in the front of the building perhaps on the side. In some cases, the access stairs are located in the rear of the structure. In some wide buildings there may be an entrance door in the middle of the building’s front that leads upstairs to the public hallway.

In most buildings the stairs are constructed from wood. Some are bare wood treads and risers, while others are carpeted while sometimes linoleum can be found. They may be narrow or moderately wide, but not roomy enough for several firefighter to operate from. They quickly become crowded and inaccessible with just a few firefighters on them.

Other features that require firefighters attention is the access to the basement. Sometimes access to the basement can be made from inside the stairway or public hall. There also have been rear building entrances leading to the basement. However, one of the more dangerous situations comes from a fire in basement where the door is an **access panel** in the floor, located in the rear of the store area. Firefighters in this case have found themselves over the fire area in heavy smoke and heat conditions looking for this access, all the while the fire is gaining headway and the floor supporting system is weakening. In this situation, firefighters must find other access and methods to get water on the fire. This is where the old cellar pipes come in to play.

In the case of fire happening on the first floor or basement of these buildings, the stairways can create a flue-like condition if fire gets into this vertical shaft- like area. This means access will not be feasible under heavy fire, smoke or heat conditions, and that occupant egress will be impossible. Firefighters will need to establish other routes of entry into the structure to access upper level living areas. Hose lines will need to be placed as quickly as possible to stop fire spread to the upper floor. Ventilation will be needed at upper levels and the roof to draw fire out of the building to prevent it from getting into apartments above.

EXPOSURES

There are **two types** of exposures to consider in fire incidents involving these structures. Interior exposures must receive top consideration because of the immediate threat to life safety of the occupants. For example, a lower level fire (in the basement or first floor) in a mixed multiple must be confined quickly because of the potential for upward fire spread through internal void spaces and stairways. These void spaces can let fire travel from the basement to the attic or cockloft unimpeded because of no fire stopping. Fire can also travel horizontally by way of floor joists, from one side of the building to the other.

Fire, smoke and heat conditions in an interior stairway will automatically expose all living units above and block any of the occupants from using them for escape. This means at a late night fire you may find residents at windows on your arrival. In many cases, the old streets have trees lining them that may stop the use of an aerial device, so ground ladders will be a top tool for their victim removal.

The other exposure consideration is that of exterior buildings and objects. Keep in mind these buildings were built in close proximity to other buildings. In a working incident where fire is blowing out of any parts of the building, there may

be similar structure(s) close by- perhaps only 5 or less. There may be direct flame contact or radiant heat, but in any case the means for control is a heavy volume of water from a 2 ½ inch hand, deck gun or other master stream appliance if fire intensity warrants.

ASSOCIATED FIRE CONCERNS

In any event, when fire takes place in these buildings there will be plenty of void spaces for fire to travel. The wise firefighter *expects* fire to spread from its area of origin and predict its likely paths of travel. Remember, there are 6 sides to a fire no matter where it is located: Front, rear, both sides, top and bottom. If fire enters a void space it is possible for it to extend from one side of a building to the other, or it can “honey-comb” where it seems to work itself into areas that you wouldn’t normally consider for extension.

The interior of these buildings are completely combustible and if occupied at time of a fire it means there can be a substantial fire load and severe life safety problem. Firefighters need to use hose lines equipped with nozzles that will deliver the highest flow possible for self-protection and knockdown power. Remember, the quicker a fire can be controlled, the sooner everything gets better.

Because these buildings are very old, chances are very good there may have been alterations done to them over the years which generally weaken the buildings and create extra combustible voids. All of this makes more for firefighters to consider and more physical work.

Again, there are plenty of void spaces for fire to travel in these buildings.
If there is a flat roof or open attic and fire happens on the floor directly below, it is imperative that the fire department *expect* fire to extend and spread-otherwise if the fire department realizes this too late and does not vent the fire out of the building, the fire will spread across the cockloft or attic space and burn the top of the building. To prevent this from happening ventilation at the highest practical point on the roof is necessary. Locate your vent hole over the fire or as close to the fire as safely possible. Vent holes should be cut using power saws to get the job done quicker. When it comes to windows…”make doors out of them!”

Window ventilation is absolutely a necessity to support interior fire operations. Window venting should be done AHEAD of the interior attack crew in a

coordinated manner using handie-talkies between the attack crew and outside vent team members. There have been times where heavy smoke conditions and venting began as uncoordinated window smashing. It has happened that this led to windows being broken BEHIND the attack crew and the fire was pulled to the vent hole. Thus, firefighters inside were in trouble because of improper ventilation actions. That points out the need for coordinated fire attack/ventilation operations using portable radios.

(NOTE: It is not recommended to use any form of positive pressure ventilation during fire attack or overhaul. Without knowing if a fire has been contained, and having unknown voids, fire can be forced into previously uninvolved areas. More important is firefighter safety-because forcing air into a fire involved building will cause heat, smoke and flames to travel the path of least resistance. This means that firefighters working inside can literally have fire pushed over and/or around and even behind them, possibly cutting off their primary egress. This kind of ventilation can also fan flames to a point where the attack cannot handle fire volume)

Offensive fire operations should call for minimum size attack hose lines of at least 1 ¾ inches (not 1 ½ inches) preferably equipped with low pressure “break-apart fog ((50 psi) nozzles or solid bore. The attack crew will need as much attack water as possible but need to maintain manageability and mobility of their attack line. This size line should deliver no less than 150 GPM, however fire departments should have a goal to flow a higher amount if possible, preferably in the 175 GPM range.

If your fire department uses pre-connected handlines for attack, you need to have at least two of your hose beds outfitted with at least 250 feet of hose. The reason is simple. Engine placement at this fire scene is just past the fire building(or before!). The entrances are generally found down an alley or driveway halfway to the building’s rear, (but sometimes in the rear.) Then you must go upstairs. Then the fire is going to be either towards the front of the building or back to the rear. Shorter length pre-connected lines will end up being short. It is wise for fire departments to have at least one bed of static 1 ¾ inch attack hose-loaded with approximately 300 to 350 feet and equipped with a low pressure nozzle for situations where a long stretch is expected.

MULTIPLE ATTACK HOSE LINES

In many cases there will be a need to stretch at least 2 lines and possibly 3 in situations where there is any appreciable amount of fire- or if there is ***any*** suspicion of fire extension. It will take at least three firefighters per attack line to move a 1 ¾ inch line into position and to keep moving in as necessary.

If there is a need for multiple hose lines, keep in mind that these buildings are located in older neighborhoods. That means there is a good possibility of small water mains or older water mains that have become lined with deposits. This could mean trouble supplying the volume of water needed for a large fire incident.

HEAVY VOLUME ATTACK

A heavy volume of fire showing on arrival should be attacked with a large volume of water. These buildings and their stock or storage items are combustible. If a hand line is chosen for attack, it should be no less than 2 ½ inches, equipped with a solid bore nozzle for stream volume, reach and penetration.

If there is any thought given to using a deck gun, then use it! A tip size of 1 ¼ inch or 1 3/8 inches should provide good knockdown in these size buildings. If a deck gun is to be used for knockdown, a supply line from a water source must be established quickly. This tactic brings the fire volume down to where the smaller more mobile hand lines can attack it. Handlines need to be stretched and placed for further fire control.

TRUCK/LADDER WORK

Truck work can be as important as putting water on the fire ! In these buildings the need for strong truck operations is imperative because of the potential for fire spread and the need for lots of overhauling. Engines arriving on the fire ground must always consider ladder company apparatus placement. Ladder or truck companies need close access to the fire building so they can get their tools, equipment and ladders in service quickly. With poor apparatus placement this can prevent truckies from doing their jobs in a timely manner to complement engine work.

Firefighters performing truck operations must be equipped with an assortment of tools to cover the different jobs that should be done: roof, windows, forcing entry, etc. Keep in mind, that in an appreciable fire situation, ventilation must be done first and then the interior work after the main body of fire has been knocked down. These supporting jobs and activities are done to support fire attack.

Access to windows and lower roofs by ground ladders is critical. Access to roofs by aerial ladders or towers should always be considered for speed, stability and safety of firefighters. This means turntable placement must be done early on. However, if an aerial ladder or tower is needed to be moved for better placement, then by all means do it.

A COUPLE OF RECENT ROUTINE COMPLEX FIRES

During the month of November, 2008, a box alarm was dispatched for a reported fire in a building on Lansing Avenue in the city of Cleveland, Ohio. This area is a neighborhood known for tightly compacted streets and plenty of mixed multiple buildings. The first due company upon arrival gave an on scene radio report for light to medium smoke coming from the second floor of a 2 ½ story building. Smoke was coming from the front upstairs windows in a “bump-out” like structure. There was a definite smell of wood and other materials burning that tipped firefighters senses that this was a working fire. First due Engine Company 11 arrived and began their stretch into the structure. The entrance to upstairs was located midway down the side of the fire building via a driveway between two similiar buildings. The acting officer of Engine 11 and the “forcible entry” man from Ladder Company were at the top of the stairs waiting for the nozzleman to arrive. Word came up the stairway that there might be a person trapped in the apartment.

The door to the apartment was locked. As the line was still being stretched into position the acting engine officer and forcible entry man masked up to make entry. At this time, there was no smoke in the hallway-just a very strong odor of it. The forcible entry firefighter started to smash at the door with the head of his axe, but the officer stopped that action until the line was in place and charged, ready to go. Then the acting officer held onto the door knob while the door was forced open, controlling the opening.

The outside vent crew raised ground ladders and began to take out the front windows. The windows of the turret were taken out completely, and then other windows were taken out working away from the fire area.

Inside there was a heavy smoke condition down to the floor throughout the entire apartment. A heat condition was banked down to about three feet from the floor at the rear of the apartment. Firefighters moved in, staying low with the hose line looking for the fire location while other firefighters behind the nozzle team searched rooms in the rear area of the unit. The fire area was a room was located in the front of the apartment. Much of the flame was reduced to smoldering ashes as it seems there not enough oxygen to allow a free burning fire. Upon finding the fire room, the nozzleman washed down the room using a solid bore nozzle, and then attached a fog tip to mechanically vent “out the window.”

The situation was placed under control, and the primary search proved negative for any victims. Afterwards, there was an examination made of the entire fire apartment by fire firefighters. It was noted that there was extreme heat damage to every room. The fire room was gutted, leaving nothing but char. The entire apartment unit from front to rear was blackened and damaged from the dense smoke condition-heavy carbonization; and heat conditions throughout. As firefighters were looking things over it was realized that this incident had the potential for a backdraft. As it was, the proper handling prevented that situation from happening. The quick and early venting combined with attack coordination may have a prevented a sudden ignition of the smoke and gases.

A more interesting and most important note comes from the fact that a bedroom located three feet away from the completely destroyed bedroom had its entrance door closed during the whole incident. After the fire, the room was examined and there was NO smoke or heat damage to this room. It can be surmised that anyone in this room would have had a greater chance of survival just from having the door closed as a barrier to the fire.

LESSONS LEARNED…

1. ARRIVAL The first fire company on the scene must give a good, clear situation report-its initial size-up. Paint a good picture for all hands responding to your incident. This can tell those units what their jobs will be when they arrive. In this case, the time of day and the type of situation dictated an occupied structure with a working fire. There was a light to medium smoke condition visible from outside the structure and no flame visible. With a report of a possible trapped occupant, it made for a complex incident.

2. STRETCHING IN The first due engine company is responsible for the initial attack hose line-make sure it is long enough to access the fire area. This line must be made quickly using a long enough hose line.
The second due engine needs to make sure this line is played out before they stretch a second line. Here, the stretch was down a drive way, upstairs to a hallway, then towards the front of the apartment to reach the fire. Pump pressure and attack volume are critical to firefighter safety and efficiency.

3. FORCIBLE ENTRY Door Control! Read the fire conditions and what they're telling you. Don't be so quick to smash a door off its hinges. If conditions are right, firefighters could be met with a ball of fire or even a backdraft. Use the "irons" for this work.

4. VENTILATION We say it so often but is any body listening? Ventilation is not a fan blowing air into a fire building! This fire needed to be channeled out of the front of the building properly. (Note: Vent for life, vent for fire???) To vent this fire requires ladders, hooks and firefighters and they need to coordinate opening-up with the fire attack/entry crew.

5. SEARCH and RESCUE Here, as the initial attack line was being stretched-in, someone from outside yelled in that there "might be a man in there!" Obviously, there is a new sense of urgency now. Firefighters at the top of the stair never the less masked up and the hose line was there in a matter of seconds. This can be a tough judgement call-whether to make entry without the protection of a charged hose line or wait a few seconds more for one to come. Many firefighters have their own stories of making entry under typical conditions only to have the fire light-up around them while doing this. Some have paid a price.

6. STAIRWAYS, HALLWAYS Interior hallways in these older structures are narrow. Sometimes they have owner or occupant possessions stored there. During fire operations they can become crowded with firefighters "wanting to get in on the action!" Don't let this happen. If the first firefighters inside run into a problem and must back up or retreat to a safe area they most likely won't be able to.

During the month of November 2009 at approximately 2145 hours a box alarm was transmitted for a building on fire in the 6000 block of Fleet avenue in the city of Cleveland, Ohio. Upon arrival of first due Engine 11 there were people on the sidewalk pointing upstairs to where a working fire was in progress. There was extremely heavy black smoke pushing from the second floor front and west side

of the building, however no flame was showing. As Engine 11 members were starting their stretch of 1 ¾ inch line into the building, the senior firefighter told the members of Ladder 11 to get the front and west side windows out right away.

The stretch of the initial attack hose line (1 ¾ inch) was down a driveway on the no.2 side or “B” side of the building and up an outside covered stairway and into the rear of the fire apartment-(a layout of 5 lengths). As firefighters were masking-up at the top of the stairs, the heavy black smoke was down to the floor and being pulled forcefully back into the apartment by the fire’s draw. The nozzle was charged and bled and firefighters moved in. Many times, there are little tips a fire gives that can help lead you to its location. However, in this case, there was no crackling or popping sounds to listen for, nor was there any heavy heat condition-just zero visibility. Still there was no flame or glow to look for.

As firefighters moved deeper into the apartment the senior man told the nozzleman to “wash down the ceiling”. This is a precautionary move to cool down fire gases and prevent rollover or flashover from happening since time was passing without seeing flame or finding the fire. Yet, there IS a working fire in this unit, creating even more gases and high heat. Thus, an increased chance of quick ignition of gases igniting and you may be in the middle of them.

NOTE: *In many cases, firefighters are taught in basic training schools to wait until they see fire before opening the nozzle (They take this as gospel with them throughout their careers!). In out of control, real fire situations where time is passing, and an out of control fire is still working, there comes a point that if the fire gases ignite, the nozzle may not be able to handle the amount of heat and flames that a rollover or flashover creates- Thus, burned firefighters. By cooling the fire gases you prevent this from happening making a safer environment for yourself to operate in. Don’t use fog streams-only straight streams (solid streams are better) directed at the upper areas of the room.*
PS: Don’t worry about water damage in extreme fire conditions, and don’t let the fire environment degenerate to the point where you must rely on your turnout gear to save your life!

The nozzleman stopped at one point while the senior firefighter found a bedroom and knocked a window out. At that moment, ventilation took effect and the two front rooms of the apartment lit up in flames and the heat throughout the apartment suddenly built up and banked down to the floor. The attack group moved back to the kitchen area to get their bearings in the apartment unit as the

fire now showed itself. The attack crew moved in and the fire was handled with 1 ¾ inch hose line using the 15/16 inch solid bore of a break-apart nozzle.

As the fire in both rooms was knocked down, firefighters with tools moved in to perform truck duties-opening the walls and ceilings, removing the wood moldings, etc. The fire did extend to the attic area, but that was handled by another engine company that stretched a second line, as good and proper firefighting procedures call for.

LESSONS LEARNED…

1. Arrival — Upon arrival, heavy, black smoke was coming from the upstairs apartment. The first- due engine positioned itself to let the truck take the front of the fire building and stretch a 13⁄4- inch attack line. The hose stretch was across the front of the fire building, down a driveway, up an outside entrance stairway and into the rear of the fire apartment. The line then had to be worked toward the front of the apartment. Proper pump pressures must be considered. Fire departments using pre-connected hoselines must be sure of their amount of hose so they don't have a short stretch or have at least one static hosebed on each engine.

2. Stretching in — While making entry into the apartment, black smoke was down to the floor and being drawn into the fire. Make sure your hoseline is charged and bled and that the stream pressure and volume are ready before making entry into such areas. Inside the middle of the apartment, the nozzleman directed his stream at the ceiling without seeing any flame. This is done to cool fire gases and reduce chance of rollover. Keep the hoseline as straight as possible when moving in, for manageability and in case you have to follow it back out for safety.

3. Ventilation — Ventilation at the windows is as important as putting water on the fire. Without it, the fire continues to grow and interior conditions worsen to the point of flashover, putting firefighters in peril. A positive-pressure ventilation (PPV) fan will only drive fire, smoke and heat into other areas of the building. In this case, the fire was drawing smoke back into the building!

4. Fire extension — Multiple hoselines were needed as the fire extended to the attic. Fire officers and firefighters must always expect extension. Don't be surprised. Fire departments should equip their engines with hosebeds and

hoseloads that allow for multiple and easy stretches. Consider the amount of personnel responding with an apparatus.

CONCLUSION

These buildings represent an “era gone by” but they still remain. Chances are good that many have been remodeled or altered. Some have changed their occupancy. In many situations they are only partially occupied. Another consideration for these buildings is their age and condition.

An appreciable fire in these structures will tax the efforts of even the best of fire departments because of their inherent conditions. Firefighters be ware! Firefighters should expect fire to spread in these buildings. Remember the two types of exposures-internal and external.

Fire fighting should follow sound principles, practices and fundamentals that have been used for decades If a fire department does not teach them to its members, don’t expect them to be performed on the fire ground. Without them, soon the fire ground becomes chaotic and that can lead to firefighters and officers making their own decisions which can prove deadly

Firehouse Online
June 2011

The "Everyday Routine Complex" Fire
PROS AND CONS OF THE FORWARD STRETCH

BY JEFF SHUPE

Firefighters are enjoying the quiet of a summer afternoon in their fire station discussing the night's dinner when the stationhouse speakers crackle. The dispatcher announces "a reported structure fire" with a sense of urgency.

Within seconds, firefighters are hustling toward their apparatus. The alarm is repeated twice. A few more seconds and fire companies are rolling. Firefighters are aware of the neighborhood from the address given. Enroute, firefighters are talking in the cab while donning their gear and equipment. As the first-due engine turns the last street corner before arriving at the reported address, it becomes obvious – a well-involved, two-story, wood-frame mixed occupancy about halfway down the block is sending heavy black smoke into the afternoon sky. Lots of fire is rolling from the structure, plus there is a severe exposure problem with a nearby two-story converted single-family dwelling on the number 4 side.

The first engine is staffed with an officer, a driver/pump operator and two firefighters. The engine has slowed its response before arriving at the fire building, even though there is a lot of excitement and an urge to rush to do things. Firefighters are looking for a close-by hydrant to "catch" before arriving at the scene – the engine is going to perform a forward stretch (also called a forward lay).

A hydrant is spotted and the engine stops across from it. A firefighter takes the large-diameter hose (LDH) from the hosebed, a wrench and wraps the hydrant, then waves the engine on. The engine proceeds slowly toward the fire. At the scene, the officer tells the driver/pump operator to spot the engine for a deck gun operation and then radios in a well-involved two-story frame structure fire with a frame exposure problem. Other fire companies will be arriving in a few minutes.

The pump operator stops the engine at the designated spot, applies the brakes and engages the pump. The other firefighter on the company gets out, disconnects the LDH and hooks it into the pump's large-diameter intake. The pump operator then radios the hydrant firefighter to charge the supply line as soon as he can and opens the air bleed. The officer has climbed on top of the engine, swings the deck gun into position and calls for water. The pump operator starts water from the engine's tank and the water supply from the hydrant will be at the pump in seconds. The firefighter has been ordered by the officer to start stretching a 2½-inch handline with a solid-bore nozzle between the exposure and the fire building. He takes the working length and nozzle and begins taking the line while the pump operator helps him get the hose out of the bed.

The hydrant firefighter has rejoined his company and takes over stretching the 2½-inch handline for the pump operator. The pump operator has the supply line ready to feed the pump. The supply line is exhausted of air and then the intake is opened – a water supply is established.

The two firefighters have stretched the 2½-inch handline into position and are calling for water. Their hose stretch is a 200-foot layout.

The pump operator reads his master gauges – his pump pressure for the deck gun is at 80 psi. His residual pressure is around 60 psi. He then opens the discharge for the handline. The pump pressure starts to drop as the firefighters flow water, so he builds pressure back up to approximately 75 to 80 psi while flowing. The deck gun has stacked tips and the 1¼-inch tip is being used now. The handline has a 11/8-inch tip. The water supply is adequate for both operations and knockdown is being achieved. The exposure is saved and the main body of fire is knocked down.

This small crew of firefighters accomplished several objectives early in this incident by good use of their equipment, using proper procedures and possessing a “can-do” attitude.

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Getting Water To the Attack Engine

The forward stretch is used routinely by many fire departments for getting water from a source (hydrant) to an attack engine. When employed properly, it provides an engine company with a quick, secure water supply and flexibility in fire attack operations. This evolution is especially effective in the early stages of an intense and/or growing incident. It lets an engine be positioned with its hose and equipment near a fire building or incident with an established water supply.

This operation is different from a reverse stretch, where an engine company arrives at a working fire and drops its attack hose (and tools) at the fire and then takes off to a nearby hydrant or water source with hose trailing behind the engine. The pump operator in a reverse lay makes all the hookups unless help is available. The “reverse” pumping engine then pumps water back to the fire. The forward stretch is also not like an “attack” engine that responds to a fire and begins the fire attack with water from its booster tank while a supply line is hand-stretched to a nearby hydrant or where a second engine supplies the attack engine with water in a relay.

In its simplest form, the forward stretch involves an engine company locating a hydrant before arriving at a fire scene; having one firefighter get off the engine with a supply hose, a hydrant wrench and any other tools necessary for making the hookup; “wrapping” the hydrant with the supply hose, and then signaling the engine to proceed to the fire or address. When the engine is in its proper or selected fireground position, the supply hose is then broken and hooked into a pump intake. Once that is done, the “call for water” is made to the hydrant firefighter, the line is charged and the water supply is established.

What Works & What May Not

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In short, the forward stretch is used to quickly establish a water supply and can help firefighters start a fire attack and keep it going without interruption of water. This procedure has its pros and cons, and we will look at some of each. Maybe your department has a few of its own.

One pro has already been mentioned – that is where the engine stops and secures a water supply before reaching the fire and then finishes responding to the location with the supply hose

being laid or “stretched” as the engine moves forward. When the engine stops on the fireground, the pump operator (or another firefighter) breaks the supply hose coupling, hooks it into a pump intake and makes a call for water to the firefighter at the hydrant. That firefighter acknowledges the call and turns on the hydrant fully. When water reaches the pump, the supply is established.

Some fire departments perform the forward stretch with one added feature – after positioning the engine at a fire that is going to be fought using handlines, the initial attack line is stretched into position as quickly as possible and is charged with water from the booster tank. This is an excellent evolution that provides quick water application on the fire while the hydrant supply is being secured. Once the water supply is established, the pump is switched over to hydrant supply. Now, other attack lines can be stretched as needed. Any extra or unused water can be used to refill the engine water tank.

Keep in mind that the volume of an engine’s booster tank water supply must be watched during initial attack operations so as not to run dry before the hydrant supply arrives. A good rule of thumb is to charge only one handline for tank capacities of 750 gallons or less. (Note: That is predicated on the size of attack hoseline used, preferably 1¾ inch, and if a fire department meets or exceeds target flow in their attack lines or if it uses high-volume nozzles.)

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If an engine arrives at a large fire that needs to be hit with a big amount of water, as from a deck gun, the engine performing the forward lay should first be positioned (with exposures in mind) for the best possible stream advantage and then supplied from a hydrant. Once the water supply is received, the heavy-stream attack can begin. By this method of supply hose stretch, your engine can start “big water” and keep water flowing without interruption, rather than using booster-tank water, as it would most likely be used up very quickly. However, if your engine is equipped with a large water tank, you can darken down a lot of fire, especially if your stream is well placed. Also consider the size of your solid-stream tips and how many gallons per minute they deliver at 80 psi.

One “con,” or downside, of the forward stretch occurs when an engine responds with less-than-adequate staffing (for example, one officer, one pump operator and one firefighter.) In this case, the firefighter making the hydrant hookup leaves the pump operator and company officer temporarily shorthanded to do the work of supply line hookup. The officer and pump operator will hook up the supply hose and may stretch an attack hoseline in the initial stages of fire operations by themselves.

Another con concerns a limited-supply water system. Where a community has a water system with small mains, small hydrants, dead-end mains and/or hydrants spaced at long distances, this can severely limit available water from a hydrant. This can be a serious problem where a large fire occurs in a remote setting and few hydrants are available, resulting in long supply hose stretches and excessive friction losses. In such cases, it is prudent to hook a supply engine to the hydrant, pumping into the supply hose pushing water to the attack engine.

In older neighborhoods, when several engines are performing forward stretches, they may experience reduced intake volumes because too many engines are drawing from the same grid source. It may be best to find the largest-volume hydrants and establish relays for maximum volume.

Steps for Implementing A Forward Stretch

1. Know your district or community and its characteristics – This is imperative and is an old axiom of the "job." Firefighters in the past were always expected to know their districts. The senior firefighters of today should have been taught this by their senior firefighters years ago and should be passing these little tips on to their less-senior members. If you know your community, then you should know where the good water supplies and the bad water supplies are located.

If you work with other fire departments on a regular automatic-response system or mutual aid system, meet with everyone you will work to see how compatible your water systems are. You also want to look at your engines and see what size hose and couplings your neighbors are using. The worst time to find out your hose is different from your neighbors' and no one has any adapters to overcome differences is when the fire is burning everything in front of you and you are powerless to get an effective attack moving!

2. Know your available water system, including fire hydrant locations, volume and pressure – Some municipalities have hydrants located every couple of hundred feet, while in some localities the spacing is much greater. In any case, it's hard for everyone to know the water system. Some fire departments have developed hydrant, or "plug," books that show all hydrant locations and their available water volumes. Departments with mobile data terminals (MDTs) in apparatus cabs entered this information in their data systems and locate hydrants by computer maps while responding. It is important to know your volume and flowing pressure from your system and the distance between your hydrants.

Do you have hilly terrain? If you have limited water availability and a hillside fire, an engine company stretching uphill will encounter the same elevation loss as if the water was going straight up as in a building standpipe. If you have this potential problem in your community, train now to overcome it. It may be as simple as setting an engine "on a hydrant" to push water to the fireground.

3. Use large-diameter hose (LDH) for supply purposes – Not that long ago, many fire departments were using supply lines consisting of 2½-inch hose. Today, LDH is the norm. Four- and five-inch hose appear to be the most popular sizes and are the most efficient at moving large volumes of water over long distances. (Some departments use six-inch hose, but it is not common; it is found in many industrial fire departments because of their particular threat potential.) However, it should be understood that even with LDH on your engines, there is still the factor of friction loss to consider, especially if you must make long stretches.

Many fire departments moving from smaller supply hose thought all of their water supply problems would go away with LDH This is not true. An example of this was illustrated by a fire department that routinely did forward stretches with 2½-inch hose, but moved to four-inch hose – a good move for that department. But the members did no homework or training on their new hose nor did they suspect anything other than fantastic water at every fire. At a large fire one night, they set their tower ladder (capable of discharging 1,500 gpm) at approximately 70-foot elevation being supplied by a single line of four-inch hose from a hydrant on an old water main 400 feet away. No engine was attached to the hydrant – it was a straight lay. Firefighters were

puzzled when they could not get anything resembling a fire stream working. Fire departments must study their own conditions and determine what size and how much hose should be used in each system.

4. Train your officers and your firefighters – It gets repetitive, but it's true. We don't train enough. Because of the conditions found in many fire departments with small budgets and cutbacks, reduced staffing, working with different personnel (some departments staff their firehouses with combination crews), overtime and, yes, even working with other fire departments through mutual or automatic aid, we lose time to train on the basics of the job. There is a real need to understand the characteristics of the evolution and how to make it work – and how to overcome any problems out in the street and still get maximum flows. If your department works with other fire departments, meet with them and train with them. The worst time to find out that "this fire department has a different-size hose" or "that fire department has a different type of thread size" and that no one has any adapters to overcome this problem is at the scene of a major incident.

CHIEF CONCERNS

By Jeff Shupe

Fires in Vacant Buildings: Strategy and Tactics

Why and how buildings become vacant affects decisions

What is a vacant building? What criteria do you use to determine that a structure is unoccupied?

In the 1970s, some fire departments had separate categories for fires occurring in vacant and abandoned buildings, the thought being that if it looked like people had just walked away from a structure, leaving possessions inside, and the building appeared to be ramshackle, then it was "abandoned." A veteran battalion chief once told me an abandoned building had no ownership, but I have always thought every structure has an owner, be it a person, group or corporation – even local, state and federal governments own vacant buildings.

Many vacant buildings have been vandalized and "stripped out" of copper and other valuable metals. In such buildings, walls and floors may have been torn apart and fire will be able to spread quickly throughout the interior.
Photos courtesy of the author

Question 1 – *When does a building become vacant?* I don't think you can establish this through a measure of time. For example, if a family leaves their home for a vacation for an unspecified period of time, does their home become a vacant building? What about seasonal businesses in buildings that are open during tourist season and closed in the off-season?

Why buildings become vacant

Vacant buildings have been around for hundreds of years and will always be around. They may be old structures in old neighborhoods in old cities that have outlived their usefulness or succumbed to hard economic times. Or, vacant buildings may be newer structures in newer cities that have also fallen victim to economic difficulties. There are many reasons how and why buildings become vacant.

Nowadays, firefighters usually refer to a building with no regular occupation inside it as "vacant" and apply the term to buildings ranging from very small, one-room "outbuildings" to former industrial facilities and high-rises.

If you are a firefighter in an old industrial city that has lost much of its employment base, you are most likely seeing a high number of vacant structures in your jurisdiction. Many cities have fallen on hard times as industry has died or moved away. People leave neighborhoods "abandoned" and neglected because there are no jobs. As a population moves out, blight and its problems move in.

While creating a hardship for those cities and towns, the economy and its problems have created hardships for other areas of the country as well. Recent times saw explosive growth in newer developments and previously undeveloped areas. That gave people a belief that good times and fortune were available to everyone. But then the bubble burst, and those areas have newer vacant buildings and depressed values.

The financial toll

Vacant buildings are a barometer of a community's future. If your fire department receives its funding from the public through property or income taxes, money lost from people and businesses moving out means money lost for firefighters and fire protection. In many cases, fire departments have lost personnel and fire stations because of economic hard times. For fire departments that rely on grants and similar programs, what happens when the state and federal money dries up?

In researching material for this column, I referenced the National Fire Protection Association (NFPA) report *Vacant Building Fires* by Marty Ahrens (http://www.nfpa.org/assets/files/os.vacantbuildings.pdf). The infor-

JEFF SHUPE has been a career firefighter for more than 37 years. He most recently was a division chief for the City of North Myrtle Beach, SC, Fire Department. He is retired from the Cleveland, OH, Fire Department and has also served as a volunteer firefighter. Shupe is an Ohio-certified fire instructor and was a field training officer for the Ohio Fire Academy for more than 24 years. He holds a degree in fire technology and attended the University of Cincinnati Fire Protection Engineering program. He is an EMT and hazmat technician and conducts training across the country at all levels.

mation is interesting and useful. For example, between 2003 and 2006, the U.S. averaged 31,000 fires in vacant buildings per year. Of those, 63% were in residential structures – 58% in one- and two-family homes and 5% in apartment buildings. During that period, fires in vacant buildings caused 50 civilian deaths, 141 civilian injuries and 4,500 firefighter injuries. From 1998 to 2007, there were 15 firefighters killed in vacant building fires.

According to Ahrens' data, 43% of vacant building fires were intentionally set – arson. Automatic extinguishing systems were found in 2% of vacant building fires and functioned in 68% where fires were large enough to cause them to operate. Where the automatic systems failed, 82% had been shut off. That should lead us to realize that even where automatic fire protection systems are on site, they are not 100% effective, and we still need a fire department to deal with those fires.

Question 2 – *Can a building be partially vacant or partially occupied?* Look at the structures in your jurisdiction and point to those that may be partially vacant. When is life hazard not a problem? This and other factors make our job complex, especially when working with low- or under-staffed fire companies.

Question 3 – *Will all this information (and more) have an impact on how you attack a vacant building fire?* Some in the fire service try to brush the problem aside by saying, "It's just a vacant building – we don't care about vacant buildings and don't need to worry about them." Really? Does that mean we let them burn? It's most likely that if firefighters can, they will attack, especially if such fires threaten wider harm to their communities.

Unknown dangers

No one wants firefighters to be injured or killed in the performance of their duties, especially for buildings in poor structural condition or with hazardous or dangerous contents or little or no monetary value.

For more news and training on leadership and command, visit: http://www.firehouse.com/topics/leadership-command.

This new, well-maintained building is "partially vacant" at various times, but presents constant life-hazard concerns should a fire or other disaster occur. Firefighters cannot know which spaces are occupied and which are not, creating accountability issues. There is much to consider in developing strategies and tactics and having enough firefighters and other resources on the scene early in the incident to handle fire-control needs and life-safety/accountability issues.

Many people believe firefighters should never enter a vacant building to fight a fire aggressively, but are they saying that about *every* building they determine to be vacant?

Every fire occurring in a vacant structure must be evaluated on the factors that are present, with firefighter safety at the top of the list. If a fire is going to be fought offensively, then organize available resources to perform firefighting operations with engine and truck work in mind. That's the key to safety and efficiency.

Engine operations include proper positioning of early-arriving engine apparatus to accommodate the arrival of truck companies. Quickly stretch attack lines that are of the right diameter and length to get to the fire for attack. In many cases, vacant buildings have been vandalized and "stripped out" of copper and other valuable metals. In such buildings, walls and floors may have been torn apart and fire will be able to spread quickly throughout the interior. With that in mind, stretch additional hoselines when there is any appreciable fire and it is extending.

Truck company operations may be vital to the outcome of an offensive fire operation, especially when there is extension. The building should be opened up and the fire and its products channeled out of the building. Buildings that have been vandalized and stripped out should not be ventilated with power fans, unless you want to push fire throughout and burn the building to the ground. Doing this when firefighters are inside may trap them.

An important ventilation concern is where extra-secure window and door coverings are in place. Learn where these devices are used, what they employ and what it takes to remove them. Should firefighters become trapped or lost operating inside a vacant structure where these systems are used and they cannot get out by their primary egress, they will have an almost impossible job trying to open them from the inside. In some frame structures it may be possible to use a chain saw or other power saw to cut around door and window frames for complete removal rather than waste time and effort working on them.

One item worth mentioning – "If someone wants a building to burn, it's going to burn!" That means this type of fire can happen in any city, any town, any place. Firefighters must watch for anything unusual while responding, on arrival and while working the incident. Back in the "war years," many vacant structures were "trapped" – meaning they had been worked on to speed fire growth. Arsonists would cut holes in floors and walls, and then place plastic bags of a flammable liquid where heat from the flames would cause the bags to fail and release their contents, sometimes around unsuspecting firefighters. Some of these buildings contained exotic flammable liquids that caused them to burn at higher-than-normal fire temperatures, sometimes even melting water pipes! Some of these buildings were reported to be consumed within minutes. And some of these buildings are still around today.

Conclusion

Vacant buildings are here to stay, and they will be found where you least expect them. Train and prepare for fires involving them. Understand that buildings are vacant for a variety of reasons and circumstances, and they may lead to unexpected situations and fire behavior for you.

Life safety is always a concern at fires involving vacant buildings. Even partially vacant buildings may create extreme accountability problems for firefighters. Follow sound firefighting practices while using available resources when called to these buildings. ■

Firehouse Online
September 2012

Chief Concerns: Fires In Vacant Buildings

By Jeff Shupe

Question 1 – What is a vacant building? What criteria do you use to determine that a structure is unoccupied?

In the 1970s, some fire departments had separate categories for fires occurring in vacant and abandoned buildings, the thought being that if it looked like people had just walked away from a structure, leaving possessions inside, and the building appeared to be ramshackle, then it was "abandoned." A veteran battalion chief once told me an abandoned building had no ownership, but I have always thought every structure has an owner, be it a person, group or corporation – even local, state and federal governments own vacant buildings.

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Vacant buildings have been around for hundreds of years and will always be around. They may be old structures in old neighborhoods in old cities that have outlived their usefulness or succumbed to hard economic times. Or, vacant buildings may be newer structures in newer cities that have also fallen to economic difficulties. There are many reasons how and why buildings become vacant.

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If you are a firefighter in an old industrial city that has lost much of its employment base, you are most likely seeing a high number of vacant structures in your jurisdiction. Many cities have fallen on hard times as industry has died or moved away. People leave neighborhoods "abandoned" and neglected because there are no jobs. As a population moves out, blight and its problems move in.

While creating a hardship for those cities and towns, the economy and its problems has created hardships for other areas of the country as well. Recent times saw explosive growth in newer developments and previously undeveloped areas. That gave people a belief that good times and fortune were available to everyone. But then the bubble burst, and those areas have newer vacant buildings and depressed values.

Financial toll on the fire service

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Vacant buildings are a barometer of a community's future. If your fire department receives its funding from the public through property or income taxes, money lost by people and businesses moving out means money lost for firefighters. In many cases, fire departments have lost personnel and fire stations because of economic hard times. For fire departments that rely on grants and similar programs, what happens when the state and federal money dries up?

In researching material for this column, I reference the National Fire Protection Association (NFPA) report Vacant Building Fires by Marty Ahrens (http://www.nfpa.org/assets/files/os.vacantbuildings.pdf). The information is quite interesting and useful. For example, between 2003 and 2006, the U.S. averaged 31,000 fires in vacant buildings per year. Of those, 63% were in residential structures – 58% in one- and two-family homes and 5% in apartment buildings. During that period, fires in vacant buildings caused 50 civilian deaths, 141 civilian injuries and 4,500 firefighter injuries. From 1998 to 2007, there were 15 firefighters killed in vacant building fires.

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Strategies and tactics

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Engine operations include proper positioning of early-arriving engine apparatus to accommodate the arrival of truck companies. Quickly stretch attack lines that are of the right diameter and length to get to the fire for attack. In many cases, vacant buildings have been vandalized and "stripped out" of copper and other metals. In such buildings, walls and floors may have been torn apart and will let fire spread quickly throughout the interior. With that in mind, stretch additional hoselines when there is any appreciable fire and it is extending.

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Firehouse Online
February 2013

Bread and Butter Operations…
FIRE ATTACK: "OLD WAYS, NEW THINKING"

BY JEFF SHUPE

It's 2:35 in the morning. The temperature outside is 19 degrees. Everything is snow covered and more is coming down. During the day your engine had several runs but nothing of any consequence. The ladder company had a few "nothing" runs too, until they caught an all hands assignment as the "extra truck" for a structure fire right before dinner. They were there for a little over an hour and released. Their structure was a vacant, two story, two-family wood frame that had a couple of rooms well involved, but the Chief in charge of the fire decided he had enough companies on the scene to handle it after "knockdown" so the ladder and another company were released early.

The firehouse is quiet as the department alerting system speakers start to crackle, preparing to notify stations and companies of a structure fire. Firefighters are out of their beds, getting dressed and are heading down the stairs towards their apparatus as the incident is announced. Once there, firefighters don their turnout gear and climb into the cabs and the seats that hold their SCBA's, quickly putting on the shoulder straps and waist belts, clipping the buckles together and adjusting their fit. You hear shouts like," Ready!", or "Go! go!" The drivers start their apparatus out the doors. As the companies respond down the slippery snow covered streets, the fire alarm dispatcher notifies all responding units that several calls have been received for this incident. In the distance you can see a glow and a column of silvery smoke rising into the clear winter night sky. It'll be a worker!

Your engine leads the way up the street. Driving cautiously on the snow and ice, your company turns the corner two streets before the location. The bright orange glow over the roof tops indicate a heavy fire condition. Seconds later you arrive. Your driver spots the engine just past a two story wood frame structure that is heavily involved on the first floor. Fire has complete control of the front rooms and porch. However, the front door is still closed and in place. Flames are issuing from sides one, two and four.

There are three occupied two story wood frame structures close by - one on side two, one on side four and a "rear" two story frame structure on side three. (This is a very common housing arrangement in older rust belt city neighborhoods). No civilians are standing around on your arrival. There is however, a newer model pick-up truck parked in the driveway along side the burning house. There is no yelling or excitement as your engine company and the ladder company begin their operations. The engine officer grabs the radio mike and speaks into the radio," Engine 11 to dispatch, we have a 2 story wood frame well involved..… appears to be occupied!

This fire needs to be hit hard and fast. It's moving quickly and appears to be "extending" internally and externally. There are exposures to consider - and remember, the house looks to be occupied! If a hand line is chosen, it needs to deliver a sufficient volume of water that can knock down the flames quickly and more.

The truck men take their tools and ladders and head for their assigned positions on the fire building as the engine crew starts its stretch of a one and three quarter inch hose line from one of the engine's rear static hose beds. The hose is equipped with a break-apart nozzle, but the engine firefighters are trained and disciplined to take the fog tip off and use the solid bore nozzle for these structural applications.

QUESTION: "Where do you want to begin attacking the fire?"

For some firefighting personnel this question presents a problem or quandary. For some it needs to be debated in a "clean air" environment. For other firefighters, the answer is simple:

The nozzle needs to go *to the front door*. Firefighters need to stretch the attack line to the "drop point" and make the call for water. The *drop point* is that location that is as close to the fire as safely possible, where the hose will be flaked out and the "call for water" will be made to the pump operator. The pump operator then acknowledges the call *back to the attack team* and charges the attack line, then throttles to the approximate pump discharge pressure needed. After receiving acknowledgement, the attack team then dons their face pieces as water is coming. Water should be at the nozzle in a few seconds. This whole process should take place in 90 seconds or less especially during *bread and butter operations.*

The nozzle firefighter then gives the line a "good bleed" to make sure of operating pressure, stream volume (and pattern if using a fog nozzle). The line should be checked to see if there is any kink(s) in it. The attack crew then does a last second quick glance of their objective and then the attack begins. The officer (or firefighter in charge) asks, "Everybody ready?" and then says, "Let's go!"
The first item of business is to knock the flames down on the porch. Then the door needs forced open which will give instant access to the fire area. An ages old firefighting attack rule is "*Never pass a fire!"* – Extinguish it as you go.(Ref. "Fireground Tactics"; Emanuel Fried, 1971) In the past, just like today, many firefighters in their haste to make quick entry have pushed past flames they thought were inconsequential only to have them grow to a size that threatened egress or burned hose lines and trapped firefighters from behind! It was important many years ago to follow that rule and it's still as important today.

In the case of this fire, it only takes a few seconds of water from the solid tip nozzle to control the burning porch. After that, force the door open, then position the nozzle inside the doorway and start attacking the fire from up close. Make sure your nozzle is fully opened for attack. It is best to start with your stream aimed at the ceiling – work it around so it breaks apart against the ceiling and upper walls making *big water*

droplets that rain over the fire area. You don't want to whip the nozzle so fast and break your stream in to small droplets or spray. Once you get the nozzle stream working on the main body of fire you should have quick knock down of most of the flames in front of you. Most likely, you won't rush in due of the volume of heat and steam produced – you might need to wait a few seconds for it to "lift" a little. That's one of the reasons for using the solid bore nozzle-for maximum water delivery to absorb as much heat as possible without pushing a lot of air into the fire area. Remember to stay low, too!

Next step – When you have controlled the fire area, quickly find the stairway to the second floor, point the nozzle up the stairwell and start flowing water so the stream hits the second floor hallway ceiling overhead. Work it so it breaks apart and deflects like a sprinkler head would be doing. Don't worry about water damage- especially when there's life safety concerns. Move the nozzle around in a clockwise motion for more stream coverage. This water delivery can allow for control of the hallway upstairs and might give any upstairs occupants a chance of survival. This will also allow firefighters to move in for search duties under a more controlled environment.

NEXT QUESTION: Why not attack from the unburned side?

First of all, you have immediate access to the main body of fire! There is no problem locating it or its boundaries. Water application will be almost immediate and you should be able to see positive results as soon as water hits the flames. Remember – the nozzle should be fully opened during attack! As mentioned before, this fire is fast moving. It is feeding on any combustible contents ***and*** the structure… and it wants to grow! Remember another old *saying "Extinguish the fire and every else starts to get better!"*

ATTACK THEORY

Over time, many fire departments have educated and trained their personnel on the benefits of attacking fires from the "unburned side". This is good philosophy, and should be encouraged when feasible. The idea is to position the nozzle where flames are not showing and begin attacking from there. It is thought of as a way to "save what you can" both human and materially. It teaches firefighters to use their heads for best results and also that fire attack is not one dimensional!

However, many decades ago when this attack philosophy was developed, fires were different. Considering the types of materials found back then as compared to now, this philosophy does not fit every structural fire situation today. Think about a typical living room or bedroom of today with all the plastic and synthetic items found in them, like stereos and TV's and DVD's. Add some vinyl wall covering and naugahyde covered, foam filled furniture, some composite wood and you have a recipe for a fast developing fire!

Maybe you have had an incident like the above fire where you have gone to the rear (or unburned side) and forced your way in and found conditions so severe with zero-

visibility smoke and heat down to the floor that you could not move in more than a few feet? How many of you remember the term *“black fire?”*
More than likely, there was more heat and fire pent-up than the nozzle could handle. My bet is you didn’t move in quickly and you didn’t save anything in front of you while the fire continued to burn! If a wind gust happens against the flames in front of the building you’re in trouble.

With the latest in fire research indicating many man-made materials burning at a more rapid fire growth rate leading to quicker times to flashover, it becomes more important for an initial arriving engine company to be able to deploy an attack hand line or appliance and get it working quickly, especially where there is a possibility of people trapped. This illustration needs to be brought out in order to understand the reason for using the quickest and best route to the seat of the fire when necessary – and delivering a knock-out punch!

NOZZLE PLACEMENT

Hose line placement has several factors to consider, especially where occupant location is in question. As a general rule, the attack team should try to place the nozzle between the people and the problem-many times easier said than done because of fire volume, location, interior features and structural conditions. As for occupant location, “How do you know for sure where occupant(s) might be found? Even if you arrive at a fire scene and have someone telling you where victims might be, there is no guarantee where they might be found or if they crawled around. If search work was that sure, you would simply run in and grab victims and everything would be ok.

OTHER POINTS OF ENTRY

Be mobile with the hose line! When dealing with fast moving fires in wood frame structures, generally the most direct route is best, as long as it is not a wreckless path - one where you must fight your way in, over or around obstacles that could get you in trouble if you need to back out to safe refuge- (Another reason to make sure you extinguish fire as you go.) Sometimes a structure “gives” you an alternate path or entrance that allows you to cut off fire travel and hit the seat of the fire. An illustration here would be a side entrance door to a house that leads down to the basement or up to the first floor. This might put you in a good position to stop horizontal fire travel. Keep in mind that usually, the stairs to the upper floors are stacked over the basement stairs

PUSHING FIRE

You are going to have those fires where you need get water on them ASAP. There may be firefighters who arrive later and question how and why you attacked a fire a particular way. Only you and those you arrived with initially can answer that. And, there may be someone in the stands who claims you “ pushed” fire!

However, this argument loses credibility when a fast-moving fire is hit head-on, hard and fast, using a high volume stream.(Ref. to U.L. study on “pushing fire”) The nozzle operator must remember to open the nozzle fully and direct the stream up over head, mostly at the ceiling and upper walls letting it flow freely, covering everything.

This will have a more controlling effect on the fire and will absorb more heat and will not push fire into other areas. Once you have done away with the fire problem, there is no fire to be pushed. Yes, there will be steam generation as in any case. And as it expands it will look for the path(s) of least resistance like in any bread and butter operation. But with a strong volume of water properly distributed, much of that heat will be taken away and not pushed as thought of in the past. If your department practices ventilation, then more heat and gases can be relieved from the structure.

CONCLUSION

This fire was attacked and controlled quickly because of a quickly stretched hand line delivering a volume of water in the right form from the right location. As with any structure fire, quick control allows other firefighting and search duties to happen sooner and more safely.

Well advanced fires in wood frame structures generally need quick application of water in the right amounts for control and extinguishment. With the addition of today’s synthetics and plastics, which are found in most typical residential settings, the volume of water discharged from an attack line perhaps with some changes in water application techniques are necessary to consider for efficiency and safety. Where there is a possibility of trapped occupants, this becomes all the more important. Arriving firefighters need to make quick decisions about size of attack and from what location to begin. Fire departments should prepare now by studying their past experiences and researching and training for high volume flows and fire attack effectiveness for these fires. On initial arrival these decisions are made following a quick but thorough size-up of the fire building, fire location and consideration of the incident priorities. And it happens from training, teamwork, and experience.

Fire Engineering

IT'S GALLONS PER MINUTE THAT PUT THE FIRE OUT!

10/02/2013

BY JEFF SHUPE

It's 2:45 p.m. on a bright summer day. Your engine company has been dispatched with a full box alarm assignment for a reported fire in a building. You and your crew are now responding through the streets of your district. Fire Dispatch Center notifies you en route that you are first due. As you get within a couple of blocks of the reported location, you see a column of grayish smoke in the distance over the rooftops of the buildings. As your engine turns the corner into a block of commercial buildings, you see a medium to heavy smoke condition that is starting to bank down in the street. It's a working fire in a one-story taxpayer. The smell of the smoke indicates involvement of contents and other things.

The fire building is on a main thoroughfare—there is plenty of room to maneuver fire apparatus into position. Water supply isn't a problem either; hydrants are nearby and water mains along this street are large and will deliver more than enough.

Your engine arrives first and is spotted past the fire building—a stand-alone one-story mercantile measuring approximately 75 feet wide by 125 feet deep. It has a built-up flat roof of plywood decking supported by open-web bar joists. The exterior walls are concrete block on four sides, and the front wall has a brick and stone façade. The sole occupant is a business that sells and warehouses carpeting.

Your crew is starting to make its stretch to the building with a 200-foot, 1¾-inch preconnected attack line, equipped with a 100-pound-per-square-inch (psi) automatic nozzle.

The second-due engine has just arrived; its pump operator is running over to your engine to help your pump operator ensure a "secured" water supply to your engine. The second-due engine officer and crew members are now helping with your stretch.

(1) In initial fire attack operations, firefighters may make an offensive attack using an inadequate size hoseline. If the fire building contains a substantial fuel load and an appreciable volume of fire, chances are good the fire will take over and require changing to a defensive strategy. Taxpayer structural fire conditions can change quickly and put attacking firefighters in a survival mode. If an incident commander does not have adequate company or fireground staffing, not enough help will be available to assist firefighters in trouble, and the incident will deteriorate. Poor fire company staffing will require calling for help as the conditions change, and the incident commander then must play catch up—a dangerous gamble for firefighter safety. (Photo by Steve Nedrich.)

The first ladder truck is arriving on scene. Heavy smoke is now pushing out of the front showroom door as it is chocked open. Your attack line is flaked out, and you have just made the call for water to your pump operator—he acknowledged your call and is charging the line, pumping at 125 psi. It is static pressure as it reaches the closed nozzle. You and your crew are kneeling on the sidewalk in front of the entrance door and are now starting

to don your self-contained breathing apparatus (SCBA) face pieces as water rushes through the hose to the nozzle. The three of you look at each other; you go on air and give your surroundings a last look as you ask your team, "Everything okay? Everybody ready?" They reply, "Yeah, let's go!"

The nozzleman gives the nozzle a quick "bleed"—enough to get the compressed air out of the line and check the stream pattern. He adjusts it to the straight stream setting and then closes it. Staying on his knees, he starts to move into the building. Visibility just a few feet inside the door is zero. You are directly behind the nozzleman while your third member stays by the door to help advance the hose into the building. He is really only a few feet away, as your advance is slow and deliberate. There are several stands holding carpet samples just inside; behind them are rolls of carpeting, creating makeshift aisles. The second engine crew has now gone around back to look at conditions there.

(2) Firefighters must always be aware of how fire can spread in taxpayer structures. Building inspections and familiarization tours are important to maintain awareness of the building's current fire load and any industrial processes occurring inside. Also observe any structural changes or alterations that have occurred over time. During fires, everyone must watch for changing fire conditions, including smoke volume, color, intensity, and movement. Read the building to spot any cracks that suddenly appear in exterior walls and when roofs are losing their stability. (Photo by Steve Nedrich.)

You get inside the fire building a distance that seems like a hundred feet; in reality, it is only about 15 or 20. The smoke is black and to the floor—no visibility. The heat is starting to bank down on top of you. You and your nozzleman are down as low as you can get

without being on your stomachs, and you are unable to move. You are quickly becoming uncomfortable. There is the sound of windows being broken behind you—and yet, you cannot really tell where it is coming from because you have been disoriented by the thick smoke and heat conditions.

Suddenly, there is a rush of superhot smoke and gases coming at you. You still don't see any flames, but you are thinking, "The fire has gotta be around here somewhere!" There are all kinds of popping sounds and stressing noises around you. You want to drop the hose and put your hands over your ears, even with a hood and helmet ear flaps covering them. Your nozzleman hasn't opened the nozzle yet because he waits to see flames—just as he was taught to do in basic fire training school! The heat is now unbearable, and you yell to him through your face piece, "Hit it, hit it!" You repeat yourself, only with a couple of adverbs and adjectives added.

(3) Firefighters demonstrate the proper technique for handling a 2½-inch handline. When selected for offensive interior operations, this size hoseline will require assigning another company or crew to help with hoseline movement and management. Firefighters should be trained in this important fire attack evolution so they know what it takes to employ this line and make it most effective. This size line provides volume, reach, and penetrating power not found in smaller handlines but makes firefighters more effective in these situations. (Photo by author.)

Your nozzleman hears you and has opened up and is now moving the nozzle from side to side and all around trying to stop the fire's growth and advancement; the stream is having no effect whatsoever. You hear the sounds of the stream bouncing off things you can't

see, without any reduction of heat. You quickly realize the two of you are about to be burned as you scream to him, "Back it out, back it out now!"

How and why did your members get into this situation? Right now, their firefighting and training are failing them. They are now relying on their turnout gear to protect them from serious burn injuries or worse.

PRINCIPLES AND PRACTICES

In his book *Firefighting Principles and Practices, Second Edition* (Fire Engineering, 1991), William Clark emphasizes strategies and tactics and that fire departments need organizational discipline—i.e., engines and ladders need to perform basic, vital functions for the different kinds of structural fires that may happen. He also makes clear that every fire has a critical flow rate and that firefighters must achieve that rate to take an aggressive approach to a structural fire.

Looking at our fire scenario, our engine company arrived and started initial attack line operations in a quick, efficient manner, as should be expected. The crew stretched a 200-foot, 1¾-inch initial attack line and had it charged with water to the nozzle within 90 seconds of arrival, as is done at most bread-and-butter operations. In residential operations, speed is a priority in getting control of a fire situation before it takes the building or occupant lives. To do this, you must have adequate fire company personnel. You also must have enough fire companies and personnel on the fireground early in an incident (first alarm) to accomplish all the necessary basic tasks for an aggressive fire attack.

However, this fire is in a commercial building. John Norman points out in *Fire Officers Handbook of Tactics, Third Edition* (Fire Engineering, 2005) that this is not a residential building and should not be handled like one. Different buildings like taxpayers and other commercial structures require different strategies and tactics. Once again, however, the American fire service in its quest for a one-size-fits-all style of firefighting can get itself in trouble with that mentality when a supposedly routine fire becomes complex. Could this problem also stem from improper training or inadequate or lack of discipline or fireground experience? Or, does it start at the top of a fire department?

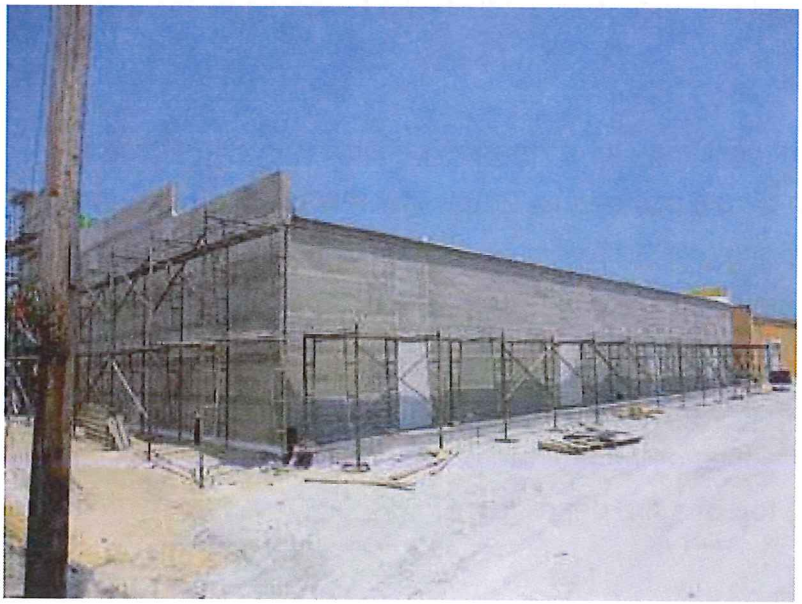
BREAKING THE INCIDENT DOWN

Looking at our incident, we see the following:

1. The weather was not a factor—it was perfect.
2. The street was a wide thoroughfare, allowing apparatus to respond without any delays and to maneuver for proper positioning.
3. Water supply was more than adequate since there were two large mains running along this street and hydrants were positioned every 150 to 200 feet in this commercial area.
4. The fire companies had the proper staffing of an officer, an apparatus operator, and two firefighters—the box alarm assignment had three engine companies and one ladder initially.

The fire building was built in the late 1950s of Type II (noncombustible) construction, mainly concrete block and brick; the roof system was structural steel open-web bar joists with a wood roof deck. The showroom area of the building was wide open with tall ceilings, plate glass front windows, and a high fireload. The stockroom area was the same, except it had no windows and a higher roof with rack storage. The fire load of this commercial occupancy is much higher and different from that usually found in a house or an apartment building. Couple with that the building's dimensions, and you have a chance for rapid heat buildup with poor air exchange—until a door is opened, a window fails, or a rear overhead door in the warehouse is opened, creating a little wind. Get the picture?

Let's look at some considerations that might help our firefighters.



(4) A newer one-story taxpayer under construction, built completely of lightweight materials. When occupied, the building will offer a large, wide-open commercial area in the front and an unobstructed storage area in the rear. The ceilings are high and the roof construction features are combustible materials. Firefighters operating at these buildings should always be suspicious of fire entering the roof or cockloft space early in an incident, burning the concealed trusses to the point of collapse while members are inside. (Photo by author.)

ROLL CALL

Begin your tour/shift with a roll call—a formal shift change. I know, I know! You've heard it before! But it needs repeating. The day begins here, with our formal exchange of departmental information between shifts and company members. Pass along any department or company business here.

For officers/acting officers, this is where *your* accountability begins. Make sure you know your crew—who they are and their knowledge, experience, and capabilities. You can discuss things or ask questions of each other related to company performance/expectations. Do this in an informal, relaxed manner; afterward, you can discuss last night's baseball game!

Go over your personal protective gear, apparatus, and equipment *together* as a team right after roll call. If one person misses something, likely someone else will catch it. Everyone on your apparatus should make sure they have a radio and a light that works.

Note that volunteer or part-time fire departments most likely do not have roll calls and do not know who will be available to respond to the next fire call. That alone is reason enough that regular fire-oriented, hands-on training is necessary for *all* department members. Each member needs to be proficient in the different duties that may be required of them. All departments, regardless of type, should have position or job assignments spelled out and noted, perhaps by seating on the apparatus, to stop any confusion about who does what at the scene of an incident.

(5) The interior of the same building features a wood truss roof assembly system with no interior supports or bearing walls. If fire occurs and extends into the truss roof area, burning will be unimpeded if no fire suppression systems or fire stopping is in place. The weight of the roof trusses and any air-conditioning equipment on the roof will put a strain on the gusset plates, and gravity will cause the roof to collapse. Firefighters should inspect these buildings in the early construction phase to spot any potential life safety threats or structural instabilities during firefighting or other emergency operations. (Photo by author.)

DISPATCH AND RESPONSE

When the tones go off, everyone needs to stop what they're doing and listen when being dispatched— you need to know where you are going and what you are being sent to.

Size-up begins now; everyone should start putting together their own. And, now is the time to get into the right "frame of mind." This is where your own preincident information or prior knowledge comes in. Sometimes you'll hear firefighters giving some information about locations or addresses being dispatched. Some members might have prior knowledge of some unknown hazards in the area. Perhaps your apparatus mobile data terminal has come up with specific data about a street, a neighborhood, or the building address.

In any case, firefighters need to share information and communicate with each other. Everyone should have their portable radio turned on and tuned to the right channel. Listen for any instructions the officer may have. Look out for each other.

ARRIVAL

As your engine nears the fire scene, remember, *slow down*! Rushing up to a burning structure and expecting everyone to jump off the engine and squirt the fire out in a matter of seconds only create unnecessary stress, especially when the fire doesn't go out!

When arriving first at a fire scene, observe all conditions and look for your water source—just in case the second-due engine is delayed or unable to respond to the incident. (That's just another reason for having at least three engines dispatched on first alarms!) The first engine company officer should make sure the engine apparatus is positioned properly, especially with ladder company placement in mind or if a deck gun or other appliance is to be used.

Sometimes, engine placement takes priority over truck placement. This is especially true when on arrival your engine finds heavy fire conditions, a fast-moving fire, or a wind-blown fire with exposure involvement. Use the engine's deck gun. This necessitates positioning the engine deck gun to cover both fires—the main body and exposures.

The engine's goal in these and other scenarios like this should be to establish a water supply and develop a quick, heavy stream to knock down the heat and extinguish as much of the main body of fire as possible.

To perform this simple operation might require a *forward lay* into the fire scene from a dependable, close hydrant. The benefits from this evolution are an established continuous water supply, the ideal engine apparatus positioning for best use of appliances and hoselines, and quick application of a large-volume appliance.

This evolution might bring an out-of-control situation under control quickly, especially in understaffed operations. Remember, when using large-volume appliances, don't just throw water into the air (like a curtain) thinking it will stop the heat or flames—it won't. You must attack the flames and keep exposure surfaces cool and below their ignition temperatures.

ON-SCENE SIZE-UP

Every fire incident needs an initial arrival report. This should come from the first unit on the scene. As stated before, when approaching the fire building, slow down your response so you can see things more clearly instead of running by them or missing them altogether. You might see something that's critical that you should put in your initial report.

There will be times when conditions on arrival are so demanding that the company officer must go right to work with his crew and is prevented from making a radio report. In such cases, perhaps the apparatus operator can make the report.

Regardless, the first unit on the scene should give an arrival report that paints a picture of what conditions you have. Don't just yell into the radio, "We've got a working fire in a two-story frame!" That doesn't tell anyone anything except that the first-due company officer sounds excited and beyond control.

Composing a clear message doesn't take long. A good initial report will alert other responding companies as to what is going on and what may be expected of them when they arrive. Some departments teach their members how to develop effective radio messages and what to listen for from initial reports about their incident.

Make an effort to mentally compose your message first so it contains information such as your company marking on the scene; the building's height, size, and dimensions if possible; the occupancy type; occupied or vacant; fire/smoke conditions and location in the building; and any important things to add such as "people outside waiting for us" or other information. Try to do it with a calm, controlled voice.

INITIAL ACTIONS

An old American fire service adage goes, *"As the first line goes, so goes the fire!"* This was true many years ago, and it still holds true today. In most cases, an engine company will be first to arrive at a fire and start attack operations. What that first engine does can set the tone for the rest of the fire.

A company officer (or acting officer) must have accumulated fireground experience (not just years on the job, time in a classroom, or certificates) to know how to read a fire building and its situation and to know what needs to be done and how to do it. These are skills gained over time. All officers and firefighters should be "fire conscious" and suspicious and always remember that fires don't stay in nice neat little boxes but will travel. (These suspicions and experiences are learned over time and should be passed on from one generation of firefighters to the next so that the next group of fire officers will be better prepared for the job.) Some firefighters and officers have good, natural fire intuition; others don't—that's a fact.

In this fire, selecting the 1¾-inch hose coupled with a 100-psi nozzle was incorrect, especially when looking at the pump pressure used. The volume of water was inadequate for the job because of the following: (1) The 125-psi pump pressure was too low and was not increased when water was flowing, so the volume discharged might have been around 80 to 95 gallons per minute (gpm), depending on hose quality and other things. (2) The interior size (cubic volume) of the building and the fire area, the lack of compartmentation, and the amount of combustible stock were far more than what any 1¾-inch line could handle, even under the best conditions. Commercial buildings can make big fires—plan your attack accordingly.

The officer should have stopped the stretch and called for a bigger handline with a low-pressure, high-volume nozzle. This interior operation needs an initial fire stream of at least 300 gpm. This is doable with 2½-inch lines and 50-psi nozzle tips capable of discharging that volume or more. The total pump pressure for a layout of 200 feet of 2½-inch hose and low-pressure nozzle requires only approximately 75 to 80 psi. These firefighters are entering a fire area without enough water to keep them safe, let alone attack the fire and control it.

In the officer's defense, if this is the only way this fire department does business, then the officer can only be held accountable to make sure things go as planned. Then it is business as usual, no matter how severe the fire situation!

Note there is hesitation on many firegrounds to call for a 2½-inch handline for offensive operations, probably because of lack of hands-on training along with inexperience in using this size line for offensive operations. Perhaps there's some trepidation: "There's a heck of a lot more fire in there than my 1¾-inch handline can handle, and that's what we're used to using!"

NOZZLE PLACEMENT

Where handline attack is taking place, the company officer is responsible to ensure that firefighters select the appropriate size of hoseline and nozzle for the job and guide the team where needed. In many cases, good, knowledgeable firefighters know what size handline they need to pull at a fire and from where it should start operations.

For offensive operations, stretch the line and place the nozzle where it has access to the fire area, keeping in mind to protect and save what you can. Interior operations call for the

nozzle to protect valuable areas that include contents/stock or to cut off fire spread and protect other valuable parts of the structure.

If occupant lives are at stake, they take priority over all other things, and you should position the nozzle between the people and the problem. Where life safety is an immediate issue along with time and resources, the quickest route to the fire is best for quick knockdown and control. If life safety is not an issue, consider the interior exposures next. The third priority is positioning the nozzle to stop or cut off fire spread/extension from one structure to another. This type of fire calls for immediate heavy line usage. Today, there are special appliances that allow firefighters to put heavy streams in service quickly.

Note: Crews that work together over time get to know each other's strengths and weaknesses. However, when working with different members, you will run into different skills, experience levels, and thinking. Officers should *never* take for granted that all firefighters have the same experience or knowledge and that things will always go smoothly. The company officer is responsible for makinge sure things go properly and according to plan or procedure. Firefighting is circumstantial and subject to change in a flash. The company officer is responsible for what happens and for correcting things when they don't go right. That's one of the reasons for having officers or acting officers in command of a company or crew. What training *and* experience do you and your members possess? Again, this is something that you need be consider at roll call every morning. Perhaps engines need to have wet drills to build team operations and ladders should perform hands-on tool and ladder evolutions. Engines and trucks in the same house should cross-train.

WATER DELIVERY AND APPLICATION

Many firefighters have been in offensive firefights where their hoselines couldn't handle it—most likely because not enough water was flowing to bring the heat down because the hoselines were too small. There might also have been other contributing circumstances such as poor ventilation, low pump pressures, hoseline kinks, or applying water from only one location and barriers prevented water from getting to the flames. Regardless of fire situations or the kind of fire department you're working with, water delivery has always been and will continue to be the most important factor in Class A fire control.

It doesn't matter how you try to change or alter it. Good, aggressive firefighting comes down to putting enough water on a fire quick to knock it out or control it. It's that simple.

To be able to do this, fire departments need to look at their community fire potential and their fire forces and determine what it takes to give their firefighters the water they need to take into a fire with them. Always remember that truck company operations complement engine fire attack and make them most effective by providing ventilation and other supporting services at structural fires.

In today's American fire service, it is easy to become confused about what is the best method to control an out-of-control fire situation. It seems that with the many other things in which the fire service is involved, it is easy to understand why firefighters have forgotten the basic principles of water and attack.

The most important phase in a young firefighter's career is the first year on the job. In this time frame, firefighters are expected to go through cadet or probationary fire school and learn the methods or principles that they will take with them throughout their career. There may be a time in those young firefighters' futures when they may have to reach into the "brain bag" to remember something learned from basic training that just might save their lives or those of fellow firefighters or civilians. And don't forget, these firefighters could be future officers.

LARGE-VOLUME HANDLINES

In buildings like this where there are large, uncompartmented areas with high ceilings, the amount of heat and gas built up overhead can be great, and yet firefighters—in complete bunker gear and staying low—may not be aware of these conditions. With no water being applied to this area because no flame is visible *and* no roof ventilation taking place, the stage is being set for a disaster. This fuel needs to be cooled below ignition temperature. Don't be afraid to throw water up into smoke when these conditions are showing.

For commercial and taxpayer-type structures with heavy fire conditions and an offensive attack strategy, use 2½-inch handlines with low-pressure, high-volume nozzles. This size line can produce a heavy stream with heat-absorbing water and penetrating force and reach. Your fire stream needs to hit the underside of the roof deck and deflect to cool gases overhead before they ignite. The open space of this ceiling area is a fuel reservoir and can turn a showroom area from smoke to flame in a matter of seconds. Without a powerful large volume of water to bring these upper-level temperatures down, you are in trouble.

Make no mistake, a 2½-inch line is heavy and not very mobile, but you can increase its mobility by marrying companies together or putting enough firefighters trained in its use on the line. This is a local fire department issue—one where a fire department must make a commitment to train and operate this hoseline offensively when necessary. It is a different scenario altogether when a large handline is set up on a street corner with a hose loop and used in a defensive operation where one person sits on it the rest of the night. Recently, some newer fire attack technologies that increase flows have been developed, and they are less taxing to firefighters.

Many years ago, David P. Fornell wrote *Fire Stream Management Handbook* (Fire Engineering, 1991). Along the way, he also penned articles on hoselines and flows, in particular, the two-inch attack handline with a solid bore one-inch tip.

Back in the late 1970s and early 1980s, some fire departments looked to change their fire attack hardware so firefighters could flow more water with less stress and weight. Many fire departments moved to the two-inch hose but used higher pressure automatic fog nozzles, because they had been promised flows similar to 2½-inch handlines. It didn't work as planned.

What it seems happened is that the hose was capable of flows close to that of the 2½-inch hose only to a point. To overcome the friction loss created by the larger flows, higher engine pump pressures were needed to push that volume through the smaller hose. Coupled with the 100-psi nozzles, it created too much pressure for firefighters to control safely and effectively. Remember, you were trying to move a big amount of water through a small conduit! The laws of nature and physics took over.

Nowadays, with newer hose lining materials, friction loss is very minimal and hose is easier to manage. This reduced friction loss allows an effective discharge/flow with engine pump pressures set where firefighters benefit from increased flow and better hose manageability.

Now, on the other side of the technology equation is the nozzle. As stated before, using *lower* pressure nozzles is a top priority for attack lines. Lower pressure (50 psi) fog nozzles are available along with break-apart features. So, now we have the better quality hose and nozzles together that allow larger volume of water discharge at lower pressures!

Also, 11⁄16-inch solid bore tips are available. Coupled with full-flow ball valves, newer two-inch hose will allow firefighters to flow around 290 to 300 gpm. Results may vary, depending on the hose's age, quality, its liner materials, and so forth. I recommend you flow your own equipment with a reliable metering device to see what volumes you are flowing and what pump pressures are necessary to achieve them.

In the above fire, a 2½-inch attack line should have been mandated as a minimum. Nowadays, perhaps a two-inch hose with a low-pressure solid bore nozzle can make the attack providing similiar flow, better hoseline management, and ease in moving in on this kind of fire. Maybe this newer "old" size line with more flow capabilities will see increased use with higher flow nozzles, since its weight and characteristics are similiar to those of a smaller attack line but a lot safer to have with you in case things go bad.

•••

As time goes on, society and technologies change. The American fire service must keep up with these changes and how they impact firefighting to keep members safer and more efficient. We must always learn from the past to teach the future needs to our people. Good fire service leaders foster initiative in their people. They are not afraid to have them think about how to improve things and make things better for the team.

At incidents where you need to stretch a large handline and use it offensively, a smart company or incident officer will double up or "marry" fire crews to advance the line. This guarantees enough firefighters on the line for management and replacement and rotation of personnel if needed. "Marrying" is something that department members need to be trained on formally and departmentwide so that when the time comes for this evolution each member will know what every position on the hoseline requires, how to position to make a bend around a hallway corner, and how to ensure that no one is pushing or pulling and that everyone is working as a team member.

Again, fire departments always need to look at the changes in tools and equipment from the past to the present. In particular for fire attack, the two-inch hose should be evaluated for use, but only if a proper low-pressure, high-volume nozzle is considered also.

Don't change just for the sake of change! Back in the 1970s, we saw change coming. Some of it was good and well thought out. Other changes were not so good and, unfortunately, it took a long time to get rid of the bad changes. Some of them still exist.

Do your homework. Make sure the firefighter is going to benefit from changes and be safer and more efficient. When firefighters are down to their turnout gear for survival, it is the last thing and the worst thing because nothing else is working at that point.

• **JEFF SHUPE** is a career firefighter with more than 38 years of service. He was a division chief with the North Myrtle Beach (SC) Department of Fire and Rescue and retired in 2011 from the Cleveland (OH) Fire Department. He has also served as a volunteer firefighter. He is an Ohio certified fire instructor and has been a field training officer for the Ohio Fire Academy since 1987. He has an associate degree in fire technology and attended the University of Cincinnati fire protection engineering program. He has been an FDIC HOT Engine Ops instructor and classroom presenter for many years.

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TRANSITIONAL COUNFSOIN

(Transitional Confusion)

By Jeff Shupe,
(ret.) Cleavland (OH) Fire Department

It is an early fall night and the weather is cool and dry. The time is a little before midnight. Your engine company has just been dispatched to a reported house on fire. The four members of your crew hustle to the engine on the apparatus floor. The "senior man" company driver climbs into the cab and starts the engine. He knows the location and best response route. You and your fellow firefighter quickly put on your turnout gear then sit in your seats, buckle in and yell "Go! Go!" Your officer looks around to see if you're ready and then tells the driver to go.

The location of the call is from an older established neighborhood in your town that is mostly single family two story wood frame structures. Most homes have from around 1500 to 2000 square feet of living space. They are spaced approximately 15 to 20 feet apart, with unattached garages in the rear yards.

There is nothing unusual while your engine is responding until you get closer to the assigned street- then the senses kick-in. You smell the distinct odor of wood smoke that says "working fire". As the engine turns into the block your driver starts to slow down to look for an address or visual because you don't see anything yet; your officer grabs the radio mic but says nothing and looks to his side of the street. There, midway down the street - a lady is in the front yard of a burning two and one half story house; she is in her night clothing, screaming and frantic as you come to a stop. Her face has been blackened from the smoke and heat inside - she yells that her husband is still upstairs. Your officer radios in a "…Working fire, second floor of a two and one half story frame – people trapped!" He exits the cab and runs to her to ask where he can be located.

Fire is coming from a second floor window in the left rear corner (No. 2-3 or B-C corner) and is lapping up to the underside of the soffit. Flames have illuminated the side and rear area of the house outside. There is a strong possibility of extension. You are the nozzleman. You go to the cross-lay hose bed and grab for the nozzle and working length of the 1 ¾ inch hose. Your heart is pounding with the excitement of a working fire with a trapped occupant – after all you're a young firefighter. If you don't show some excitement, maybe you're not cut out for this work!...and to add to things, it's only your company for the next couple of minutes before the rest of the assignment arrives. This is not a regular occurrence for your department, but it is the kind of situation you have been trained and schooled to take care of – as a team member.

You and your fellow firefighter start to stretch the 200 feet of 1 ¾ inch hose line, which is equipped with a low-pressure, high volume break-apart nozzle. For this fire it's preferable to use the solid stream feature. But you don't think about that during your excitement…plus, you are a little

confused about where to start attacking the fire from. Your officer is not here helping with the hose, nor is he available to tell you where to take the nozzle. He is an experienced firefighter and officer and has hustled into the house and up the stairs. He is trying to get a "read" on the fire's progress and what is involved – and possibly try to locate the victim. This is done at fires across the country where an officer or a firefighter has been able to locate a fire and confine it by simply closing a bedroom or hallway door.

This move can "buy" time for a trapped occupant while an attack line is brought into position and operated between the victim and the fire. In some rare cases the confining of the fire has allowed for victim rescue before a hose line was put into operation.

Your officer is at the top of the stairs. He has his SCBA face piece on with all his other protective clothing, including his light and radio. The super hot black smoke has now banked down to the floor and below the top steps. He moves up to the second floor laying on his stomach to avoid the layered heat as he fans the hallway in front of him with an outstretched hand. The fire pops and crackles. He keeps a foot in contact with a wall. He begins to wonder where you are with the attack line. This is a typical interior fire operation – a "bread and butter" kind, and he expects you to have that nozzle and hose line charged behind him and ready for the attack as quickly as possible.

The volume of water has taken control of the heat - it's called critical flow rate and it's the minimum amount of water necessary to aggressively attack a fire and control it.

You're at the front of the house and are starting to donn your face piece when suddenly the pump operator yells at you to get that line inside now!

You take the line inside the house and call for water in the first floor vestibule. Your officer backs down the steps through the smoke and yells through his mask, "Get that line up here!" The line is charged, bled and moved up to the fire area. (The fog tip should have been removed from the nozzle in favor of the 15/16" inch solid bore slug.) There is no visible flame, just a faint glow of dark red through the heavy black smoke, but the heat is unmistakable. You hit the hallway ceiling first with all the line has and then start to move it around. You now see where the fire is coming from. The steam causes some real discomfort as ventilation is limited but soon lifts as you're told to "Keep the line working!" The volume of water has taken control of the heat - it's called *critical flow rate* and it's the minimum amount of water necessary to aggressively attack a fire and control it. You should not shut an attack line down in a situation like this, just because flames have been darkened. The water is necessary to bring the confined heat temperature down and to be sure that the fire is knocked. Heat levels need to be reduced as much as possible for anyone trapped. It's also for your protection and other firefighters operating in the fire area. P.S. - Don't be afraid to throw water into smoke and don't be afraid of water damage!

Your officer crawls past you on the floor to another bedroom while your fellow firefighter stays with the line at the top of the stairway. Your officer crawls out of that room and feels the wall and finds a closed door and opens it – it's the bath room and there is the husband, unconscious, blackened, burned and overcome laying in a bathtub with the water flowing. You help your officer lift the heavy, wet, slippery victim out of the tub and onto the floor. Then you drag him on the hallway floor and down the stairs – almost losing him - it's not pretty but this is job reality - it's not the clean world of a fire training academy.

Other firefighters now on the scene help with care for the victim. He has serious burns but he is alive and will recover with some serious injuries.

Question: Why was the young firefighter with the nozzle confused about nozzle placement without his

officer there to tell him where to take the line? Or… Was he thinking about something else that he heard about - "transitional attack", that has worked its way into the American fire service – that is eroding principles and practices that lead to good aggressive firefighting – even when there is occupant life involved?

ENGINE OPERATIONS

The engine company is the most basic unit for fire extinguishment in the American fire service. Every member of every fire department should be thoroughly trained to perform the basic operations required of an engine company. If all front line fire department members can do this then an engine company should be expected to arrive at a bread and butter structure fire, assess a fire situation (using incident priorities), and determine what course of action needs to be taken.

In structural fire operations where offensive firefighting can not be done, THEN another method of applying water to the flames must be considered – and that will most likely be from an outside location. ***Until then, an offensive attack hose line should be able to be stretched and charged within 90 seconds of stopping the apparatus in this type of bread and butter fire.***

Any one working an engine should be trained in the "hows" and "whys" of offensive firefighting. Engine officers should be held responsible to see to it that their crew members are able to perform aggressive fire fighting.

In structural fire operations where offensive firefighting can not be done, ***THEN*** another method of applying water to the flames must be considered – and that will most likely be from an outside location. Until then, an offensive attack hose line should be able to be stretched and charged within 90 seconds of stopping the apparatus in this type of bread and butter fire.

Remember, *"At the heart of modern firefighting is the ability to attack a serious fire aggressively and extinguish it."* John Norman, author; Fire Officer's Handbook of Tactics, 3rd edit. 2005

CHANGING IDEAS and PERCEPTIONS on FIREFIGHTING

Shortly after FDIC of 2014, I attended a "hand-off" class as a student for a strategy and tactics program. All of us in attendance were fire training instructors with differing amounts of time and experience on the job. We were there to receive the training and then go out in the field and train other fire service members. During classroom sessions we were broken into groups to work on scenarios contained in the course. One particular scenario was a three-story wood frame apartment building that had obvious lightweight construction features (i.e.- trusses in the roof). The picture we were given showed simulated fire in just one of the third floor windows. During group discussion of this scenario one class member stated in his initial arrival size-up plan, "Oh, this is easy…I'll park my 'cruiser' over here and position myself on this side to see it; then I'll order a 2 ½ inch line here in the yard to hit it from here."

Another instructor and I looked at each other with puzzled faces. I believe my first thoughts were this person is one of those confused "Walter Middie" types or a public safety person who shouldn't be in a decision-making role in the fire service!

As firefighters and officers, our first concerns should be for any potential occupants in the immediate fire area and then any occupants in adjoining areas. Only the fire department can verify – through a primary search - when a building has no life safety to be concerned about. This correlates to our Incident priorities and their order and how to satisfy them. We must address other key items in an incident like this, including; firefighter safety (wear your PPE), building construction (know your lightweight construction and how fire impacts it), fire

attack capabilities (know how long it will take you to stretch a line), and anticipate the fire (are the right resources on the way, if not, call them).

But sadly, what appeared to a few of us to be an quick offensive fire attack was looked at as a defensive fire by a few others. This is a problem that runs deep and is impacted by the knowledge and experience of fire instructors. When this instructor was asked about giving this tactic more thought, this person was emphatic about what he wanted done – his reasoning was after all…"that building has trusses in it!"

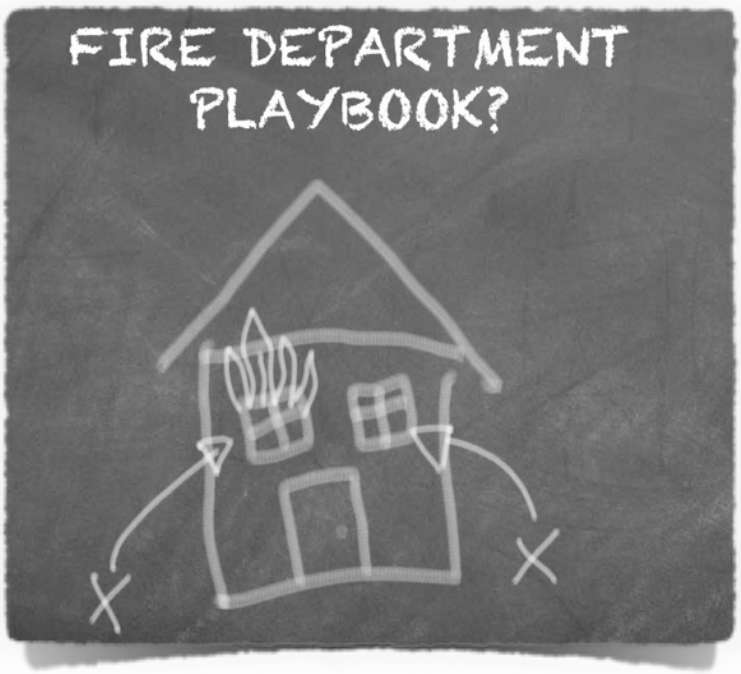
I am somewhat confused and wonder if the American fire service is now in a posture of arriving and starting operations in a defensive manner until it is determined it is ok to go inside.

TRANSITIONAL FIRE FIGHTING

It seems every few years there comes a subject or hot topic that gets a lot of attention. It gets pushed throughout the many channels of our internal media and educational venues. Sometimes a topic will get totally distorted from its original intent as it makes its way through the fire service. Things like Class A foam, positive pressure ventilation, incident command, nozzle design and many others are discussed and debated and made into a science by some. Some in our profession want to re-invent the wheel, while others want to be able to recirculate old knowledge with a new twist, and act like they invented something new. Oh yeah, then they can claim credit for it. If you talk to older firefighters who have been conscientious and are knowledgeable about job history, many will tell you that "We've already been there, fought that battle and that we need to get back to the basics of the job".

So, have we arrived at a point where some officers (and firefighters) in the fire service are looking for an easy way out to decision making and are looking for a "one strategy is good for all incidents" approach? Are these decision-makers being swayed by the political winds? Are they trying to protect themselves from being criticized for making an unpopular decision on a fire ground, or are they afraid of having to defend themselves for popularity reasons? Hmmm. These are some questions to be discussed in a contemporary issues class.

I am somewhat confused and wonder if the American fire service is now in a posture of arriving and starting operations in a defensive manner until it is determined it is ok to go inside. It seems this philosophy has found its way into some fire departments. There are currently fire officers who have taken great pride and take credit for changing their department into defensive organizations. Doesn't this type of systemic strategy tell the public that anyone can do the work of firefighting in these departments? Who can't spray water in a window from the outside? We often arrive on scene and find civilians performing this tactic. Has the American Fire Service degenerated to this level? If this is the case, then we don't need to conduct any more training, or buy any more equipment. We're done.



To know that there are some fire service instructors who preach that firefighting is easy and all you now have to do is arrive and start from the outside FIRST, shows no respect for the job, and the professionalism many of us try to have. This attitude is a slap in the face of those who have made the ultimate sacrifice or have been disabled because of their vigilance to duty.

Historically, we have been a proud profession of risk takers. Historically, not many people wanted to be firefighters. Many of us went through periods of extreme fire activity years ago during the "war years". Many crews had company pride and didn't let tough conditions stop them from the objective. Countless civilians were saved while even more had their property saved because of these aggressive firefighting efforts.

To think that a "defensive first" firefighting policy is a step in a better direction is just wrong. The fire service has gotten a lot better over the past 30 years; better education, equipment, training and job mandates have been introduced and made for enhanced safety and efficiency.

To know that there are some fire service instructors who preach that firefighting is easy and all you now have to do is arrive and start from the outside FIRST, shows no respect for the job, and the professionalism many of us try to have. This attitude is a slap in the face of those who have made the ultimate sacrifice or have been disabled because of their vigilance to duty.

"Whenever firefighting can be conducted inside it should not only be encouraged but demanded. In the United States and abroad, the distinction between a good fire department and a poor one is based on whether they "get in" when the going is rough. This distinction is not based on pride alone. It has real basis in efficiency."

A LOOK BACK

"Whenever firefighting can be conducted inside it should not only be encouraged but demanded. In the United States and abroad, the distinction between a good fire department and a poor one is based on whether they "get in" when the going is rough. This distinction is not based on pride alone. It has real basis in efficiency." William E. Clark, author; FIREFIGHTING PRINCIPLES and PRACTICES, 2nd edit. 1991.

Today's American firefighter has easier and better access to training and education than ever before. This is a fact.

Today's American fire fighter has better personal protective gear and occupational "on the street" protection than at any time in the history of firefighting. This is a fact.

Today's American fire fighter (when compared to fire fighters of the 1970's and 1980's) responds to a much smaller number of structural and overall fires, yet answers many more non-fire related calls for help than those older members. That is a fact.

Today's American fire fighter has the most customized, efficient and most dependable fire apparatus. This is a fact.

Have any of you heard through all this fallout of transitional methods, the cry for getting "back to the basics" of firefighting? Or, is all this stuff something that has been done in the past but now has been "reborn" because a study has put its spin on it with some new terms?

I am encouraged that there are so many firefighters and officers who are studying but at the same time questioning the validity of the UL studies. In today's society, many people will jump on a political bandwagon if it sounds good, without knowing the

real impact or future outcome of what they are proposing.

New ideas in modern firefighting are just that – they don't have to be accepted just because they are being touted heavily or pushed in our profession by some who may have an agenda.

Be smart. Do your own research. Network with others. Build consensus. Go to conferences and classes. Hear what is being said on both sides of the fence. But, after all you do in your quest to find answers, be strong enough to make decisions and keep good, principled firefighting at the core of your values. ***end**

TWO INCH ATTACK HOSE - IT WAS ALWAYS MISUNDERSTOOD!

In the 1970's the American fire service was looking to *up* its game especially in the area of structural fire attack. It was a time when many fire departments were engaged heavily with daily working fires – and many large scale fires, too. Fires were attacked aggressively by firefighters wearing styles of turnout gear not seen today. Tall rubber boots or heavy work shoes, turnout coats made of cotton or rubber, rubber or canvas gloves that did not have liner systems and helmets without impact caps or earlaps was usually worn. Hoods were non-existent. Liners in turnout coats might have been an old army field-jacket or something similar. Oh, yes, sometimes firefighters didn't wear a turnout coat – only what some felt was comfortable for the job at the time!

Looking back at those times (sometimes referred to as the "War Years or the "Battle Years"), and comparing the equipment and personal protection worn by firefighters to gear standards today, firefighters performed the impossible with what was available. Fire fighters, through their respective fraternal organizations (IE: Int'l Assoc. of Fire Fighters – (IAFF), Int'l Assoc. of Fire Chiefs (IAFC)) and other agencies were looking for safer and more effective fire control equipment, procedures and better personal protection. Research and field-testing of turnout gear and station wear was done by a joint venture of these two unions along with the NFPA and others. The effort was called "Project FIRES" and the goal was to find workable ensembles of turnouts and clothing from the study of actual conditions and physiology – yes, that's right! It was finding what could protect us and not hurt us.

Yes, back then you trained with SCBA but they were heavy and cumbersome. Thankfully our old SCBA became the focus of research which was looking for better breathing apparatus for firefighters, as part of the *ensemble*. NASA was involved and helped with this work. The old devices were bulky and hard to breathe from as they were "demand" type systems - where you had to inhale to get any air- meaning they were NOT positive pressure, and the liter flow was likely very low and not enough to keep you going! It was not uncommon at a working fire to hear low pressure alarms sporadically ringing short signals because the users' demand for air was more than the SCBA regulator could supply. Firefighters would take them off as soon as they could in many cases. Fortunately, many saw the wisdom of better turnout gear and personal protection for firefighters. Over time the firefighter protective ensemble or "envelope" has morphed into what it is today. I have said it many times before in classes and conferences that right now the American fire fighter is the 'best protected' than at any time in the history of firefighting. In fact, many senior members will say today's firefighter is maybe too protected so the wearer cannot recognize the environment they might be in.

This was also a time when some of the old 'disciplines' or ways of doing the job were taught and expected to be executed on the fire ground – like truck work and ventilation skills to complement fire attack - as it should still be.

Sadly, some American fire departments began to see firefighter layoffs, resulting in fire force reductions and other problems. It was also a time when some of the basics of firefighting started slipping away.

FIRE ATTACK & EXTINGUISHMENT MECHANISMS

"Put the fire out and everything gets better!" Andy Fredericks

While all this and more was taking place in our profession, fire attack efforts were being looked at for better water delivery. Back then we knew the fire environment was changing. One of the things looked at was the growing use of synthetics and other materials that contained hydrocarbons or similar things. Firefighters were smoke eaters and the "newer" fires weren't the same as in the past. Something was different, and it wasn't anything friendly. The realization then, was the same as now – that fires were burning hotter, faster and creating heavier, more dense toxic smoke than fires that were purely class A – wood, cotton or other ordinary combustibles.

Yes, it was realized that more water was necessary for aggressive extinguishment. Along with that came the need for less stress for firefighters moving hose lines into burning buildings. But also then as now, it was necessary to understand that each size attack hose line has a point where they are no longer effective for fire control and a bigger line and a greater flow is necessary. That point was somewhat lost over time because of people who thought automatic or other types of nozzles would allow smaller hose lines to match the flows of larger ones.

In the past, the fire service focused on three sizes of fire attack hose lines – Booster (3/4 and 1 inch) 1 ½ inch and 2 ½ inch. Each size has/had its own capabilities and limitations and for many decades it was the norm to see those lines on the job. (NOTE: Interestingly, you could go to a major fire somewhere and maybe see all three sizes stretched - and maybe abandoned, while the big guns were working. This was jokingly called "progressive firefighting" as fire departments would sometimes initially stretch small hose lines that were too small for the initial attack. After being pushed back by the fire, firefighters would stretch the next size bigger and repeat the scenario until they ran out of hose options and had to resort to master stream equipment – or maybe not! A lot of buildings were lost because of that thinking. Some of those hose line choices no doubt were predicated from the old belief that a little water goes along way when it turns to steam, expands and snuffs out the fire!!!

It all sounded good on the drill ground and in the security of the class room. Of course that type of attack is supposed to be used in a confined space or hold of a ship! The sales people made fog sound great when trying to sell you an automatic or other fog nozzle. Just remember, it takes GPM's - NOT micro-scopic droplets of water in small amounts to overpower a fire.

It was also noted in some circles that the use of fog and its confinement for structural fire attack set the cause for ventilation back decades in many fire departments.

Today, there are studies and research being conducted and we see people trying to make a science out of fire fighting. It is not! Perhaps some people are looking for recognition trying to satisfy their ego and be able to give the gospel of fire according to themselves. How very wrong because instead of working to learn / teach principles and practices they are confusing many and causing unnecessary controversy between what is right and / or wrong about fire fighting.

THE MOVEMENT BEGINS

Going back into the 1960's the FDNY started employing RAPID WATER combined with 1 ¾ inch hose and a 15/16 inch solid tip nozzle. Simply put, it was system on an engine that employed a device to dispense a friction reducing agent into pump outlets which allowed greater water flows through smaller hoses and nozzles. The goal was to get more water on the fire and minimize weight and hose management stress. Some departments followed suit and bought into the idea but over time, things like operational costs, maintenance and reduction in fire activity no longer warranted the need for it. Many things were researched and tried in the field. Some lasted some did not. But please never let it be said the fire service is stagnant and not forward looking.

As different ways of delivering more water were tried, it paved the way for many different ideas on how we could do it and what tools (Hose and nozzles) would be needed. Starting in the 70's and 80's many departments began researching ways to increase their water delivery and some of the changes were smart and well thought out.

Some departments went for changes in their fire attack systems and switched hose sizes from "small to big" and "big to small. That may sound funny or strange but briefly, what happened for example, is some departments moved away from 1 ½ inch attack hose in favor of 1 ¾ inch attack hose as their primary attack hose lines, which I think we can agree is a good move in the right direction. One and three quarter inch hose with a low pressure solid bore or constant gallon age nozzle makes a great interior attack line with good target flow and mobility. It is able to handle a good body of fire in a structure when properly handled. It has excellent use in other firefighting applications such as for rubbish, vehicles, other fires and foam hand lines Interestingly, as this hose was mainly intended for interior structural operations, it was getting used for vehicles, rubbish and other fires and then began getting stretched for large fires. It is not and has never been intended to be a heavy hand line for large scale offensive/defensive fire operations. Its stream does not have the reach or volume required in those situations. An article written by a Chicago fire officer noted how the 1 ¾ inch hose line had grown to become the "booster line" of the 90's meaning) it was used by some departments for everything and for ridiculous reasons. It is a telling tale when a fire department uses this size hose line for defensive operations at a major fire.

Another mistake or misunderstanding made by some departments back then was to keep their old low volume, high pressure nozzles and attach them to the new hose, which limited the discharge volume!

HERE COMES TWO INCH HOSE AND MORE MISUNDERSTANDING

Again, the push for more water and easier attack line management was addressed with two inch hose with 1 ½ inch couplings. I don't think anyone could argue the concept. However, it seems some fire service officers/"managers" were ready to move forward without doing some homework to see how much fire attack efficiency was to be gained with this size hose. Tragically, some departments bought into the thinking that 2 inch hose with an automatic or other type of high pressure fog nozzle would flow as much water as a 2 ½ inch attack hose line. They discarded their 2 ½ inch attack hose in favor of two inch hose. Automatic nozzles (or other regular fog nozzles) requiring a nozzle pressure of 100 psi at the nozzle were installed. Coupling nozzle pressure and friction loss in older 2 inch hose while trying to flow that volume

was in some cases dangerous. To flow in the range of 265/275 gpm's there was a friction loss of around 45 psi per 50 foot length. In doing the math, you can see an average 200 foot layout would require a pump pressure of around 280 psi to flow that much water through the hose. That's unmanageable for a firefighter to safely hold and 30 psi ABOVE annual hose test pressure! In so many instances the 2 inch hose has been under-pumped all these years to avoid those higher pressures and is probably flowing what 1 ¾ inch hose can comfortably flow!

Furthermore, another problem that came with 2 inch hose was it being stretched as an interior second or third line into a bread and butter type operation when additional lines of 1 ¾ inch hose would have been sufficient. Because of the close dimensional hose size and same size couplings it was thought by many to be "*about the same as 1 ¾ inch!*" Weight-wise and for handling. Some officers justified this practice by using the old "back up" hose line rule where a second line should be at least as big *or* the next size bigger than the first line.

Without proper training or educated officers to correct the problem, it soon became a hose line handled with two or in some cases only one firefighter inside a building fire. And of course, there is the back pressure from the higher pressure nozzles. When advancing two inch line up or down stairways, making turns or bends, it takes two to three firefighters to do it efficiently. The older jacket and hose liner material needed a bigger bend radius or it kinked especially in residential or other tight areas. One fifty foot length of two inch hose holds about 68 lbs. of water where as a one and three quarter length holds about 52 lbs. of water. Thus it was deemed unmanageable or unworkable. Minimum fire ground staffing for 1 ¾ and 2 inch attack lines should always (yes, always!) be at least 2 firefighters for each size line – depending on the situation. More stretching complexities? … then get additional help on the line.

There were also concerns voiced that replacing 2 ½ inch with 2 inch hose would lead to reduced fire ground staffing. Thus confusion on hose line selection began! By the way, that same mobility and water weight logic was used to sell the idea of two inch over two and one half inch hose. Remember again, each size hose has its limitations.

It took many years of actual flow testing and fire ground results to realize that the claims of two inch hose were misleading or false. Many fires were "lost" because of low flows. Two inch hose is an excellent attack hand line but as mentioned before, it has limitations, and should never have been thought of as a replacement for 2 ½ hose. Many of those fire departments have since switched back to 2 ½ inch for large hand line operations. Some departments have retained their 2 inch hose for use as an intermediate size attack line or for standpipe use. The key to any flow questions is answered after you put YOUR own equipment and pump pressures to a flow test on YOUR engines to see just how much water you are really discharging. A fire stream may look good, but that can be deceiving.

A LITTLE BIT ON NOZZLES

Moving to two inch hose HAS BEEN a good move for the fire service. Period.
Along with this movement, though came the push to equip these new hose lines (and one and three quarter inch hose, too) with automatic type nozzles with variable flow ranges. As automatic fog nozzles were introduced, they were presented in such a way that misled many firefighters as

to how much water was actually flowing from a nozzle. The stream may look good but the volume…
The nozzles were said to regulate themselves to pre-set nozzle pressures – usually around 100 psi. It has been witnessed all over the country – a 200 ft. stretch of hose with an automatic nozzle at the business end. Looking at the pump panel outlet pressure gauge and reading a discharge pressure of around 95 or 100 psi. What about friction loss, you ask?
There were claims and statements floating around, "If you don't use these nozzles or embrace this new technology then you're stuck in tradition and not progressive!"
What's wrong with tradition? Isn't *saving lives and property* a fire service tradition?
Or another interesting floater was "So and so fire department uses these nozzles and they're the most progressive department in the world!" Really? How do you determine that???

Much like we see happening today regarding fire service politics.
Unfortunately, local homework was not done by many fire departments and we ended up relying on a sales person or some other uninformed person who said "Look at that stream!" "Why, you're doing 250 gpm's right now." Ok, if you say so.
What was not said in many places was "Let's put this new stuff on a flow meter and see if it performs like you said it does!"

On the other side of this movement were the departments that used their old nozzles!
The trend today is to move forward with nozzles that are low pressure, high volume. Without a doubt, there has and always will be a nozzle controversy. But the reality is that these nozzles (both solid and fog) will deliver more water at lower pressures and result in less reaction force. There will always need to be good strong information and regular training for any equipment provided to firefighters otherwise they will teach themselves and create "their own" devices, and draw their own conclusions.

IT'S A NEW DAY!

Several years ago while still on the job in Cleveland, I was assigned to conduct an engine company operations class for all engines and all shifts, including battalion chiefs. In the block of instruction we flowed the three sizes of attack hand lines (1 ¾, 2, 2 ½ inch) found on engines with a flow meter, then conducted a simulated offensive fire attack pairing two engine companies on a 2 ½ hand line.

When it came to the two inch hose, it was generally found that flows were way under what was expected. Most two inch hose at that time was between 10 and fifteen years old. Higher pressure automatic nozzles were assigned to the two inch hose. The nozzles were old and not well maintained. (NOTE: If your department uses automatic or other fog nozzles a regular nozzle maintenance program is absolutely necessary. Low pressure fog and/or solid bore nozzles are worth investing in.)

Using the CFD SOP mandated set pump pressure of 125 , some older two inch hose flowed in the neighborhood of 135 gpm's. This flow is easily beaten with 1 ¾ inch hose which has less hose & water weight to deal with.

Since those "early times" hose and nozzle research has taken place and has given the fire service more information, resulting in better qualities for each. Standards that mandate certain items or functions, materials and manufacturing, testing, etc. for nozzles and hose is allowing for greater flows and manageability.

This photo illustrates some of the 2 inch hose and nozzles tested. A couple of points of consideration for hose was bend radius and resistance to kink along with potential for nozzle whip. A well-matched attack hose system needs a good, high volume nozzle valve and tip size (or high volume – low pressure fog tip).

RECENT FLOWS AND FINDINGS

There is no perfect size or weight of fire attack hose line for all fires – there isn't! There is no "One size fits all" hose line, either. Otherwise we would have found it by now. However, if we did, someone somewhere would have found something to complain about and probably would possess a degree and would have conducted a study to down play all the previous facts, figures and work accomplished.

A couple of years ago, Jerry Herbst of Elkhart Brass Co. was introducing a newer solid bore tip size aimed at better flows for 2 inch hose for the fire service. It is the one and one sixteenth inch tip. This tip size beats down the old hydraulic rules of solid tip sizes and hose diameters Since working with it back then, I have been a proponent of it. I have presented it in training and conference venues, and I tell people this is some of that "old style stuff" with the new modern approach. The bottom line is it gives greater flows with lesser resistance pressures, especially when matched with good quality hose.

Recently, I have been doing some research with a small group of firefighters from local fire departments in my area. Jeff Diederich, a lieutenant with the Bedford, Ohio fire department brought the group together, and expressed concerns of his department's initial operations from standpipes in taller buildings with low initial staffing. Another of his concerns is standardization and minimum attack flows for his department and the other fire departments they work with. Understandably, his issues and others are echoed by many departments across the country.

During the times we flowed, a plan was devised to get good data on hose, nozzles and flows so an informed decision could/can be made regarding which hose performed best with flows and manageability of two inch hose. A flow meter was attached to a side discharge of a pump. Right after the flow meter tube an inline psi gauge was also installed.

An inline gauge was installed behind an Elkhart 1 3/8 split ball valve shut off. The nozzle was pressurized to 50 psi and then we pito'ed the stream to verify the inline gauge accuracy. +/- 2psi. Below are our observations.

2" Ponn Conquest, 100ft, in 1.5 couplings.

Here are some of the results of that testing:

Tip Size	15/16th	1-1/16	1-1/8
Outlet PSI	66	85	95
Nozzle psi	50	50	50
GPM	220	280	320
Est FL/50ft	8	17 (+ / - 2psi)	23

A discussion regarding the Fl properties of 2" hose, and specifically why it can NOT replace the 2.5 hose for longer lays was had. To prove our point we used the Bedford Niedner 2" as an example - 2" Niedner xl-800, 200ft, in 1.5 couplings

Tip Size	1-1/16	1-1/8
Outlet PSI	144	170
Nozzle PSI	50	50
GPM	270	300
Est FL/50ft	24	30

200ft Niedner with 1-1/16 50 PSI NP

In June of this year I presented at the Boise Fire Symposium. FIRENUGGETS.com and the Boise Fire department, as you would expect, put together a great conference as was evidenced by the number of students and where they came from. (I urge all of you to stay up on this conference and attend this school sometime in the future!)

In our area of **Engine Operations – Fire Attack training**, there were three sections and one dealt with flows of different sizes of attack hand lines using low pressure nozzles. When the two inch was being demonstrated, the results were very much consistent as back in Ohio. (Before the conference I had the same 2 inch hose shipped to Boise and the same nozzles.) The intent was to check quality of pumps and flows of the same hose and nozzles. Here were the results:

100 feet (2- 50 ft. lengths) 2 inch hose. Couplings were 1 ½ inch thread size.

Nozzles were controlled with an Elkhart split ball valve. 1 3/8 inch waterway.

Tips sizes were : Solid Bore - **1 "; 1- 1/16"; 1- 1/8"**

Pump Discharge Pressure : Approximately 90 – 95 psi. (50 psi NP plus 20 psi FL/ 50 ft. length of hose)

Flow results: **1" – 260 gpm; 1- 1/16" – 280 gpm; 1 1/8" - 297 gpm.**

Each student rotated through, holding each size nozzle at each of the different flows. This was to have them experience the actual force and how to counter it with good nozzle mechanics. Of course working as a team with a back - up firefighter. Coincidentally, after I demonstrated the hose line flowing around 300 gpm's, a student asked me how the back pressure felt. I said, "Look, I'm 63 years old and I just held this BY MYSELF!" You however, should have someone to back you up on this line and all hose lines; if they do their job, you won't have any problem with this line – or any other one for that matter! I believe every one came away with a little more understanding about the newer hoses along with nozzles, pressures and mechanics.

WHY IS THIS HAPPENING?

As I mentioned earlier, the newer standards that apply to the materials, manufacture, testing, etc. of our hoses and nozzles are mostly what is allowing for better flows and manageability (. In the far distant past when many of the old mathematical formulas were developed, there was one kind of material for hose lining – rubber! Hose jackets were cotton or Dacron. So, the formulas were based on those materials.

Today, we have several different types of hose linings and a few of those allow greater flows because of low friction loss. Other factors are the hoses' ability to expand and carry more water. Couplings, nozzle valves, and nozzle tips have all been re-worked for better flows.
In any event, if your department wants to conduct testing/research for hoses and nozzles then you should do it AFTER you have developed a plan to find what you are looking for. For example, do you need to consider greater flows and mobility? Personnel availability and initial stretching considerations? A quick, blitz line with move-in capabilities?

A WORD ABOUT TWO INCH ATTACK LINES

This is an intermediate size line and ***should not*** be considered as a replacement for 2 ½ inch attack lines. The two inch hose is an excellent size attack line for immediate large flow from an engine water/booster tank or perhaps a tanker-pumper. It can provide for heavy knock-down and then advancement into a structure if that's what conditions call for. Just remember, it can take a tank down quickly.
It is also a hose line where its use in standpipe operations is being realized or considered more and more, either as an entire attack line or as the "lead length".

The flows we attained were under training and controlled conditions. Like any attack hose line, there needs to be set "target flows" that give a particular size line its identification and capabilities. Even though we have consistently flowed over 260 gpm's with this size line, it seems two inch hose should have a target flow of approximately 230 gpms. This figure is what our group agreed upon considering flowing pressures, manageability and looking at the 1.75 and 2.5 inch target flows. In any event, each fire department should test and flow their own equipment as results will vary from department to department.

DON'T EXPECT to see absolute accurate numbers! In the past, some old "Drillmasters" would pull out an old hydraulic formula and quiz you on it to see if you knew exactly what you were pumping! That was *pre-flow meter era* and, what we in the job now realize is that we are looking at approximates - "target flows" are the minimum gpm's that *a* particular hose line should be flowing, but we work to beat that.

By the way – this proves that fire fighting is not a science – it never has been, and never will be. Unfortunately, those who do not understand principles and practices will try to change the job for themselves.

Low pressure, high volume nozzles are being looked at and are winning favor in fire departments across the country. They work well with all size hose lines. They are a must for two inch hose. Old rules of hydraulics stated that a solid bore tip should not exceed 50% of the hose diameter. That is not true any more. We have successfully shown that bigger tips are applicable. Interestingly, I ask firefighters to look at the waterways of 1 ½ inch hose couplings and nozzle valves – they are 1 3/8 inches. I then ask them to consider a deck gun with 1 3/8 inch tip @ 80 psi and to consider its volume – which is around 500 gpms's. We're not looking for anything near that amount but it shows that this line can provide a high flow for us. All we have to do is our homework!