Overcoming Common Engine Company Mistakes and Fireground Problems

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Rescue Co. #1

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Jason Rivera

- 30+ years of fire service experience
- New Haven CT Fire Department
  - Firefighter Rescue Co. 1
- Newtown CT Hook and Ladder Fire Company
  - Ex-Chief
- Massachusetts US&R Task Force 1
  - Rescue Specialist
- Christiana, DE Fire Company
- Owner NorthEast Squad Concepts LLC
- FDIC Instructor since 2017
- Published author Fire Engineering Magazine

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City of New Haven, CT

- Population 140,000-200,000
- Densely populated urban setting (6,500 people/sq. mile)
- Fire Department Staffing-380 members/4 shifts
  - 10 Engine Companies
  - 4 Truck Companies
  - 1 Heavy Rescue Company
  - 2 Paramedic Units
  - 2 Battalion Chiefs
  - 1 Deputy Chief
- Approx. 33,000 calls per year
- Approx. 80+ working fires per year

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Overview

Class was born from incident at 67 Dickerman St, New Haven CT on March 1, 2015

Multiple problems encountered at scene

- Delayed Truck Company
- Narrow one-way street with vehicles parked on both sides
- High snow banks
- Below freezing temperature
- Known trapped occupant
- Front door propped open
- Hoarding conditions
- Frozen hydrant
- **Initial attack line became hung up outside**

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Overview of New Haven Incident

- Members on scene adapted and overcame a multitude of fireground problems
- Successful rescue was made
- I received 2nd and 3rd degree burns to legs, wrist and torso
- Training, teamwork, strong leadership and experience are the keys to combating problems and mistakes

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Course Delivery

- Class has three sections
  - Introduction
  - Engine Company mistakes
  - Fireground problems
- We will break down the challenges we face into two categories:
  - Mistakes (Human error)
  - Problems (Unanticipated challenges)
- Each challenge will be addressed and ways to more quickly overcome them discussed

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Likes and Dislikes

- Likes
  - Efficient hose stretch with limited manpower
  - Calm and deliberate actions
  - Everyone did their job
  - Efficient use of manpower
  - Quick control over a rapidly declining incident
- Dislikes
  - Forcible entry techniques
  - Use of PPE

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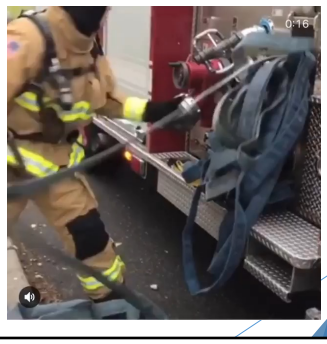

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Engine Company Duties

- Rescue victims
- Put water on the fire
- Ladder buildings as needed
- Respond to EMS calls/MVA's
- Handle Haz-Mat incidents

A member of the engine company must be a jack of all trades

BUT

We must never forget our primary mission which is to put water on the fire quickly and efficiently

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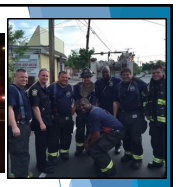
Introduction

- Why do we need to train???
  - Training builds proficiency
  - Training prevents injuries
  - Training builds company pride
  - We OWE it to the people we serve
  - We OWE it to our brothers
  - We OWE it to our families
  - We OWE it to ourselves



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Proficiency/Training

- **No tactic saves more lives or property than a properly placed initial attack line**
  - The only way to become proficient is through practice
  - Members who work together must train together

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Company/Department Improvement

- How do we get better if we don't face our:
  - Mistakes
  - Shortcomings
  - Bad decisions
  - Screw ups
- Tailboard critique
- Post incident analysis
- Kitchen table discussions

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Friday night is pizza night!!!

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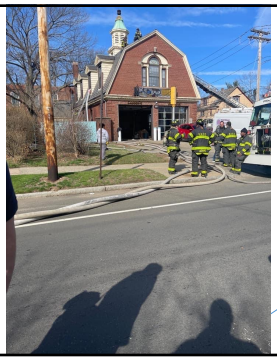
...and again



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- Kitchen table discussions

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What makes a good Firefighter/Fire Officer

- *A good firefighter or fire officer is not judged solely on his ability to make a good decision at the right time, he is also judged on his ability to correct a mistake or problem when it occurs.*

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Decision Making

- How much info do we have when we arrive?
  - *We are trying to make perfect decisions with imperfect information*
- How many decisions need to be made in the first minute?
  - Size up
  - Strategy
  - Tactics
  - Command
  - Incoming units
  - Curveballs

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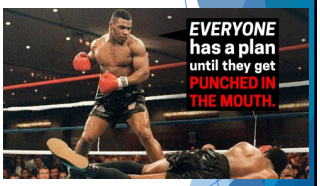
Adaptable

- Expect the unexpected
- Have a plan B already in mind
  - And have the Plan B resources enroute
  - Be proactive---not reactive
- There is more than one way to skin a cat
  - Listen to other members/officers ideas
  - WE are smarter then I



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Calm

- One of the best traits of a leader is the ability to remain calm under pressure
- Calmness is contagious but so is panic
- Listen to leaders you idolize, try to emulate them
- Even if you are freaking out inside, portray an image of confidence and calmness on the outside
- Don't be afraid to ask for help if you are in over your head

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Communications

- Goes hand in hand with calmness
- Communications break down is a leading cause of LODD and is always a factor in LODD reports
- Must have precise instructions for members of the company and all incoming companies
- If first to arrive, paint a picture of what you have for incoming companies

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Most Common Engine Company Mistakes

- Failing to properly size up a building
  - Not clearing the bed
  - Improper carrying and deployment
  - Advancing line through wrong entrance
  - Not being familiar with your company's hose load
  - Improperly packed hose load
  - Stretching too short
- Failure to chock doors
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- Undersized hose line
- Improper nozzle techniques
- Entering fire area with improper flow

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What's in a size-up?

- A size up should paint a picture for all incoming companies
- A proper size up should include
  - Car or company number arriving on scene
  - Height of building
  - Construction type
  - Occupancy type
  - What is seen
  - What actions we are taking

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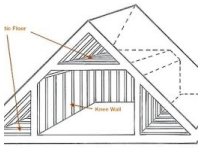
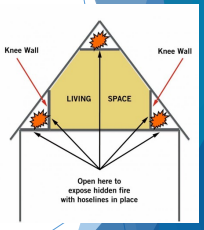
2 story or 2 ½ story???

- What does the ½ story mean to you?
- What special equipment do we need
- Livable space
- Knee walls





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Stairs to the ½ story

- Location
  - Rear of the house off the kitchen
  - Closet in a bedroom
  - Off the hallway opposite the basement stairs
  - Pull-down stairs
- Access to the stairs may often be tighter than normal 36" door
  - AKA "servant stairs"
- May be used for storage
- May have tight turns

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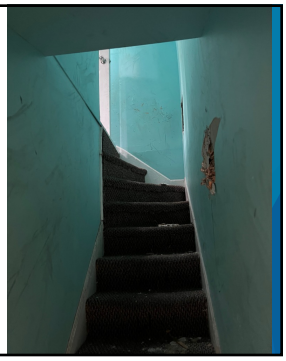

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Things aren't always what they seem

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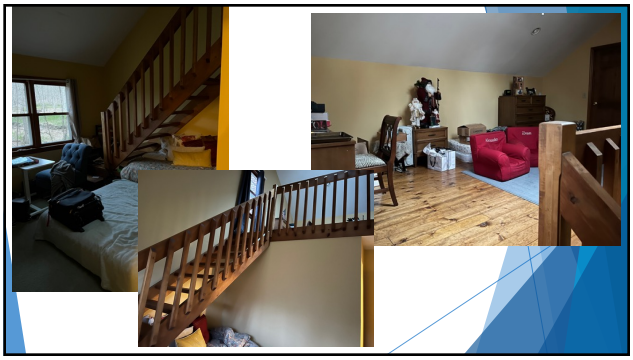

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What floor are they stretching to?

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MY BABY IS TRAPPED ON THE 2ND FLOOR!!!
- Where are we searching?

STRETCH A LINE TO THE 1ST FLOOR!
- Where's the line going?

- Which floor is which?
- What floor will civilians refer to as the 1st floor?
- What will they refer to the lower floor as?

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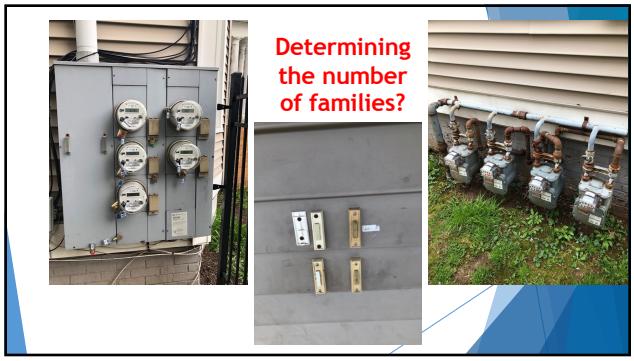

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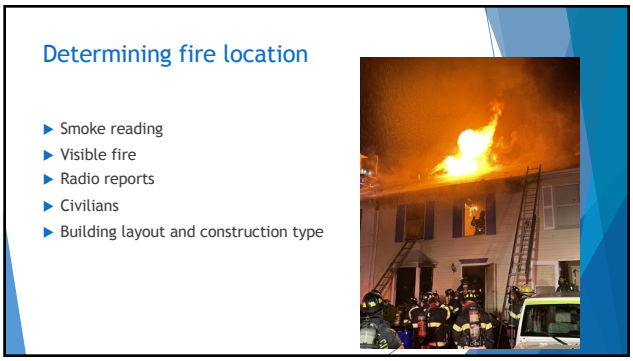

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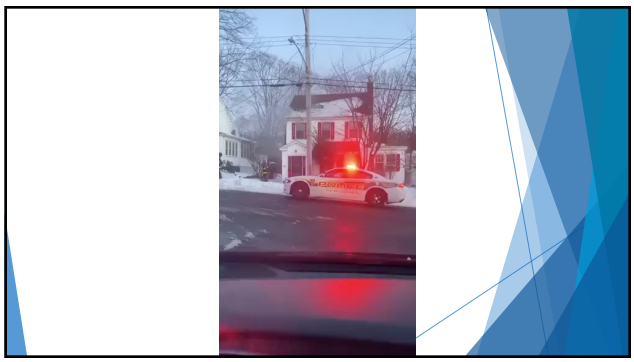

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FULLY INVOLVED!!!

- What is a fully involved structure?
- We all know someone who has given the fully involved size up for a non-fully involved building
- Paint an accurate picture

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Sandy Hook CT

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Redding CT

Kinnelon NJ

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Springdale CT November 2023

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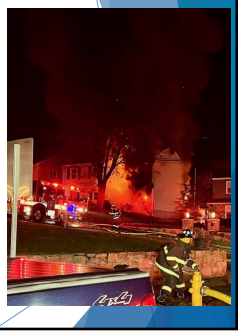
Springdale CT November 2023



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Concerns

- Fully Involved
  - Defensive Op's
  - Water Supply
  - Ladder Trucks
  - Master streams
  - Exposure protection
- Not fully involved
  - Search
  - Offensive fire attack
  - Stretching handlines
  - Ventilation
  - Water supply
  - A multitude of others…

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FULLY INVOLVED???

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Building Construction Types

- Class 1-Fire Resistive
- Class 2-Non Combustible
- Class 3-Ordinary
- Class 4-Heavy Timber
- Class 5-Wood frame
- Where does Lightweight Truss fall?

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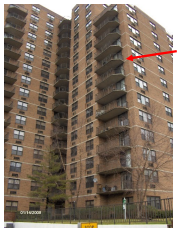
Class I-Fire Resistive



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What are our concerns with this type of construction?

- Life hazard?
- Fire spread?
- Fire load?
- Collapse potential?
- Engine Company specific concerns?

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Class 2-Non Combustible

- Unprotected steel structural components
- May or may not be sprinklered
- Very little resistance to collapse during a significant fire

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What are our concerns with this type of construction?

- Life hazard?
- Fire spread?
- Fire load?
- Collapse potential?
- Engine Company specific concerns?

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Class 3-Ordinary

- Constructed of masonry and wood
- Older buildings found on Main St USA
- Will withstand heavy fire for about 20 minutes
- Renovations may contain lightweight components

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What are our concerns with this type of construction?

- Life hazard?
- Fire spread?
- Fire load?
- Collapse potential?
- Engine Company specific concerns?

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Class 4-Heavy Timber

- Similar to Ordinary but with larger structural members
- No void spaces
- Many used to be for manufacturing and industrial uses, now converted to apartment buildings

66

What are our concerns with this type of construction?

- Life hazard?
- Fire spread?
- Fire load?
- Collapse potential?
- Engine Company specific concerns?

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Class 5-Wood Frame

- Found in most houses
- Most common type of construction
- Can be platform or balloon frame
- Can be stick built or lightweight
- Knee walls in finished "1/2" story

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What are our concerns with this type of construction?

- Life hazard?
- Fire spread?
- Fire load?
- Collapse potential?
- Engine Company specific concerns?

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Balloon Frame

- One of the biggest hazards in Type 5 construction
- Studs run from basement to attic with no fire stops
- Fire will also spread laterally across floors

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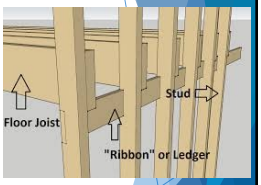

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Truss Construction

- Lightweight structural components that can fail in minutes during heavy fire
- Can be found in any occupancy type
- May be constructed of wood or steel
- Newer buildings have sprinklered voids, older do not

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Bowstring Truss

•Beware of the arch
•The most deadly of all trusses
•Found in large open areas (bowling alleys, malls, supermarkets)
•Huge potential for catastrophic failure

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Resistance to Collapse

- Buildings that show the greatest resistance to collapse:
  - Class 1-Fire Resistant
  - Class 4-Heavy Timber
  - Class 3-Ordinary
  - Class 5-Wood frame
  - Class 2-Noncombustible
  - Any building with TRUSSES is the most likely to collapse!

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HOW FIRE FIGHTING CAN INCREASE RISK OF BUILDING COLLAPSE

- Improper vertical ventilation
- Extra weight added by water
  - One 1 ¾" handline with a 15/16" tip will flow 185 gpm. Water weighs 8.33 lbs per gallon. At this rate we are adding 1535.5 lbs per min. to the building

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Improper vertical ventilation

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Improper vertical ventilation

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Improper vertical ventilation

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Improper vertical ventilation

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Light smoke to this in 3 minutes...

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Transitional attack

- Tell me your feelings on it
- When is it right and when is it wrong
- Needs based assessment
  - Manpower
  - Apparatus
  - Water
  - Rescue needs
  - Fire conditions

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Time and place

- If resources are adequate and the fire is still able to be attacked offensively performing a transitional attack:
  - Puts incident stabilization above life safety
  - Leaves victims in an untenable atmosphere for longer
    - We must treat all buildings as if they're occupied
- Ask yourself if it was your mother in that fire would you want the fire department standing outside spraying water through a window

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- Entering fire area with improper flow

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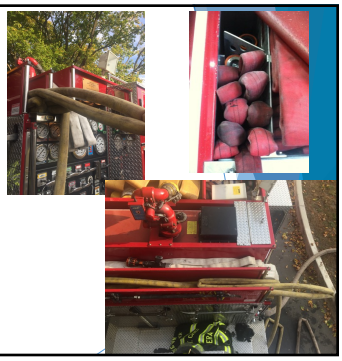
Clearing the Hose Bed

- The hose stretch begins at the engine
- Any hose left in the bed will create problems
- Kinks created in the hose bed are difficult to remove, waste time and can cut off/reduce water supply to the nozzle
- It takes mere seconds to make sure the hose bed is clear
- A good pump operator will assure the hose bed is clear prior to charging lines. This is part of his job!
- The hose team should remove the load in a coordinated fashion



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Improper Carrying and Deployment

- Properly carrying hose bundles will allow for quick, efficient deployment of attack hose
- The way we pack our hose can help/hinder the stretch
- The nozzleman is responsible for the first 50' of hose
  - AKA travel length
  - In limited manpower situations the nozzleman may be responsible for a lot more hose

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Hoseline deployment

- The nozzle and the first coupling should be laid side by side at the point of entry
  - This gives us 50' of travel in a compact area
- The nozzle should be bled and stream checked prior to entry
  - Remove air in line
  - Check pattern/reach
    - Right to fight/left to vent
    - 1-2 feet of reach per PSI of nozzle pressure…50 psi nozzle pressure=50-100 feet of reach
    - This is also the time the pump operator should check his PDP, flow and remove nearby kinks

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Hoseline deployment

- Correct problems before entry
- As hose is advanced into the building it should be staged
- Hose should be pulled into a room adjacent to the path of travel and stacked/staged there for easier advancement
- The backup and control person must hustle to ensure a quick advancement
- SET YOURSELF UP FOR SUCCESS WHEN FLAKING LINE!

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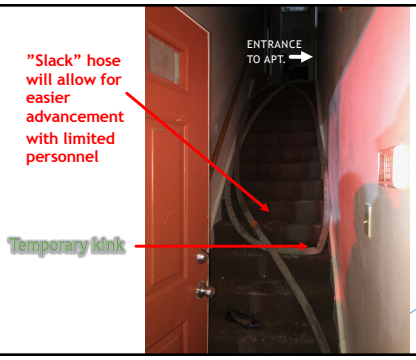

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Advancing line through wrong entrance

- Initial attack line should enter through front door
  - Protect stairs and primary means of egress
    - Many victims located in the paths of egress
    - Direct route to main artery of the house
    - Provide protection for members searching above
- Proceed quickly to seat of fire
- May call for additional resources as needed

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Advancing line through wrong entrance

- Backup line should enter thru same door or an entrance that can easily access the floor above
  - Same size line as initial line
  - Can supplement first line if needed
  - May proceed to floor above
  - May hold stairs
- Additional lines should find alternate entrance
- No more than 2 lines through the same door
- Consider alternate means of entry

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1st line goes…

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You arrive on scene and have heavy fire showing from the 2nd floor.

Which door leads to the second floor?

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Garage Fires

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Garage Fires

- Fires in attached garages level with 1st floor **OPTION #1**
  - Initial handline should proceed to front door of house and make its way to the door separating garage and house
  - If door is found open, close it
  - If door is compromised play line into garage
  - Second line can attack fire
    - Consider 2 ½'" for direct fire attack
  - Third line may either back up the first or proceed to floor above

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Garage Fires

- Fires in attached garages level with 1st floor **OPTION #2**
  - Initial handline should proceed to front door of house and stand by
  - Officer or other member heads inside and finds door leading to garage
  - If door is compromised or open and fire is impinging into house the initial line is brought to that location
  - If door is holding the line can be played into garage and a 2nd line stretched into house

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Garage Fires

- Fires in attached garages level with basement
  - First line thru front door and find basement stairs
  - Investigate fire conditions in basement
  - If fire is in basement hold the stairs/attack fire if possible
  - Second line (2 ½") direct attack on fire
  - Third line to first floor/check for extension

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Basement Fires

- Basement fires
  - First line through front door and find stairs to basement
  - This line should be used to protect the stairwell from extension into house. Only descend if safe and no other entrance available
  - 2nd line entry can be made through Bilco doors
  - If no Bilco check for basement windows
  - Last resort is using a cellar (Bresnan distributor) nozzle
  - Must check stairs for integrity
  - DO NOT hang out on the stairs
    - Collapse
    - High heat
    - Changing fire conditions

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Unfamiliarity with Hose Loads

- Know what hose loads your company uses
  - Three most common-flat, minuteman, triple layer
  - Others are gaining popularity-Cleveland, reverse horseshoe
- How much hose is carried?
- Is it live or dead?
- Know how to deploy them
- Know how to repack them
- Practice til you can't get it wrong

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Anatomy of a Minuteman Load

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Key points to deploying

- Pull hose load straight out
- Pull out hose until leading edge is between waist and knee
- Squeeze hose load to prevent it from coning undone

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Pull hose load straight out

Do not pull to the side, this adds friction and will slow down the stretch

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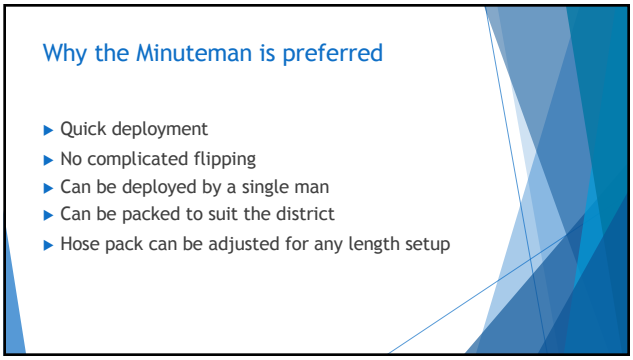

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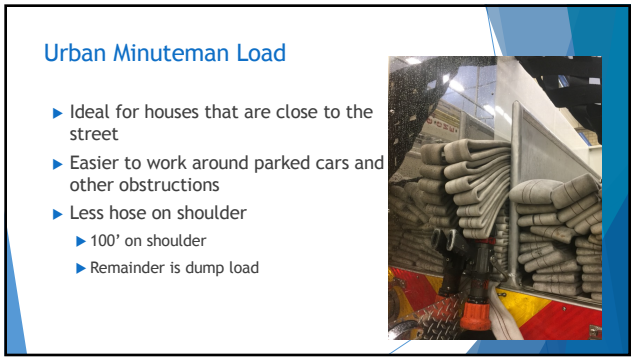

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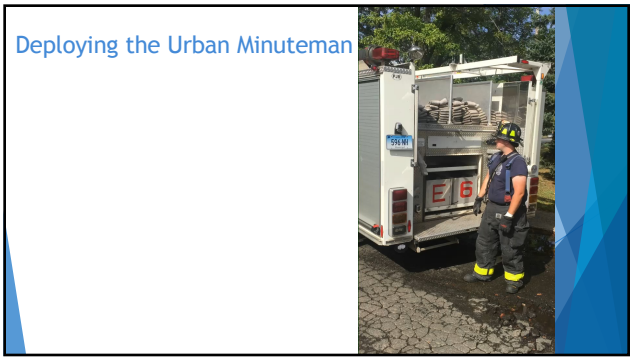

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Suburban Minuteman Load

- Ideal for longer stretches to the front door
- Good for wide open areas with little obstructions
- More hose on the shoulder
  - 150' on shoulder
  - Remainder is dump load

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Single Man Minuteman Load

- Displays the versatility of the Minuteman load versus other hose packs
  - Hose can be packed so it can be deployed by a single FF
  - No need for a 2nd FF to clear the dump load
  - Will be a slower process then a 2 man stretch

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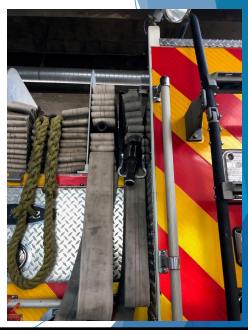
High Hosebeds



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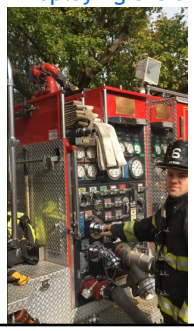
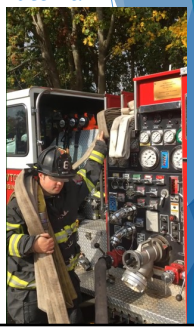
Deploying the Single man Minuteman





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Flat load

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Deploying the flat load

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Most Common Engine Company Mistakes

- Failing to properly size up a building
- Not clearing the bed
- Improper carrying and deployment
- Advancing line through wrong entrance
- Not being familiar with your company's hose load
- **Improperly packed hose load**
- Stretching too short
- Failure to chock doors
- Entering an IDLH atmosphere with an uncharged hose line
- Not bringing enough hose to the fire floor
- Undersized hoseline
- Improper nozzle techniques
- Entering fire area with improper flow

132

Improperly Packed Hose

- A seemingly minor oversight can be catastrophic on the fireground
- All shifts/members should pack hose in the same manner every time
  - One way of operating so there are no surprises
- Packs pretty---Pulls pretty

133

Most Common Engine Company Mistakes

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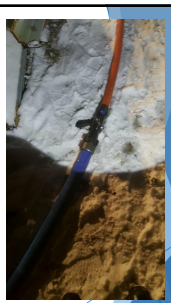
134

Stretching too Short

- Estimating Hose stretches
  - Distance from the building
  - 50' per floor
    - Good for residential building up to around 2500 sq ft
    - Good for many apartment buildings
    - Not so good for mansions, commercial, horizontal hi-rise



Adding an 1 ¾" line to a 2 ½" line at a fire in Prospect, CT December 2017

135

Stretching Short

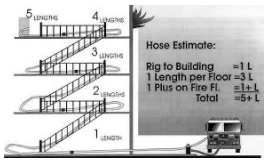
- 50' for fire apartment
- Using floor below for layout
- Stairwells
- Rope stretches
- Residential vs. Commercial

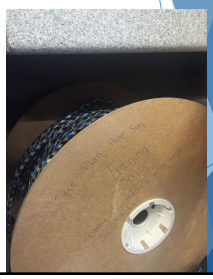
Simple Fire Hose Calculator (direct route)

Distances to consider	Feet of Hose needed	EXAMPLE: Fire on the 3rd floor	EXAMPLE: Fire on the 5th floor
Rig to building	50'	50'	50'
Traversing the stairs using traditional path	Add 50' between each floor (# of floors minus one)	50' + 50'	50' + 50' + 50' + 50'
Travel length on fire floor	50'	50'	50'
Total		200'	300'

136

Estimating the Stretch





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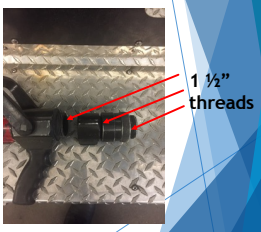
138

Stretching too short

- How do we extend the line?
  - From the nozzle end or the pump end?
    - What equipment do we need for each situation
    - Area of refuge
    - Keep the fire in check...water can and closing doors
    - What equipment is needed?
      - Hose
      - Nozzle
      - Reducer
  - Using a smooth bore or break apart nozzle
  - Tying off the bail



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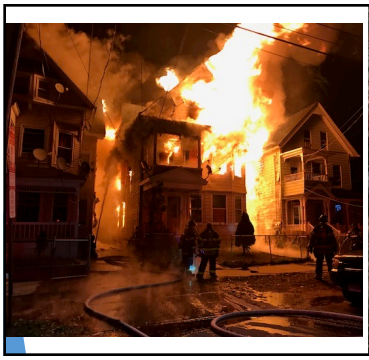
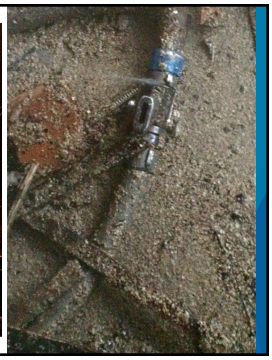




140

Adding a length of hose

141

142

Stretching too Long

- Almost as bad as coming up short
- Kinks will kill the flow
- Hoselines need to be properly flaked out prior to entering the fire area and/or being charged

143

Alternate Hose Stretches

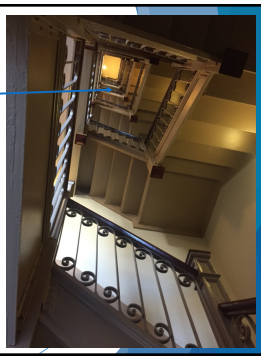
- Well stretch
- Rope stretch
- Fire Escape/Exterior Building stretch
  - Not typically for primary or backup line
- Stretch through rear door
  - Not typically for primary or backup line
- Using aerial ladder/tower as standpipe
  - Benefits vs Drawbacks
- Lines over ladders
- Hook stretches

144

Fire Escape Hazards

145

Well stretch



146

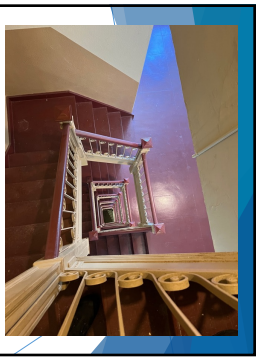
Well stretch

- Hand estimation method
- More efficient use of hose
  - 1 length makes approx. 5 floors
- May supplement traditional stretch
- Less chance of couplings getting hung up on stairs
- Hose is pulled to fire floor if door is controlled, floor below if it is not
- Ensure enough hose is on fire floor before charging

147

Well Stretch Options

- Options for stretch
  - Carry nozzle only up
    - Essential if 2nd line
  - Carry lead length on shoulder
  - Drop hose down well
    - May get hung up
  - Drop rope down well
    - May not reach bottom floor in tall building



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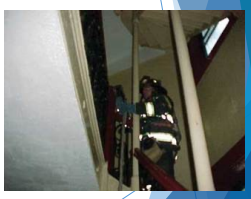
Nozzle Only Carry

- Necessary for wells with structural columns
  - Hose will have to be passed around supports
- Lead length will have to be pulled up on fire floor
- Care must be taken to not pile hose on top of nozzle which could create a knot



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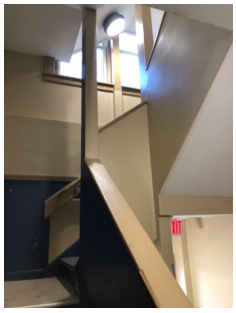
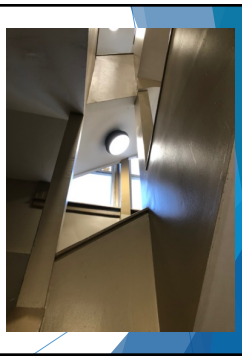




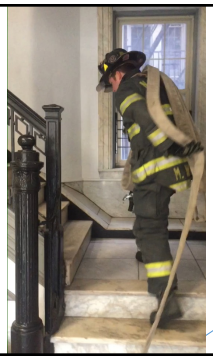
150

Lead length carry

- Member will carry first 50' of hose with nozzle attached
- Quicker deployment once on fire floor
- Carry hose on shoulder opposite well

- Will not be able to easily pass hose around supports

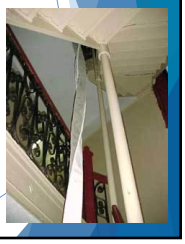
151



152

Second line in well

- Care must be taken to not wrap lines during stretch "Barber pole effect"
- Must carry nozzle only
- 2nd line must be manipulated around 1st line at every turn to prevent wrapping
- A wrapped line will quickly tighten and halt the stretch



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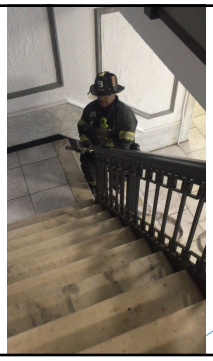


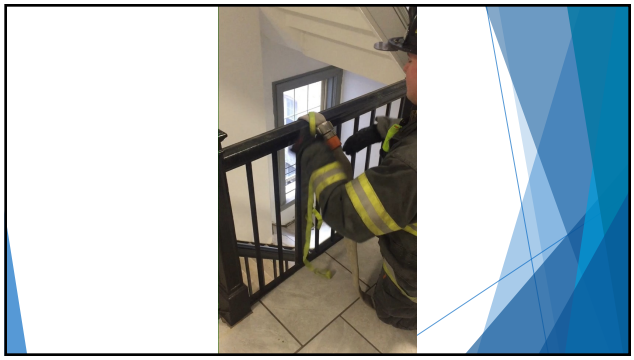
154

155

Securing the line

- The line(s) must be secured at their highest point
- If not they could pull back over the railing
- Do not run hose through railings, place over banister
- On tall stretches line may need to be secured at intermediate floors

156



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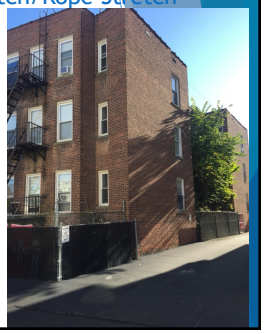
Fire Escape/Exterior Building Stretch/Rope Stretch



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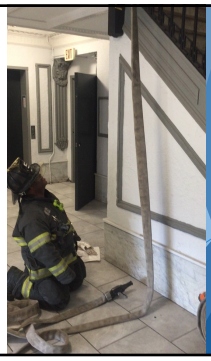
Rope Stretch



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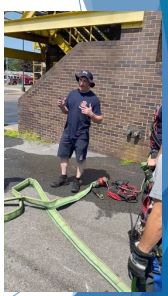
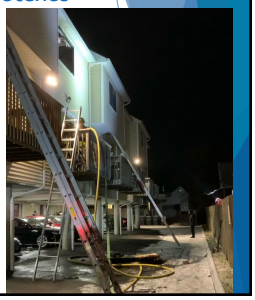
Exterior Building Stretch
aka Making Your Own Standpipe



161

Lines over Ladders and Hook stretches

- Great option to quickly raise a line above grade
- Must be practiced to become proficient
- Can be completed dry or charged depending on situation
- Coordination between truck and engine guys



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163

Most Common Engine Company Mistakes

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- Not clearing the bed
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- Advancing line through wrong entrance
- Not being familiar with your company's hose load
- Improperly packed hose load
- Stretching too short

- **Failure to chock doors**
  - Entering an IDLH atmosphere with an uncharged hose line
  - Not bringing enough hose to the fire floor
  - Undersized hoseline
  - Improper nozzle techniques
  - Entering fire area with improper flow

164

Failure to Chock Doors

- Every swinging door that we stretch through should be chocked or secured
  - Door to fire area may remain partially closed until ready for fire attack
  - Force door and prevent from re-locking
- An uncharged line that becomes wedged under a door and then charged can lead to disaster
  - How to overcome this obstacle

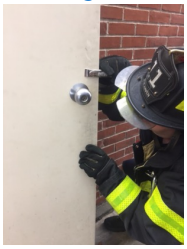
165

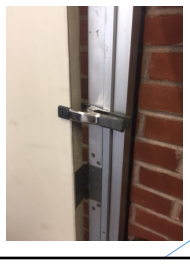
Chocking doors

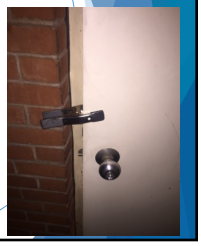
- How can we secure the door
  - Wooden chocks
  - Clamps
  - Hinge hangers
  - Commercially made vs. home made
- Where do we place chocks

166

Placing door clamps







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Chock Those Doors

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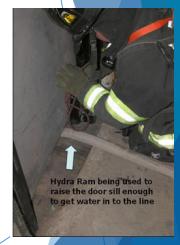
Fixing the Problem



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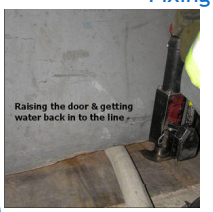
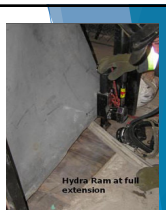
Fixing the Problem





172

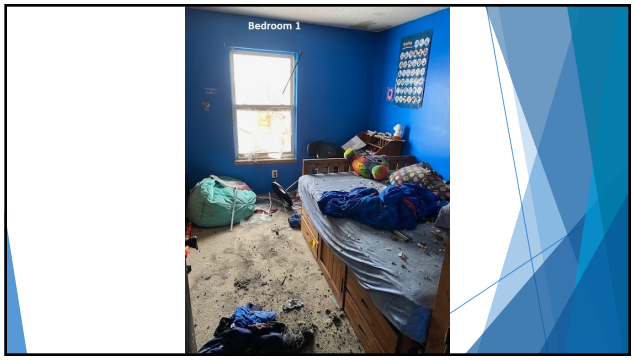
Door Control

- Use the door to your advantage
- Hollow core doors can hold back a tremendous amount of heat, smoke and fire
- If we are waiting for water…CLOSE THE DOOR!

173

174

175



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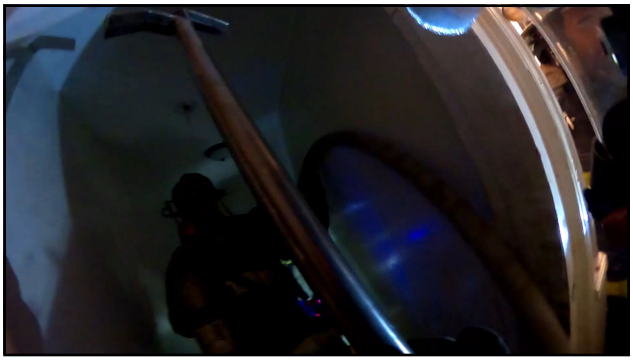

179

180

181

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183

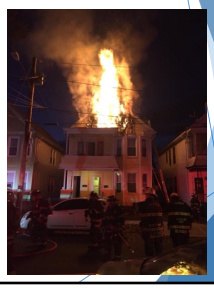
Where do we charge the Line

- Why would we stretch dry?
- 1st floor fires?
- 2nd floor fires?
- Basement fires?
- Hi-rise?

- **When do we mask up?**
- Before or after forcible entry?
- 1st floor fires
- 2nd floor fires
- Basement Fires
- Mental measurement
  - Take one last look under the smoke and at the size of the house to determine approx. travel distance to fire and room layout

184

Where would you charge the line?



185

Where would you charge the line?

186

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187

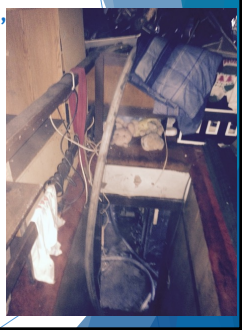
Not bringing enough hose to the fire floor

- If we charge the line too soon or fail to bring enough hose to the fire floor, advancing will be difficult
  - Slow our attack
  - Allow fire to grow
  - Requires more manpower
- The importance of the 'Control Man'
  - FF on every corner
  - FF at every friction point
  - If not enough manpower, everyone has to hustle

188

If we come up 'just a little short'

- Hose can be thrown up over handrails initially
- This allows hose to be used to advance towards the fire instead of being used to go around stairs
- Once attack is initiated the line should be moved onto the stairs to facilitate a rapid exit if needed
  - This will be accomplished by bringing in more hose from the outside or lower floor

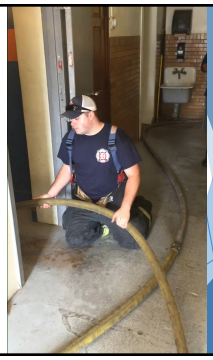


189

Control man

Who plays this role???

- Constantly on the move
- Either at the top or bottom of stairs
- Will make or break the stretch



190

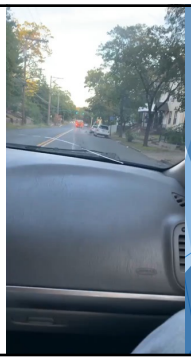
Kinks kill

- Kinks in the hoseline reduce flow anywhere from 17 to 59 percent
- Kinks can be easily removed using several methods
  - Manually remove kinks
  - Pop the nozzle
  - Charge line to a higher pressure initially and then back it down
- Be cognizant around bends over railings
- Some newer hose reduces tendency to kink

191

Everybody wants this new, kink-free hose. The problem is, it's very expensive.

How can we force the city to buy us new hose???



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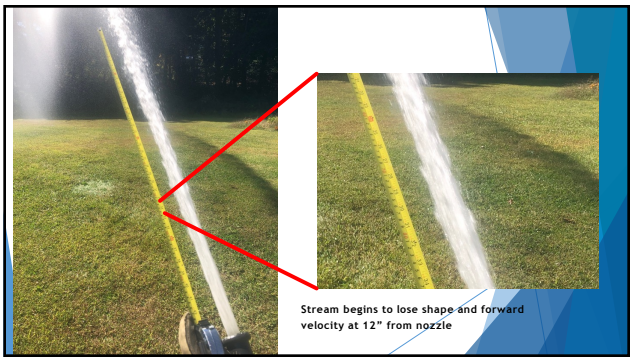

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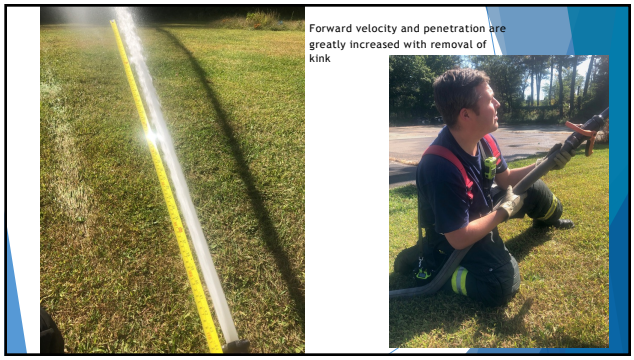
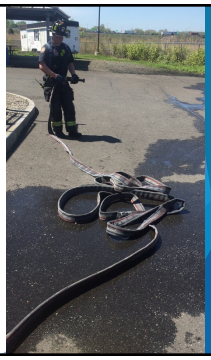


196

Advances in Hose Technology



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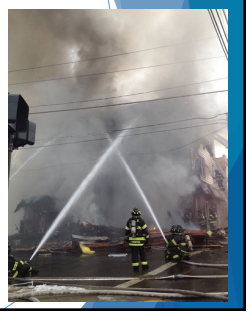
199

Undersized Hose Line

- Will not allow for advancement due to lack of GPM
- 1 ¾" is for compartmentalized fires
- More GPM are needed now more than ever
  - Modern furnishings produce greater BTU's
- 2 ½" line minimum for commercial
  - Newer equipment for departments lacking manpower
- Adequate manpower to move lines
- Key to hose line movement is utilizing your manpower
  - Spread everyone out
  - FF at every corner if possible



200

DALLAS System

- Acronym for when to choose a 2 ½"
- Used by FDNY

- D-Defensive position
- A-Advanced fire on arrival
- L-Large fire in uncompartmentalized area
- L-Large Volume of water needed
- A-Area or size cannot be determined
- S-Standpipe Op's

201

DALLAS

- Defensive position
- Go with the 2 ½" when operations will be defensive
- 2 ½" provides the needed GPM and reach to penetrate into the building
- Use the 2 ½" to protect exposures
- Can be stretched and operated by a single FF
- Pressure loop
- Other techniques

202

dALLAS

- Advanced fire on arrival
- Fire has engulfed the majority of the structure
- May be used prior to going interior with a 1 ¾"
- Can be for both residential and commercial

203

daLLas

- Large fire in uncompartmentalized area
  - Typically found in commercial buildings
  - Fire has the ability to grow quickly due to lack of compartments
  - Need the reach of the 2 ½"
  - Found in big box stores, supermarkets, etc
  - Consider early collapse due to construction type (Class 2)

204

dalLas

- Large volume of water needed
- GPM vs. BTU's
- May require master streams (flows greater than 350gpm)
- May require multiple 2 ½'s
- 2 ½'s on every commercial building fire regardless of what is showing from the exterior

205

DALLAS

- Area or size cannot be determined
- Generally occurs in large commercial buildings
- Don't rely on smoke condition alone to estimate the size of the fire
- Smoke can be filtered as it travels long distances
- 2 ½" lines provide for greater reach and penetration

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211

DALLAS

- Standpipe Op's
- Standpipes are designed to be used with 2 ½" hose
- Never use a high psi nozzle on a standpipe
- Consider using in line pressure gauges on standpipe outlets
- Older standpipes (pre-1993) require 65psi at highest outlet
  - This is based on using 150' of 2 ½" hose with SB nozzle flowing 250gpm
  - Any other setup will greatly reduce GPM
  - Example: 150' of 1 ¾" equals 60psi FL plus 50 psi NP equals 110psi (~160-185gpm). This doesn't come close if we are only getting 65psi from the standpipe

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- Failure to chock doors
- Entering an IDLH atmosphere with an uncharged hose line
- Not bringing enough hose to the fire floor
- Undersized hoseline
- **Improper nozzle techniques**
- Entering fire area with improper flow

213

Improper Nozzle Technique

- Nozzle should be operated in a wide circular sweeping motion
- Stream should be solid or straight
  - Right to fight
- Nozzle should be bled of air, pattern and reach checked

214

Improper Nozzle Technique

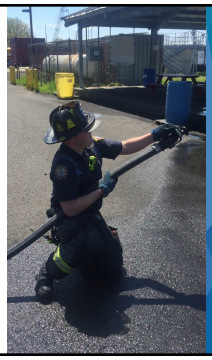
- Nozzle should be kept an arms length ahead of operator
  - Do NOT use pistol grips
  - Hoseline locked under armpit
  - Allows for wide sweeps and operation around corners
  - Eases nozzle reaction
- Flow big water, no penciling

215

216

217

Proper Nozzle Techniques



218

Nozzle reaction

Hose	Nozzle	40 PSI			50 PSI			60 PSI		
		GPM	NR	Reach	GPM	NR	Reach	GPM	NR	Reach
1 ¾"	7/8"	144	48#	51'	161	60#	56'	176	72#	61'
2 ½"	1 1/8"	238	79#	61'	[illegible]	[illegible]	66'	291	119#	71'
		GPM	RF	Reach	GPM	RF	Reach	GPM	RF	Reach
1 ¾"	15/16"	165	55#	54'	185	69#	59'	202	83#	64'
2 ½"	*1 3/16"*	265	89#	64'	296	111#	69'	325	133#	74'

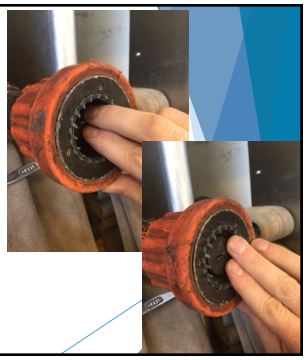
Table #5 The rule of 1/8ths and 1/16ths is a simple two nozzle system for fire service handlines

- A single FF should be able to handle up to 70lbs of NR safely
- A two person team can handle up to 100lbs of NR safely

219

Checking the pattern

- Right to fight, left to vent
- Always want to enter the fire area on straight stream
- Fog streams will expand up to 1700 times when converted to steam and may cause thermal inversion leading to injuries
- Discharge outlet of nozzle can be felt with a gloved hand in no visibility to check pattern



220

Advancing while Flowing

- Technique must be practiced often
- Must be a coordinated effort

221

Most Common Engine Company Mistakes

- Failing to properly size up a building
- Not clearing the bed
- Improper carrying and deployment
- Advancing line through wrong entrance
- Not being familiar with your company's hose load
- Improperly packed hose load
- Stretching too short
- Failure to chock doors
- Entering an IDLH atmosphere with an uncharged hose line
- Not bringing enough hose to the fire floor
- Undersized hoseline
- Improper nozzle techniques
- **Entering fire area with improper flow**

222

Assuring proper GPM

- Know your proper PDP
  - PDP is determined by knowing your nozzle pressure requirement, hose size and length and any losses in the pump plumbing
  - Match correct tip size to hose diameter
- Test each preconnected hose line with pressure gauge and flow meter
  - Inline pressure gauge-placed at nozzle
  - Pitot gauge-prone to user error
  - Flow meters-can be placed anywhere in line---subject to >10% error
- Under and over pumping lines
  - Time and a place for these options
  - Under pumping will lower GPM's and make nozzle easier to handle but cause it to kink
  - Overpumping will increase GPM but make the nozzle more difficult to handle

223

4 types of nozzles

225

Automatic vs. Constant/Fixed Gallonage

226

Smooth bore vs. Automatic

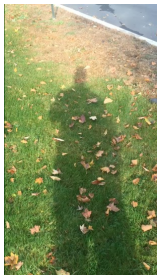
- Smooth bore nozzle stream gives an accurate representation of GPM
  - Low GPM=Early stream break-over or broken stream
- Automatic nozzle stream may look good but lack GPM
  - Stream looks great even when pumped at wrong pressure
- Remember PSI directly affects your GPM
  - 30 x sq. root NP x diameter of nozzle=GPM

227

Automatic nozzles explained

228

Automatic Nozzles



Proper pump pressure

Under pressurized

229

Barrel length affects stream quality

230

Shut-Offs

- Solid Ball
  - Traditional shut off
  - Least amount of turbulence to stream
  - Harder to open/close
  - Ideal for Smooth bore Nozzles
- Split Ball
  - Newer type design
  - More disruption to stream
  - Easier to open/close
  - Bad for smooth bore, better for fog nozzles

231

Most Common Engine Company Problems

- **Coupling caught on obstructions**
  - Burst hose length
  - Frozen hydrants
  - Blocked hydrants
- Water supply problems
- Difficult access to building
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

232

Couplings Caught on Obstructions

- During your initial stretch size up all obstructions
  - Parked cars
  - Trees
  - Curbs
  - Fences
  - Stairs
  - Snow
- Regardless of assignment this is all of our responsibilities

233

Control Firefighter

- Arguably one of the most important members of the attack team
- May have other assigned duties
- Key in hose advancement
- Prevents kinks and being caught on obstructions

234

235

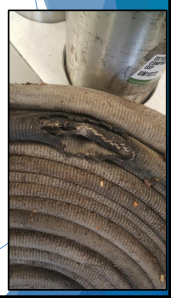
Most Common Engine Company Problems

- Coupling caught on obstructions
- **Burst hose length**
  - Frozen hydrants
  - Blocked hydrants
- Water supply problems
- Difficult access to building
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

236

Burst Hose Length

- Identifying the correct burst line
  - Communications is key!
- How are we replacing the burst length
  - Piecing in a length
  - Stretching a new line



237

Burst hose length

- Move to an area of safe refuge
- Must be communicated to IC
  - Urgent radio traffic
  - Everyone on the fireground must be made aware

238

Urgent radio traffic

- Different than a Mayday
  - Frozen hydrant
  - Blocked hydrant
  - Burst length
  - Water supply problem
  - Structural issue
  - Unusual incident
  - Hoarding conditions

239

Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- **Frozen hydrants**
- Blocked hydrants
- Water supply problems
- Difficult access to building
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

240

Frozen Hydrants

- Hydrant maintenance program
- Shoveling hydrants
- Secondary water source
- Frozen anti-vandal

241

Frozen hydrant operations

- Multiple flares placed at base or inside of hydrant
  - May thaw after several minutes
  - Does not eliminate need for secondary water source
- Immediately locate secondary water source
- Notify all companies via department radio

242

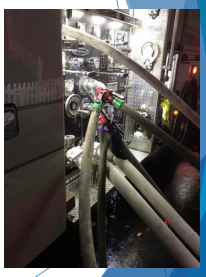
Hydrant Maintenance/Shoveling Program

- Anytime it snows enough to cover hydrants we have to shovel
- Caps should be checked to make sure they aren't frozen
- Before it drops below freezing hydrants should be checked for standing water
  - Drop a string with a weight to bottom
  - If wet the hydrant has to be pumped
  - Small hand/electric pump

243

Secondary water source

- Later arriving companies should stage so they can lay away to secondary hydrants
  - Back down street to the fire building
- If municipal system is questionable, call for tankers
- Consider nursing off first tanker and use others for tanker shuttle

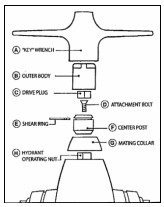


244

Magnetic/Anti-vandal hydrants

245

Anatomy of the magnetic hydrant

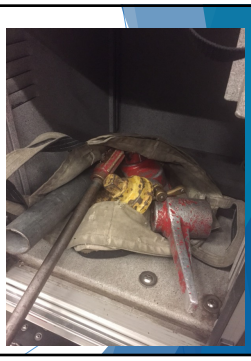


Magnetic top free spins until the magnetic wrench is placed on which lifts the activator lock allowing the operating nut to be turned

246

Frozen Anti-vandal

- The magnets in the anti-vandal component can freeze and render the hydrant OOS
- A sharp blow to the bonnet may free the magnets
- If frozen the hydrant must be taken OOS and thawed before being placed back in service



247

Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- Frozen hydrants
- Blocked hydrants
- Water supply problems
- Difficult access to building
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

248

Blocked hydrants/Hose lines

- Hydrants are often blocked by parked cars
- Narrow streets with street parking may block supply lines




249

Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- Frozen hydrants
- Blocked hydrants

- **Water supply problems**
  - Difficult access to building
  - Using the standpipe system
  - Vacant buildings
  - Clogged Nozzles

250

Water Supply

- Who is supplying additional water beyond our tank?
- How big a tank do we have?
- How long will it last
  - 500 gal=2 ½-3 minutes with a single 1 ¾"
  - 1000 gal=5-7 minutes with a single 1 ¾"
- What is giving us a constant water supply
  - Hydrants
  - Dry hydrants/cisterns
  - Tanker/tender shuttle
- What is our 'Plan B' water supply

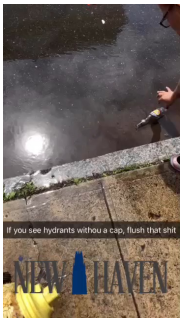


251

Utilizing our hydrants

- Three choices of lays
  - Forward
  - Reverse
  - Direct connection-Hooking up big
- Gating our unused outlets for later use
- Flush and test
- Missing caps


252



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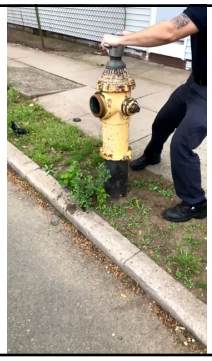
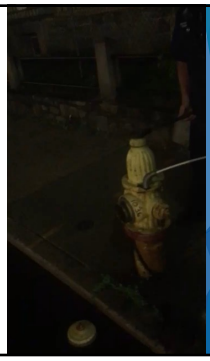

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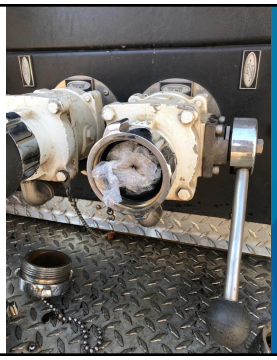


255

Getting the most out of the hydrant

- Use as many connections as possible
- No kinks
- Large diameter hose
- Dedicated engine on hydrant
- Closest hydrant to fire/Largest main

256

The Hydrant Bag

- Hydrant wrench
- Magnetic wrench
- Gate
- Caps
- Cheater bar
- Pipe wrench
- Spanner wrench
- Other adapters

257

Rural Water Supply Problems

- Are there hydrants in your whole town?
- How may tankers/tenders are readily available?
- What is their response times?
- Do you have fill sites?
  - How far from the fire are they
  - Can tankers fill/dump in a circular pattern
- Will you have enough tankers to meet your fire flow?
- Tanker/tender driving safety
  - Approx 22% of fire app. accidents involve tankers
  - More fatalities in tankers/tenders than engine and ladder combined

258

Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- Frozen hydrants
- Blocked hydrants
- Water supply problems
- **Difficult access to building**
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

259

Difficult Access to Building

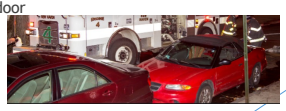
- Parked Cars
- Snow Banks
- Fences/Railings
- Dogs
- Set back buildings
- Boarded up buildings
- Renovations

260

261

Parked Cars

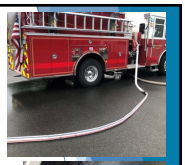
- Beware of lines getting caught under tires
- Consider running lines over hoods and trunks
- If the majority of hose is kept on the shoulder during the stretch to the building we should be able to navigate around vehicles
- Dry lines caught under tires will have the same affect as a dry line under a door

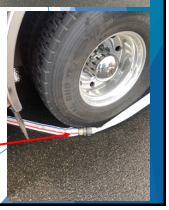


262

Stretching around the rig

- Sometimes a line must be stretched around the rig
- Two biggest hazards:
  - Tailpipe
  - Tires
- Take big turns





AVOID THIS!!!

263

264

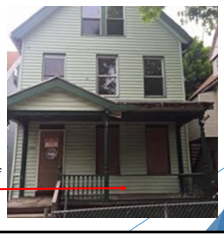
Snow banks

- If possible avoid stretching through deep snow
  - We don't know what's under the snow
  - Slips, trips, falls
  - Snow between gear and our body
- Look for driveways or shoveled walkways

265

Fences/Railings

- Consider taking out fences if they impede the stretch
- Stretch over, not around
  - Less friction points
  - More efficient use of hose



Removed sections of railings

266

Set back buildings

- Must allow access for ladder trucks
- Only one shot at doing it right
- Can add hose, can't stretch the ladder
- Pre-planning makes the job easier

267

268

Hoarding/Cluttered Homes/Pack Rats Collyer's Mansion

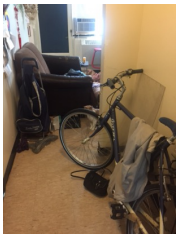
Langley Collyer

269

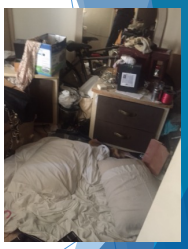
Homer and Langley Collyer (NYC 1947)

270

Hoarding/Cluttered Homes



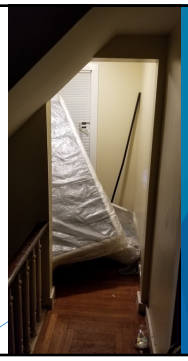
Even seemingly small items can hinder the stretch



271

Hoarding/Cluttered building hazards

- Blocked egress/entry routes
- Entanglement
- Difficult hose advancement
- Hidden fire
- Difficulty in applying water to the fire
- Disorientation



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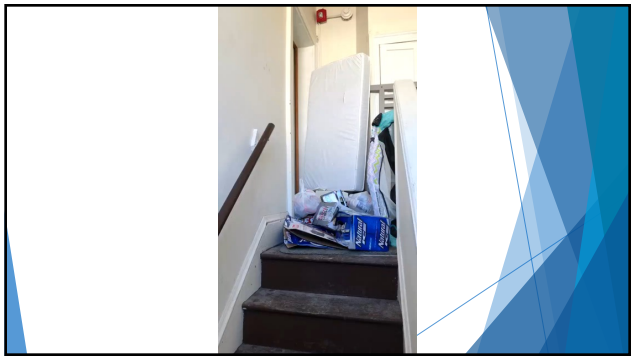


275

Hoarding/Cluttered Homes

- Must maintain hose pack on shoulder
  - Dragged hose will get caught
  - Traversing objects is easier with hose on shoulder
- Expect items EVERYWHERE
  - Bicycles in stairwells
  - Washer/dryer against doors
- Moving furniture
  - DO NOT haphazardly throw furniture/items
  - Can cover up victims not yet discovered
  - Can hinder other companies stretches
  - Can injure/confuse other members

276

277

Burned out stairs

- Alternative entrance
- Place weight to outside of the stairs
- Ground ladder

278

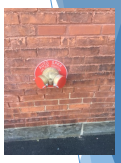
279

Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- Frozen hydrants
- Blocked hydrants
- Water supply problems
- Difficult access to building
- **Using the standpipe system**
- Vacant buildings
- Clogged Nozzles

280

Standpipe Systems

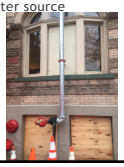


- To use or not to use
- Do we trust the system?
- What do we pump it at?
- Do we have readily deployable hi-rise hose packs
  - What size is the hose and what nozzle are we using?
  - Systems are designed to be used with 2 ½" hose with 1 1/8" tip

281

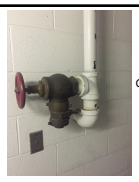
Fire Department Connection (FDC)

- Where is the FDC?
  - Is it for the standpipe, sprinkler or both?
  - Is it usable?
  - Trash/threads/blocked/water source
- Temporary Systems
  - Locations
  - Usability

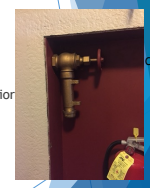


282

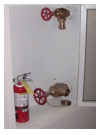
Standpipe Systems



Class 1



Class 2



Class 3

- Class 1
  - 2 ½" connections to be used by FD
- Class 2
  - 1 ½" connections and hose to be used by trained personnel prior to FD arrival
- Class 3
  - Both 1 ½" and 2 ½" connections

283

Supplying Standpipe Systems

- Must have an independent water source
  - No yard hydrants
- Connecting to sprinkler or standpipe FDC first?
- Pump pressure
  - Many depts. start at 150psi plus 5psi per floor

284

WHATS YOUR GAME PLAN???

285

WHATS YOUR GAME PLAN???

286

287

Speedswivel

288

289

Supplying Standpipe Systems

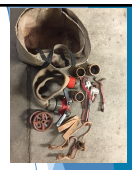
- Alternate plan if FDC is broken/frozen/missing
  - Add double male/female
  - Turn hose 5-7 to the left and thread on
  - Rope stretch
  - Lowering hose from a window
  - Hooking up to standpipe outlet on 1st floor
    - What steps to introduce water into system?

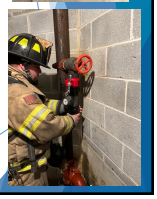
290

291

Hooking up to the Standpipe outlet

- Follow department SOG/SOP regarding elevator use
  - Many departments require using stairs below ~7th floor
- Size up the floor below for apartment location
  - If fire is reported in 15D, find where 14D is to help estimate stretch
  - Check two floors below for apartment/stairs layout if scissor stairs are found
- Connect one floor below fire floor

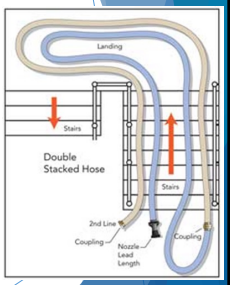




292

Standpipe Op's

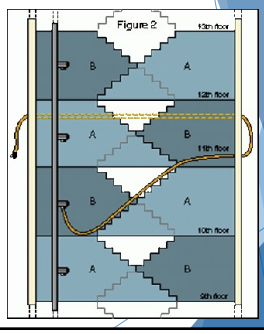
- Flake extra hose up stairs so it may be pulled down during advance
- Check hallway for smoke condition which may indicate whether door to fire apartment was left open
- Force an adjacent apartment for area of refuge



293

Scissor Stairs

- Each stairwell will exit on opposite side of the building for each floor
  - Every other floor exits in the same area
- Standpipe connections are located on every other floor in each stairwell
- Hose management is vital
- FF's must check floor layout two floors below fire floor
- **Know your building with Scissor Stairs!**



294

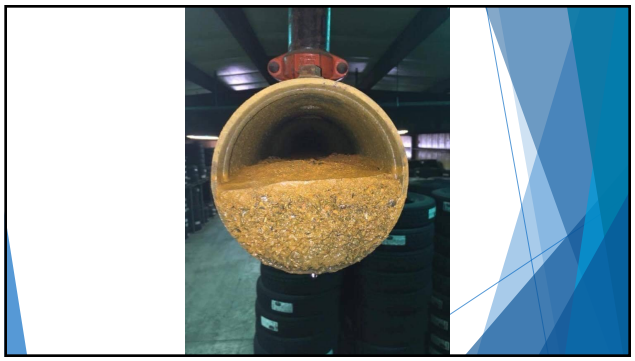
Operations at Standpipe Hookup

- Make sure hose is flaked out properly
- Do not charge until nozzle person is ready
- **Use of an inline pressure gauge is advisable so we know exactly what we are flowing**
  - **Would you pump off the engine without a gauge???**
  - **Partially closed valves, PRV's, PRD's, etc**
- Know your friction loss and nozzle pressure
- Take elevation loss into account

295

So why do we need an inline pressure gauge???

296



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298

Water Supply Problems

The normal attack hoselines used by the Philadelphia Fire Department incorporate 1-3/4-inch hoselines with automatic fog nozzles designed to provide variable gallonage at 100 psi nozzle pressure. The pressure reducing valves in the standpipe outlets provided less than 60 psi discharge pressure, which was insufficient to develop effective fire streams. The pressure reducing values (PRVs) were field adjustable using a special tool. However, not until several hours into the fire did a technician

10 U.S. Fire Administration/Technical Report Series

knowledgeable in the adjustment technique arrive at the fire scene and adjust the pressure on several of the PRVs in the stairways.

When the PRVs were originally installed, the pressure settings were improperly adjusted. Index values marked on the valves did not correspond directly to discharge pressures. To perform adjustments the factory and field personnel had to refer to tables in printed installation instructions to determine the proper setting for each floor level.[4] For more detailed information about PRVs see Appendices D and E.

Several fire department pumpers were connected to the fire department connections to the standpipe system in an attempt to increase the water pressure. The improperly set PRVs effectively prevented the increased pressure in the standpipes from being discharged through the valves. The limited water supply prevented significant progress in fighting the fire and limited interior forces to operating from defensive positions in the stairwells. During the next hour the fire spread to the 23rd and 24th floors primarily through autoexposure, while firefighters were unable to make entry onto these floors due to deteriorating heat and smoke conditions and the lack of water pressure in their hose-

299

Standpipe Operations Field Test

- 5 story vacant office building
- Domestic water supply to standpipe system, no fire pump
- One 100' 5" Supply line
- Hydrant Supply of 115psi intake pressure
- Two 50' 3" lines supplying FDC
- Connected to standpipe on 5th floor
  - 20psi elevation loss
- 150' of 2.5" attack hose with 1 1/8" tip
  - 266 GPM

300

Standpipe Operations Field Test

- Static engine discharge pressure of 150psi
- Static pressure at standpipe outlet 130psi

301

Standpipe Operations Field Test

- With standpipe discharge was fully opened along with nozzle fully opened
  - Engine discharge pressure 125psi
  - Pressure at standpipe 95psi
  - Nozzle pressure 75psi
  - Nozzle flow 325gpm
- Nozzle was unmanageable with 1 person and difficult to manage with 2

302

303

Standpipe Operations Field Test

- With standpipe gated down
  - Engine discharge pressure to 130psi
  - Standpipe discharge pressure 70psi
  - Nozzle pressure 50psi
  - Nozzle flow 266gpm
- Manageable with 1 FF, easier with 2

304

305

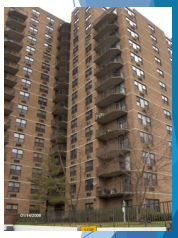
Static vs. Flow

- Static pressures are always higher than flow pressures
- Sometimes the adjustments on our gates are significant
- Without an inline pressure gauge we are guessing at what our flows are
- Guessing at what a proper static pressure is without flowing may lead to an unmanageable line
- Get out and practice these flows before the fire

306

Advancing down the hallway

- Check your stream and bleed the line prior to entering hallway
  - If you choose to stretch dry, have good water before entering fire apt
- A heavy smoke condition in the public hall indicates the fire apartment door was left open
  - Line must be charged prior to entering hallway
- Controlling the door quickly will help the push
- Two companies should be teamed up to assist with line advancement
- Consider forcing entry to an adjacent apartment for an 'area of refuge'



308

How do we pack our Hi-rise pack

309

Deployment of the Standpipe Bundle

- Male and Female are side by side
- Directly under M/F is the center point
- Can be connected together in good visibility on floor below
- Easy deployment in poor visibility
- Easy to pack

310

311

312

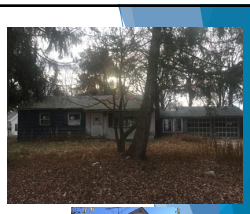
Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- Frozen hydrants
- Blocked hydrants
- Water supply problems
- Difficult access to building
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

313

Vacant Buildings

- How did the fire start if there is no power or operating equipment
- Do we make an offensive attack?
- Exposure protection
- Are we searching in front of the attack line/above the fire?
- Structural hazards
- Booby traps
- Accelerants



314

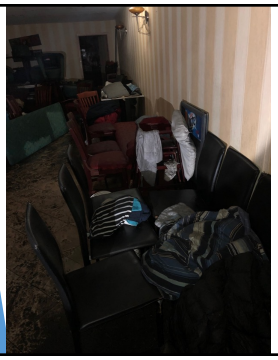
Vacant Building Operations

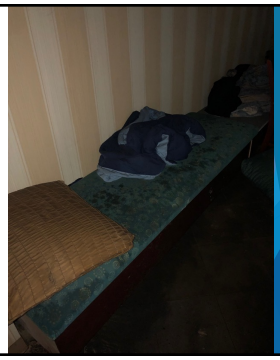
- Go or no go…
  - Should be based on structural integrity, fire conditions and manpower
- A civilian was removed, unburned from the fire floor of the building pictured below in Kentland MD

315

Vacant building signage

316





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Unexpected Victims

9/13/2019 200 Goffe St New Haven CT
Dispatch audio

318

Unexpected Victims

9/13/2019 200 Goffe St New Haven CT
Arrival audio
Engine 6 on scene 2:06 after dispatch

319

Unexpected Victims

9/13/2019 200 Goffe St New Haven CT
Dispatch advises that all occupants are out of the house 1:08 after arrival of 1st due engine

320

Unexpected Victims

9/13/2019 200 Goffe St New Haven CT
1st due engine locates victim 1:22 after notified that 'all occupants were out'

321

Vacant building Operations

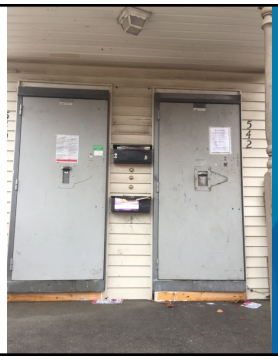
- No building is vacant until WE say so
- Only an aggressive search and fire attack strategy will save lives
- Never write off a building based on whether it appears vacant from the exterior
- One fire service website lists 65 fires in vacant buildings yielded rescues in just the first 8 months of 2016

322

Boarded up buildings

- Some are boarded up better than others
- Carry a light chainsaw for entry thru plywood
- Be familiar with vacants in your area
- Some are secured with plywood, others with commercial means
- Searches still need to be completed
- Delayed report of fire can lead to advanced fire conditions
- Slowed entry will allow fire to grow

323



324

Renovations

- Most buildings have been renovated at one time or another
- Renovations may lead to confusion due to unique construction features
  - Stairways that lead to dead ends
  - Truss construction in older buildings
  - Poor construction quality

325

Renovations

- Lack of fire stops
  - Rapid fire spread
- Lack of fire detection and suppression
  - Delayed reporting
- Dangerous conditions due to construction not being completed

Front porch collapsed with no direct exposure to flames

326

Doors to nowhere

No landings

327

Exposure Protection

- The best protection is extinguishing the main body of fire
- When is this not possible?
  - Too large a body of fire
  - Limited water supply
  - Lack of manpower
  - Wind driven fire
- Minimum size line should be 2 ½”
- May have to write off a building to save others

328

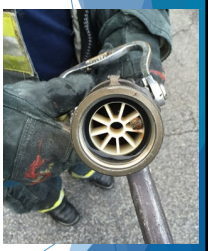
Most Common Engine Company Problems

- Coupling caught on obstructions
- Burst hose length
- Frozen hydrants
- Blocked hydrants
- Water supply problems
- Difficult access to building
- Using the standpipe system
- Vacant buildings
- Clogged Nozzles

329

Clogged Nozzles

- Debris in the water supply may clog nozzles
- Debris can be from either municipal or static source
- Smoothbores without stream straighteners pass debris best
- Automatic/fog nozzles clog the easiest
- Debris will cut down on your GPM as well as reach and penetration

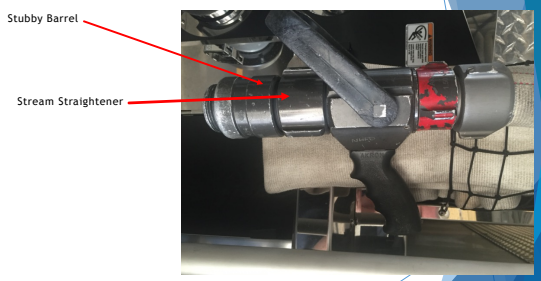


330

Stream Straighteners

- Originally designed for large caliber streams
  - Have been adapted to handlines
- Honeycomb design provides for greater reach and penetration
  - Reduces turbulence
  - Gathers water into a solid cone
- Honeycomb in smaller lines can easily become clogged
- Using a long barrel produces similar stream

331



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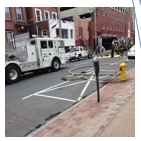
335

336

So how do we get better?????

- Train Train Train!!
- Experience
- Stop and think
- Remain calm
- Trust your brothers
- Hone your craft
- Treat the job as if your life depends on it…one day it may!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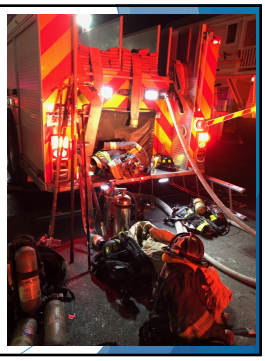
Conclusion

- The ability to recover from a mistake may be one of the greatest strengths of a firefighter
- Problems occur on every fireground, every day. We must be able to overcome these obstacles to succeed
- The safety of you, your brother and sister firefighters and the public rests on your shoulders…act accordingly!!!



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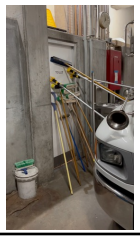
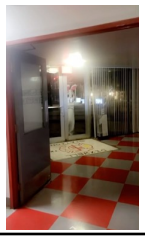
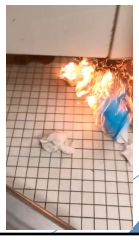
Love the JOB, the PEOPLE and the TIME you have because it will all come to an end at some point, so take advantage of it all!!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Credits and References

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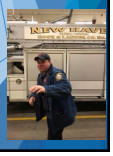
- Dan Gordon, Flash Fire/FDNY
- Fire Engineering Magazine
- Elkhart Brass Inc, Key Hose
- New Haven Fire Department
- Newtown Hook and Ladder Fire Company
- Christiana Fire Company
- Brad Young, Fire Photographer
- Glen Duda, Fire Photographer
- Trell Simmons, Fire Photographer
- Doc Johnson, Fire Photographer









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QUESTIONS????

COMMENTS!!!!

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