# Engine Operations: Stretching, Pumping, & Troubleshooting

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# Recipe for Success

1. Allow **NOTHING**
   to interfere with your ability to maintain the ready and in-service status of your Command so……
2. Everybody Can Go Home

In every case of negligence,

There is a chain of unacceptable and unaddressed permitted actions and behavior

# WHAT YOU PERMIT YOU PROMOTE

# Engine Ops

- If you had to fix just one thing about your attack operation, what would it be?
- Do you have engine scene assignments?

# Engine Ops

- Are pre-connects your normal attack?
  - Main issues?
- Do you ever stretch off the back? Is it a problem?

# Positioning

- Where do the first alarm engines position
- Back of ladder issues
- How do we get water?
  - Ever any issues?

**Size up the Stretch**

**How many lengths?**

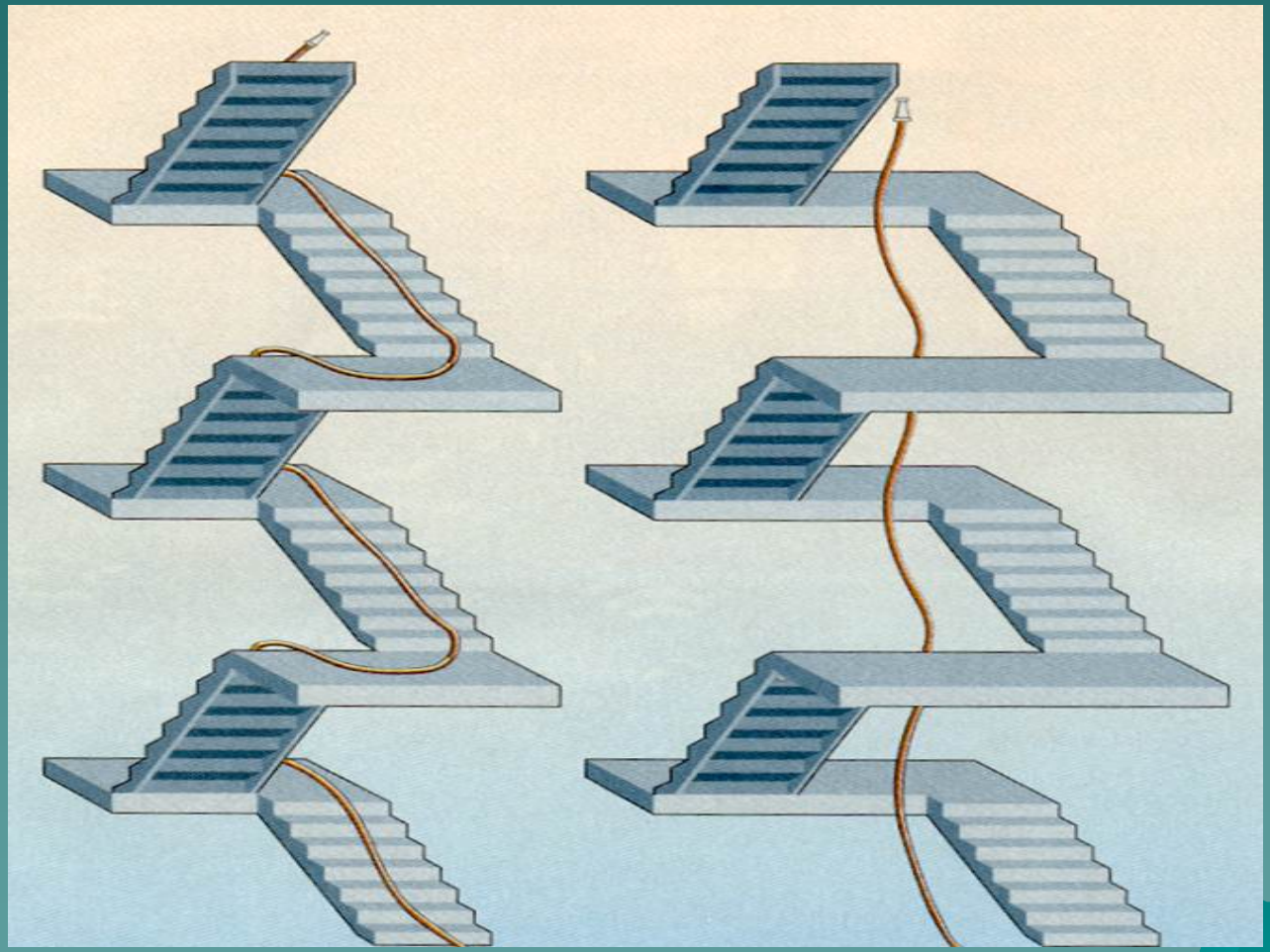
**Where do you charge the line?**

video

# Hose Length
## Making the Right Choice

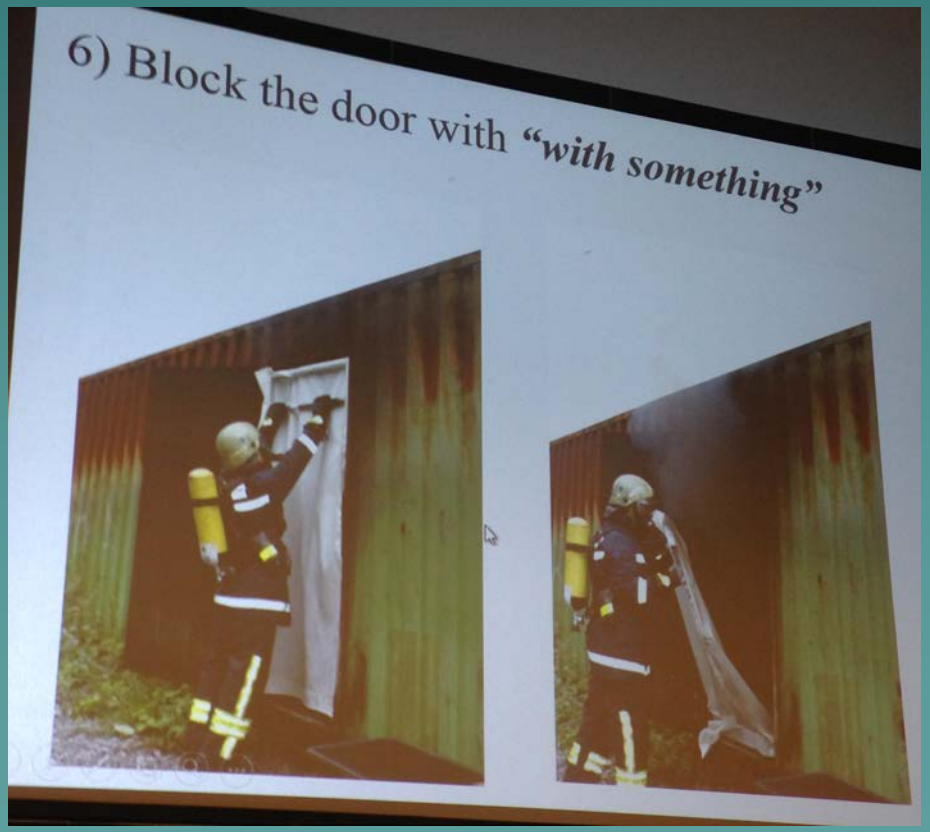
- Street Length
- Height of Building
  - 1 length per floor + 1 working length
  - Open stairwell rule = 1 length per 5 floors + one working length
- Size of building
  - ---Have enough hose equal to the width plus the depth plus one length for each floor above or below grade

# Stairwell holes



# Maintain Door Control

- Door control position
- Flow Path Control Curtain




# THE UL / NIST STUDY

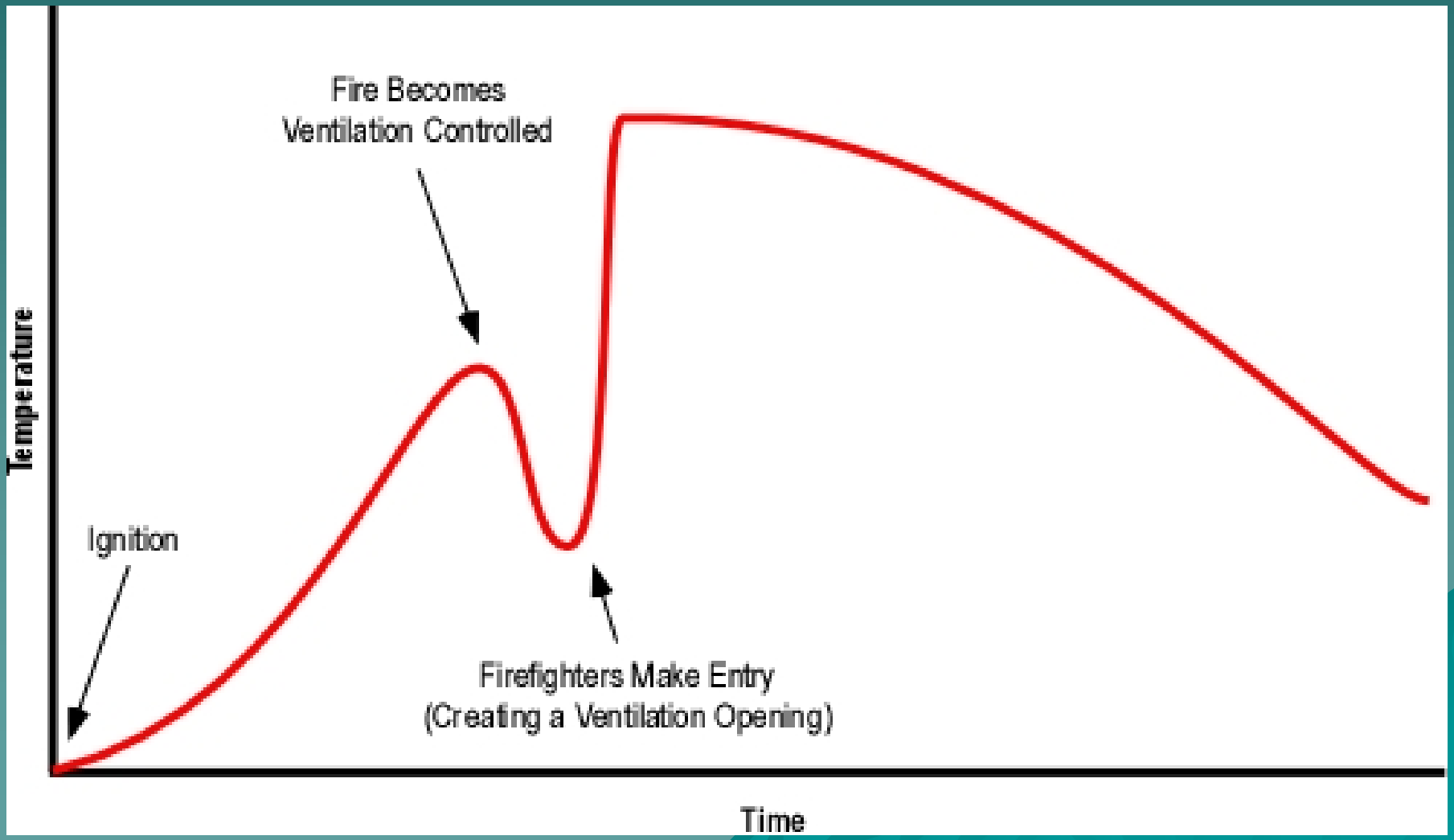
- Strict control over Attack / Ventilation Coordination

- Based on new fire loads and how they behave in modern buildings
- Legacy contents: 8.5 minutes to flashover AFTER ventilation
- Modern Contents: 2 minutes to flashover AFTER ventilation

# THE UL / NIST STUDY

- Starve the fire until attack is ready – water in line at fire area
- Control the flow paths
- KEEP THE BEAST IN THE CAGE
- ANY building openings without water application spikes temperatures
- Air introduced by openings (doors and windows) feeds fire. No H2O = bigger fire
- EVERYONE MUST REVIEW THIS STUDY

# TIME TEMPERATURE CURVE



# THE UL / NIST STUDY GUIDELINES

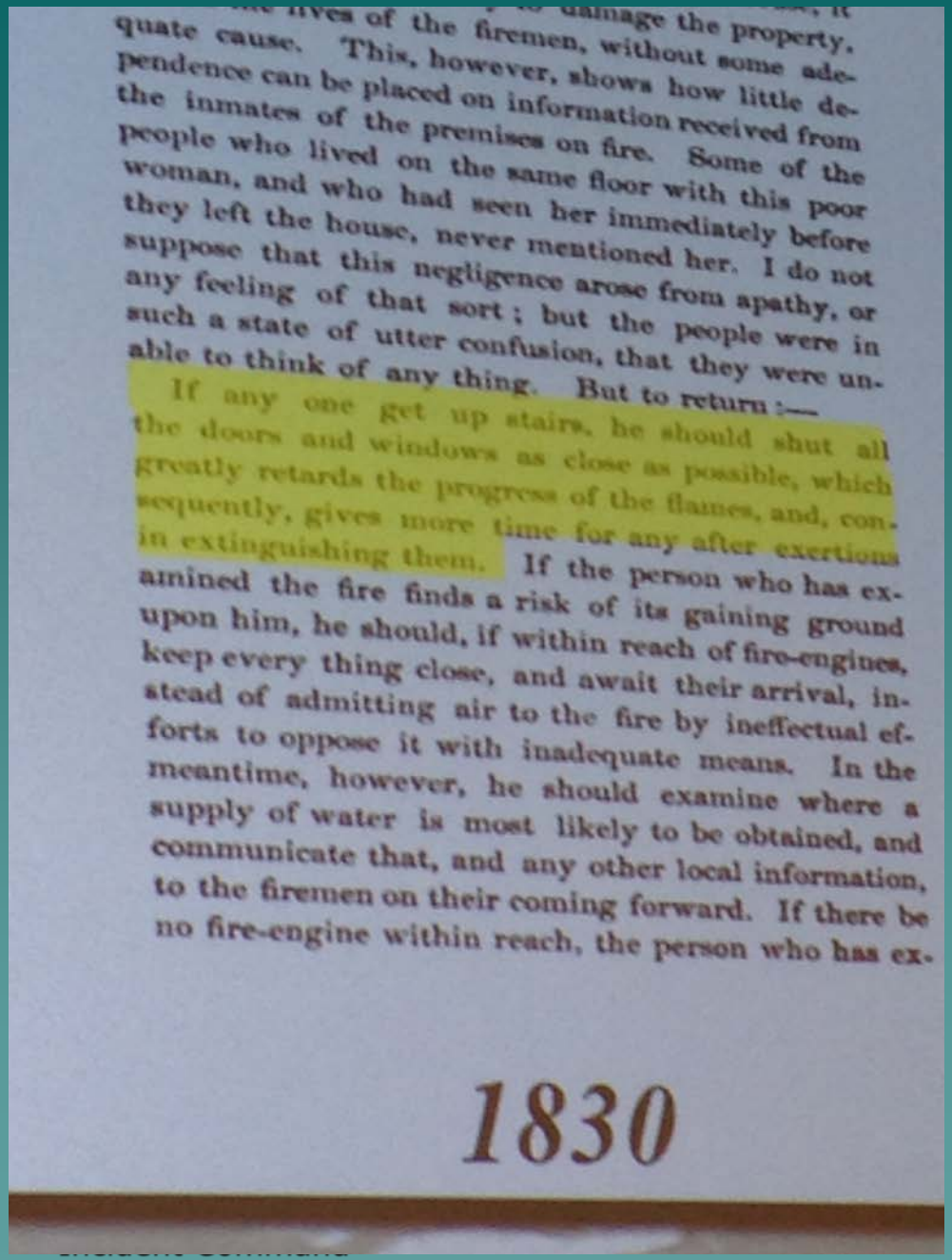
- A FF without a hoseline DOES NOT belong in any flow path under any circumstances
- All openings in the building must be controlled until water is flowing on the fire
- Attack doorway should be controlled until water is at a place where it can be applied to the burning material
  - Door control assignment

# THE UL / NIST STUDY GUIDELINES

- Both horizontal and vertical ventilation should be conducted only after water is being applied to the fire

- VEIS firefighters must get in and get to the door to the room and close it as a first action

VIDEO



damage the property.
lives of the firemen, without some ade-
quate cause. This, however, shows how little de-
pendence can be placed on information received from
the inmates of the premises on fire. Some of the
people who lived on the same floor with this poor
woman, and who had seen her immediately before
they left the house, never mentioned her. I do not
suppose that this negligence arose from apathy, or
any feeling of that sort; but the people were in
such a state of utter confusion, that they were un-
able to think of any thing. But to return:—

If any one get up stairs, he should shut all the doors and windows as close as possible, which greatly retards the progress of the flames, and, consequently, gives more time for any after exertions in extinguishing them. If the person who has examined the fire finds a risk of its gaining ground upon him, he should, if within reach of fire-engines, keep every thing close, and await their arrival, instead of admitting air to the fire by ineffectual efforts to oppose it with inadequate means. In the meantime, however, he should examine where a supply of water is most likely to be obtained, and communicate that, and any other local information, to the firemen on their coming forward. If there be no fire-engine within reach, the person who has ex-

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# THIS AIN'T NEW STUFF!!!

# Take more than just the nozzle

# Attack Line Deployment

- **Other Considerations:**
  - **Support of the stretching of the Initial Attack Line (no line more important)**
    - **Consider teaming engine companies**
  - **Flake the line out before calling to charge**
  - **Stay on the safe side of the door**
  - **Bleed nozzle / check pattern**
  - **Ensure team is ready**
  - **Chock the door**

# Tactical Breakdown

- Stretching too many hoselines through one opening

video

# Pump Operator Considerations

- Light up the scene
- Pull off that “extra length”
- For cross lays – ensure all hose is out of the mattydale
- No kinks to the door / under car tires, etc.
- Flow the hydrant before connecting
- No water until requested

# Water Supply

- **Hydrant Volume**
  - **N.F.P.A. Marking System**
    - **Blue 1500 GPM +**
    - **Green 1000 – 1500 GPM**
    - **Yellow or Orange 500-1000 GPM**
    - **Red 500 or less GPM**
  - **Colors found as bonnet color or hydrant banding**

# Water Supply

- If you are using 1, set up for 2
- If you are using 2, set up for 3
- If you are using 3……
- Manifolds

# Manifolds

- Bring the hydrant right to where you want it
- Avoids apparatus congestion
- Takes advantage of best mains

# Case study

- Rapido Taxi  4800 Broadway Union City  2122 hours  85°
- 1 story ordinary commercial 1600 square feet
- Little building created BIG exposure issues
- Repair-area held heavy fire load
  - Cars / tires / motor oils / gases

# Case study

- Fully involved on arrival with fire igniting B exposure and telephone pole / transformer
- Exposure issues
  - B side – attached occupied 3 story wood frame MD – trapped occupants
  - C side – 5 story ordinary MD with combustible mansard
    - Many windows exposed
  - Power lines Side A

# Case study

- B side shaft exposed
- Explosions from inside building
- Deep-seated fire
- Attack obstacles
- Fire through roof issues

# Initial Actions

- Squad 1
  - establish water supply
  - deck gun on B exposure
  - Begin 2-1/2” stretch to front of building
- Ladder 3
  - Search and evacuate B exposures
- R1 and L1
  - Search & Evac C exposure

# Additional Actions

- Decentralize Command
  - B and C Divisions
- Lines into all exposures
  - Operate from windows on C side
- Three 2-1/2” lines to fire bldg.
- 3 manifolds used from additional water supplies
- Ladder pipe to fire building

# Lessons Learned / Reinforced

- Even small buildings can have a lot of fire in them.
  - How will it influence exposures?
  - How will you control them?
- Don't be afraid of the deck gun for exposure issues
  - Ensure water supply

# Lessons Learned / Reinforced

- Get water on parent body of fire
  - Reduce radiant heat toward exposures
- Plan for multiple water supplies
  - Manifolds
- Be wary of power lines
  - Keep personnel out from under them when exposed to heat / fire

# Lessons Learned / Reinforced

- Building construction a key to exposure protection
  - Asbestos siding beneath vinyl siding on Exposure B
- Plan for big water
  - Big lines for exposure protection
  - Small lines OK for inside exposures
  - Manifolds

# Pulling the BIG Line

- Where is it located?
- When do you pull it?
- Are there any guidelines?
- What do you pump for each length?

# Master Stream Considerations

- Keep Supply lines short
- Maintain collapse zones
- Anticipate fire spread
- Proper nozzle selection
  - Smooth bore vs. fog
- Tip size vs. GPM

# Master Stream Strategies

- Pump in VOLUME
- Hit fire only
- No streams into vent holes
- Consider water weight
- Once fire is darkened, shut down stream
  - Consider interior operations
  - Safety check first

# Rules

- Rule #1:  DON”T PANIC
- Rule #2:  If you about to PANIC, see Rule #1 and see the next slide

# Pump Operations

**When Facing Operational Problems:**

**1st action:**

# Notify Command

# Pump Discharge Pressure

- 1- ¾” lines
  - 15 PSI per length
  - Nozzle pressure (50 or 100 PSI)
  - Elevation (5 PSI per floor above 1st)
- 2- ½” lines
  - 5 PSI per length
  - Nozzle pressure (50 or 100 PSI)
  - Elevation (5 PSI per floor above 1st)

# Roundtable Discussion

1. What is head pressure?

- How does it affect your pump pressure on the fireground?

# Roundtable Discussion

2. What is friction loss?

- How does it affect your pump pressure on the fireground?

# Roundtable Discussion

3. How much friction loss in 100’ of 2 – ½” hose flowing 250 GPM with a solid bore tip?

4. How much friction loss in 4 lengths of 1 – ¾” hose flowing 150 GPM?

# Roundtable Discussion

5. How much nozzle pressure should be on a straight tip nozzle with a 2 – ½” hose?

5a. How much nozzle pressure on a 1 – ¾” line with a task force tip nozzle?

6. How much head pressure is added to the attack line operating on the third floor?

# Roundtable Discussion

7. You are the water supply engine. The hydrant you are hooking up to has a stripped stem. What do you do?

# Roundtable Discussion

8. You are the water supply engine and you cannot get the steamer connection off. What do you do?

- What could be the problem and how do you solve it?

# Roundtable Discussion

9. What do you do if you pull up to a hydrant and one of the 2 – ½” discharge caps is missing?

# Roundtable Discussion

10. What do you do if the front suction breaks while you are supplying from a hydrant?

# Roundtable Discussion

11. What do you do if your LDH supply line breaks while supplying an attack pumper?

# Roundtable Discussion

12. Regarding the maximum pressure you can pump at if you are relaying water from the supply engine to the attack engine, how do you know when you have reached this pressure?

# Roundtable Discussion

13. You are pumping the attack engine and the attack line breaks. What do you do if you see it happen (outside in the street)?

    What do you do if you are notified by the interior companies that this has occurred?

# Roundtable Discussion

14. You are pumping the attack engine and your rig jumps out of pump and begins to move down the street. What do you do?

    What do you do to maintain water flow to the attack line(s)?

# Roundtable Discussion

15. You are the 1st Engine on the scene. There is an odor of smoke. The 2nd arriving engine bumps you. As you pull forward to the water supply, you see that a Police car has double parked and is blocking your access to the water supply. What are your options?

# Roundtable Discussion

16. A supply pumper has just dropped its LDH to you, the attack pumper. As the supply engine is traveling toward the water source, the LDH gets hung up in the bed and is being dragged down the street. What do you do?

# Roundtable Discussion

17. What nozzle pressure do you want on a master stream device with a solid bore tip?

# Roundtable Discussion

18. During a snow storm, what are the problems you face and how will you address them?

# Roundtable Discussion

19. What do you do with your task force tip (fog nozzle) after a fire?

# Roundtable Discussion

20. You are the water supply engine to a standpipe. The FDC siamese is jammed with cans and other garbage that you cannot remove. What do you do?

# Roundtable Discussion

21. You are the water supply engine to a standpipe. Both of the 2 – ½” swivels are frozen from the rust and the cold. The clapper valves are operational. What do you do?

# Roundtable Discussion

22. You are supplying a sprinkler system in an old factory.

    What is your pump pressure?

    How many GPM flow out of the average sprinkler head?

# Roundtable Discussion

23. You are the attack pumper. You are in pump, your tank is dropped, the gate and the gated wye is open but no water is flowing. What is the problem and how do you correct it?

# Roundtable Discussion

24. What is the difference between a gated wye and a siamese?

# Roundtable Discussion

25. What is a water hammer?

26. What does water hammer affect?

27. How do you limit the effects of water hammer?

# Roundtable Discussion

28. What is the best way to back into a block when approaching an intersection?

29. As a first arriving engine, there may be times when backing down the street might be the best option. When should this be done?

# Roundtable Discussion

30. You are pumping a big job and you run out of fuel. What do you do?

# Roundtable Discussion

31. Your engine is supplying two 1 – ¾” and two 2 – ½” lines at a big job. Because of the potential for building collapse, you are told by the IC to move the rig out of the collapse zone ASAP. What do you do and what are your priorities?

# Roundtable Discussion

32. You are the first arriving engine and there is a hydrant in front of the building. Do you make the hydrant? Why or why not?

# Roundtable Discussion

33. What is the pump operator's responsibility for attack lines going into the building?

# Roundtable Discussion

34. You are dispatched to a neighboring jurisdiction on mutual aid. What special tools do you need?

# Roundtable Discussion

35. What is pump cavitation?

    What do you do if your pump cavitates?

# Roundtable Discussion

36. What is the difference between pressure and volume?

37. When do you pump in pressure and when do you pump in volume?

# Roundtable Discussion

38. You have finished pumping a major job from a hydrant. You notice that there has been a lot of street construction by the hydrant. What potential problems can occur?

# Be Safe Out There!