NORTH HUDSON REGIONAL FIRE & RESCUE
FIRE PUMP Quiz

1. What is head pressure, and how does it affect your pumping pressure on the fire ground?

Head pressure is the effect of gravity on water.

One pound per square inch (PSI) can lift water 2.301 feet. Conversely .454 PSI will lift water one foot. Since the average height of a floor is 10 feet, the amount of pressure needed to lift water one floor would be 10 X 0.454 = 4.54 PSI. In the fire service we would round this number upward to 5 PSI per floor. Do not count the 1st. Floor when calculating head pressure.

2. What is Friction Loss, and how does it aflect your pumping pressure on the fire ground?

Friction Loss is the loss of pressure in the hose line caused by water rubbing up against the interior walls of the hose jacket. The smaller the diameter of the hose, the higher the friction loss factor, since only a small amount of water flows freely. The larger the hose, the lower the friction loss factor, since more water flows freely. The higher the pressure, the higher the friction loss will be. If the nozzle is shut, there is no FL, since there is no flow.

3. How much Friction Loss is in 100 feet of 2 1/2 " hose flowing 250 GPM with a straight tip?

10 PSI per 100 feet or 5 PSI per 50 foot length.

4. How much FL is in 4 lengths of $1^{3}/4$ " hose flowing 150 GPM?

Friction loss in a 50 foot length of 1 3/4" hose is approximately 15 psi.
15 multiplied by 4 = 60psi. The total Pump Discharge Pressure (PDP) using a task force tip would be 160 psi-100 psi for the nozzle & 60 psi Friction Loss (FL).

5. How much Nozzle Pressure should be on a solid bore nozzle with $2^{1}/2$ " hose?

50 PSI

On an 1 1/2 " Task Force Tip at ground level? 100 psi. The PDP using 4 lengths of 1 3/4" Hose would be 160 psi. Putting too much pressure into the line is as dangerous as too little pressure. Remember, if the nozzleman cannot hold the nozzle because of too much pressure, he will be forced to shut down and back out of the room. He may gate down the nozzle, but at a cost of losing GPM.

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

2 X 5 10 PSI

7. What do you **do if you are the water supply engine and the hydrant you want to hook up to has the top of the stem stripped?**

Use a pipe wrench (Stillson) or vice **grips instead of your hydrant wrench.**

8. What do you do if you are the water supply pumper and you can not get the steamer connection off?
What could be the problem and how do you solve it?

Since the water company is supposed to flow every hydrant at least once a year, it is unlikely that the steamer connection would be frozen or rusted shut, but it can happen. However, if a resident opened the hydrant with the steamer connection in place, then the pressure behind the cap might be too great to open the it. Try the 2 1/2 " hydrant outlet. If water flows out, shut the hydrant, and open the steamer connection. If no water flows out, you can use both 2 1/2 " outlets by stretching 2 lengths of 2 1/2" hose(one to each outlet) from the hydrant to your 2 1/2" intakes.

9. What do you do if you pull up to a hydrant and one of the two 2 1/2' outlet caps is missing?
Make the steamer connection, and also stretch 1 length of 2 1/2" hose from the hydrant to the 2 1/2" pump intake. You can also take a 2 1/2" cap from one of the engine's discharges, and put in on the 2 1/2" hydrant outlet. If no 2 1/2" cap is available, screw a 2 'A" nozzle onto the hydrant outlet (make sure that it is in the shut position).

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

Close the front suction to the pump. Drop your tank, and throttle up. For this reason, you should always be in pump while hooked to a hydrant. This will allow you to continue to flow water to the attack pumper for about a minute. Then, shut down the hydrant, disconnect the broken soft suction hose, and replace the connection with your Stoltz hydrant adapter (threaded steamer to sexless coupling). Connect an LDH Pony Length to the hydrant and to the side LDH pressure intake valve. Open the hydrant. Close your tank, and throttle down to the correct pressure.

11. What do you do if your **LDH Supply Line breaks while supplying** water?

Shut down supply line immediately. Notify the Attack Pumper. The attack pumper should close his LDH piston intake valve, then drop his tank to continue the flow of water into the attack lines. Exterior lines may have to be shut down temporarily to conserve water. Attack pump operator will notify the IC. Stretch a new length of LDH from the engine closest to the break, hook it up and continue the water flow. Ask for help in this instance, since speed is of the essence.

12. What is the maximum pressure you can pump at if you are relaying water from another pumper to the attack pumper? Keep in mind that the stretches are usually long in this situation.

This may be considered a trick question. In a relay situation involving 3 or more engines, pump operators should be more concerned with the compound gauge than the pressure gauge. You can only throttle up (increase rpm's) until the compound gauge reaches 20 psi. If you increase pressure at this point, you run the risk of going into vacuum.

13. You are pumping the attack pumper and an attack line breaks, what do you do?

If the broken line is in the street, you will see it. Shut down the line and notify the IC. The IC will then notify the interior companies that the attack line is down due to a break. Pull off another length of hose, disconnect the broken line, and replace it with the new length. Have another firefighter or company help you, since men are in the building and speed is important.

If the broken line is in the building, Interior Operations will usually notify Command. Shut down the affected line. It is important to know where your lines are operating so you know which line to shut down. Have a nozzle ready for the company that will advancing the new attack line from your engine. When manpower becomes available, the IC will have a company remove the damaged attack line from the building so the damaged length can be replaced.

14. You are the attack pumper and your rig moves out of pump and starts to move forward, what do you do? What do you do to maintain water flow in the attack lines?

Throttle down. Jump into the cab, take the rig out of pump. Make sure the emergency brake is engaged, and that air pressure is normal. Shut down the engine. Have the supply engine increase its discharge pressure to 150 psi, to maintain water flow on your attack lines. Your pumper has now become a manifold (coupling). Remember the LDH piston intake valve is set at 150psi. Increasing pressure above 150 psi will cause water to flow from the relief valve. Keep in mind that LDH is not made to endure high pressures. Notify the IC to have the Shops report to your location. Chock the wheels, and make sure your emergency brake is engaged. Start up the rig and put it in pump. If the same problem exists shut the engine down and await the Shops.

15. Same Question for a pumper at a hydrant?

Throttle down. Jump in the cab, take the rig out of pump. Make sure the emergency brake is engaged, and the air pressure is normal. Shut down the engine. Notify the IC that you have a problem and have the Shops respond to your location. Chock the wheels. Many times hydrant pressure will be sufficient to supply the attack *engine.* Therefore, use your pumper as a manifold. If more pressure is needed to relay the water to the attack puMper, advise the IC that you will need a replacement pumper. Upon arrival, disconnect your engine, and hook up the replacement.

16. Your Engine is the first rig on the scene and there is an odor of smoke in the air. Your officer leaves the engine to find out location of the fire. The 2nd due pumper pulls into the block behind you, and radios you that he is bumping you up. The 1st due ladder has pulled in behind the 2nd due engine. You are now the primary water supply pumper. As you proceed to the hydrant on the corner, you notice that a police car has doubled parked blocking your route. What are your options?

Radio the next due engine to back down the block to you and drop their LDH and give you a water supply. Break your LDH and hook it to your discharge. Hook your supply LDH from the new supply Pumper to your piston intake valve. As soon as you receive water from the supply pumper, charge your LDH to the Attack Pumper.

Another option mentioned to me would be to ram the police car, and push it passed the intersection. Then make the hydrant. The Ist option saves thousands of dollars, and creates better fire—police relations.

17. A supply pumper has just dropped its LDH by you, the attack pumper. As the supply engine is traveling to a hydrant, the LDH gets hung up in the bed and is being dragged down the street. What do you do?

Notify the supply pumper by radio to stop his rig. Explain the problem. If a company is needed to backstretch the LDH to your engine, notify the IC.

18. What Nozzle Pressure do you want on a master stream device with a straight tip?

80 ps.

19. During and after a snowstorm, what are the problems you face, and how will you deal with them?

There are numerous problems you will face with snow, ice, and cold weather. Hydrants may be covered or blocked by snowdrifts or plowed snow. This may make it impossible to utilize your front suction intake for water supply. When snowplows clear narrow streets, they push the snow up against the parked cars making the street even narrower. Access to the pump panel and discharge gates may become restricted. Even small amounts of water near your engine will create a slippery work area. Hydrants may become frozen, if the water company did not properly winterize them. The pump and hose lines can freeze if water is not flowing through them. The effects of the weather will adversely affect you if you are not prepared.

Some Solutions: Know the locations of all hydrants in your first response area. Use your 25 foot LDH pony length if you can not hook up your front suction to the hydrant. Remember when utilizing your LDH pony length you will need a Storz Steamer to LDH Hydrant Adapter. Keep it in a location where you can readily access it. If the steamer connection is blocked, use 2 V2" hoses to the 2 IA" discharges of the hydrant (use short lengths if available). If the hydrant is frozen, call another engine by radio, and have him drop you a supply line. You will then become a relay pumper.

If you are the attack engine, attempt to line up your LDH piston intake valve with a driveway or between parked cars. Since the intake valve is on the captain's side, have the firefighter in the jump seat assist you while the captain is making his size-up. Keep in mind that the Ladder Company must make the front of the building.

Always carry a 5-gallon pail of rock salt or calcium chloride with an empty coffee can on the apparatus. Spread it in your work area to prevent slipping.

Nozzlemen should keep their nozzles cracked open when not in use to prevent their hose lines from freezing. Freezing usually occurs after the fire has been extinguished and firefighters have shut their nozzles during overhaul. Nozzlemen should stick their cracked nozzles out a window or in an unclogged bathtub or sink to avoid freezing the hose line. Drain hose lines immediately when they are no longer needed. If you develop a frozen line, notify the Shops. DO NOT bend the hose length. This may cause severe damage to the hose, placing it out of service. After the fire has been extinguished, crack your pump drain to allow water to continually flow through the pump to prevent freezing.

During cold weather months, engines companies should ride with their pumps dry. This is necessary due to the large amounts of service calls where the apparatus may be parked out in the cold for long periods of time. Practice priming your pump. Remember to check your priming fluid daily.

It is always a good idea to keep a bag of dry clothing (sweatshirt, gloves, etc.) in a warm location on the apparatus to keep you warm. I can't overemphasize having extra gloves, since your first pair will always become wet. You cannot pump with frozen hands.

20. What do you do with your task force tips after a fire?

Flush them when you get back to quarters.

21. You are the water supply engine to a standpipe, and the FD Siamese is jammed with cans and garbage that you cannot remove. What do you do?

Stretch your 2 12" standpipe supply line to the nearest 1st floor standpipe. Remember to bring a 2 1/2" double female connector with you. Screw the double female onto the male end of the hose, then screw the other end of the double female onto the 2 Vi" standpipe discharge male. Go back to your engine and connect the 2 1/2" line to a discharge outlet. Charge the line, go back to the standpipe (removing hose kinks along the way), and open the standpipe discharge valve. This is commonly called "back feeding" or "bypassing" the system. Then return to your pump and adjust engine pressure accordingly.

22. You are the water supply engine to a standpipe, and both of the 2'1/2" swivels are frozen from rust and the cold, but the clapper valves still are operational. What do you do?

Once again adapters are the key. Take a 2 1/2" double male and a double female and screw them together. Then connect the male end of your connection to the standpipe swivel. The next step is to connect the male end of the hose to the double female adapter, DO NOT reverse these steps or the hose may become twisted. To connect a 2nd 2 1/2" line to the standpipe siamese, you may have to get additional adapters from another engine company, if your engine only has one set.

23. 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?

Most sprinkler systems are tested at 150 psi. Since the factory is old, some of the heads may be new, but the pipes are not. Therefore, a safe engine pressure would be to start at 150 psi. The flow from sprinkler heads vary greatly from 15 GPM to 100 GPM.

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

Your pump is air bound, and needs to be primed.

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

In a siamese, water flows from two or more hose lines into one.
In a gated wye, water flows from hose line or pump discharge into two hose lines.

26. What is water hammer?

Water hammer is the negative effect of water on all conduits it is flowing through when it comes to a sudden stop. The most common occurrences in the fire service happen when nozzles are shut down too quickly, and pump discharge gates are closed too fast.

27. What does water hammer affect? (more than one answer)

Water hammer affects hose lines, pumps, hydrants, and even water mains.

28. How do you limit the effects of water hammer? (more than one answer) Close

nozzles, discharge gates, gated siameses and gated wyes slowly.

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

If you want to back down a street on the right side of the road, make a left turn into the street across the intersection. Then back straight across the intersection and down the street. Passing the intersection, and then trying to back down the street, would cause you to be turning the apparatus while you are backing up. The later is much more difficult and time consuming than backing the rig straight down the street.

30. If you are the first due pumper, are there times when backing down the street is the best option? The answer is "yes." When should this be done?

On a two way street, when the Ladder Company is coming from the opposite direction, it is better to back down the street stopping two buildings before the fire building. If you drive straight down the street and pull two buildings passed the fire building, it can create a problem with the Ladder Company: The rear of the ladder truck will stick out into the middle of the street, turning a two way street into a one way street. This in effect turns an advantage into a disadvantage.

31. You are the third due engine at a structure fire. What is your objective?

The third due engine at a structure fire backs in to the rear of the ladder truck, leaving enough room so that ground can be pulled. You are the secondary water source. If the first water source fails, you will become the primary water supply. If water is needed to supply the ladder pipe or a manifold your rig will be utilized.

32. Same question at a High Rise Fire.

The third due engine at a high rise fire supplies the FD Connection.

33. Your engine runs out of fuel while pumping a big job. What do you do?

Shut down your apparatus. Shut off all electric, so you do not drain the battery. Notify the IC to have the Shops respond to your location with fuel. Do not try to think of an excuse to tell the IC, since there is none. Monitor your fuel gauge periodically throughout the fire, and eliminate this problem.

34. Your engine is supplying two 1 3/4 " and two 2 1/2" lines at a major structure fire.
Because of a potential building collapse, you are told by the IC to move your rig out of the collapse zone ASAP. What do you do, and what are your priorities?

Pull off one length of hose for each of the hose lines you are supplying from the bed. Move them off to the side of your apparatus. In this case, two on each side would avoid tangling. The IC will already have alerted the companies operating your lines of the situation. Throttle down and disconnect the lines from your discharges. Radio the supply engine to shut down his supply. Disconnect the LDH from your piston intake valve. Take your rig out of pump and move it 50 feet (2 city building lots). Then reconnect your lines. To reconnect your water supply, it may be easier to use two 25-foot pony lengths to replace the 100-foot length.

If you are connected to a hydrant, close the hydrant, disconnect the front suction, and close the front suction intake valve. When reconnecting, use Lint pony lengths to reconnect to the hydrant and connect them to your LDH piston intake valve. Remember that you will need a Storz Steamer to LDH Adapter. If the IC requires you to move your apparatus more than 50 feet, disconnect your rig from all lines, move the required distance, and have companies help you back stretch the required lengths to the hose lines.

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

NO. The front of the building is reserved for the Ladder Company. If you make this hydrant you will screw up the whole operation. Forget the hydrant is even there. Many lines come off of the 1st due engine. If the building takes off and collapse is eminent, moving your apparatus would cause the shut down of critical hose lines.

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

It is the pump operator's duty to make sure there are no kinks in the hose lines from his apparatus to the front door. Kinks in the hose lines reduce gallons going to the nozzle, causing the company operating your line to call for more pressure.

37. You are dispatched to Hoboken or Jersey City on a Mutual Aid Call. What special tools do you need?

You will need a radio with the frequency of the town to which you are responding. You will also need Jersey City to North Hudson adapters, since North Hudson Regional and Jersey City have different threads on their hydrants and hose couplings. Hoboken and Jersey City have the same hydrant and hose threads.

38. What is pump cavitation? What do you do if your pump cavitates?

Pump cavitation occurs when air instead of water is being drawn into the pump from the intake side. When a pump operator attempts to deliver more water than his pump is receiving, the intake (suction) hose line collapses, and causing pump cavitation. When this occurs, the pump impellers sustain damage, which shortens their life expectancy.

Pump cavitation can also occur if another Engine Company connects to a hydrant that is connected to the same main as the hydrant you are utilizing.

When cavitation occurs, throttle down immediately until the front suction or LDH fills with water. Then slowly throttle up not allowing your compound gauge to go under 20 psi.

What is the difference between pressure and volume?

All of our engine companies ride in pressure. The majority of our pumpers have

1500 GPM pumps. In pressure, a 1500 GPM pump can deliver 750 GPM at 250 psi. In volume, a 1500 GPM pump can deliver 1500 GPM at 150 psi.

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

If you are the attack pumper or supplying a FD connection at a high rise building, you should be pumping in pressure, since pressures of greater than 150 psi will be needed. If you are a water supply engine or supplying master stream devices, you should be in volume, since pressures over 150 psi are not needed. These devices may need more than 750 GPM.

40. You are operating the boom of a squirt at a large structure. Do you pump in pressure or volume? Why?

When operating the boom of a squirt, immediately switch from pressure to volume. 750 GPM will not be able to supply the squirt adequately since it works best throwing 1000 GPM. Keeping the squirt in pressure will also burn the seals in the boom,

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

Small stones, pebbles, and sand can accumulate in the pump from mains and hydrants that have been added or replaced. Have your officer notify the Shops upon your return to quarters, since the pump may need to be backwashed.