

Commack Fire Department

CFD Probationary Firefighter Basic Lesson Plan

Topic: Hydrants / Supply Lines

Class # 1

- **Level of Instruction**
 - Probationary Firefighter
- **Equipment Needed**
 - Engine
 - 5" hose
 - 3" hose
 - Hydrant wrench and spanners
 - Gates (single, double, 3-way)
 - Adapters
 - Full turnout gear
- **Resources Needed**
 - CFD Probationary manual
 - CFD SOG's
- **Terminal Objective**
 - Firefighter's will demonstrate how to properly, completely and safely hook up the correct supply line to the hydrant and be able to flow water to the attached Engine when directed to do so.
- **Enabling Objectives**
 - Firefighter will identify the different types of supply lines and their features
 - Firefighters will properly hook up and operate a hydrant
 - Firefighters will understand and explain the difference between a straight lay and a reverse lay
- **Lesson Outline:**
 - How hydrants work
 - Gravity from water towers
 - Hydrant Parts
 - Stem nut and operating nut
 - All outlets/discharges (male)
 - Steamer cap
 - Donut caps (side caps)
 - turn on at the same time
 - Cutting chains
 - Supply lines
 - Hose diameter
 - 5"
 - 3"
 - Connections/couplings
 - Storz

- National Standard (2- ½ “)
 - Lengths
 - Hydrant Operations:
 - Front Suction / Steamer
 - Forward Lay
 - Reverse lay
 - Hand stretching / back stretching
 - Overcoming distance
 - Water relay (in-line pumping)
 - Hydrant hook up
 - Importance of flushing the hydrant
 - Steamer hook-up
 - Gates on side (2 if possible)
 - 3” hook up
 - Gate 3”
 - Additional gate on other side
 - Engine anatomy
 - Intakes
 - Female
 - Lower half of pump panel
 - Straight pipe in
 - Discharges
 - Male
 - Upper half of pump panel
 - Slightly angled pipe coming out
 - Other key terms and nomenclature
- Summary
 - Remember the basics of how the hydrant gets hooked up.
 - FLUSH THE HYDRANT, EVERYTIME!
 - Remember how your hose bed is set up, males go towards the fire
 - More gates the better
 - Open the hydrant fully
 - Keep supply line to the side of the road to allow access of other apparatus



COMMACK FIRE DEPARTMENT TRAINING DIVISION



Hydrants and Supply lines

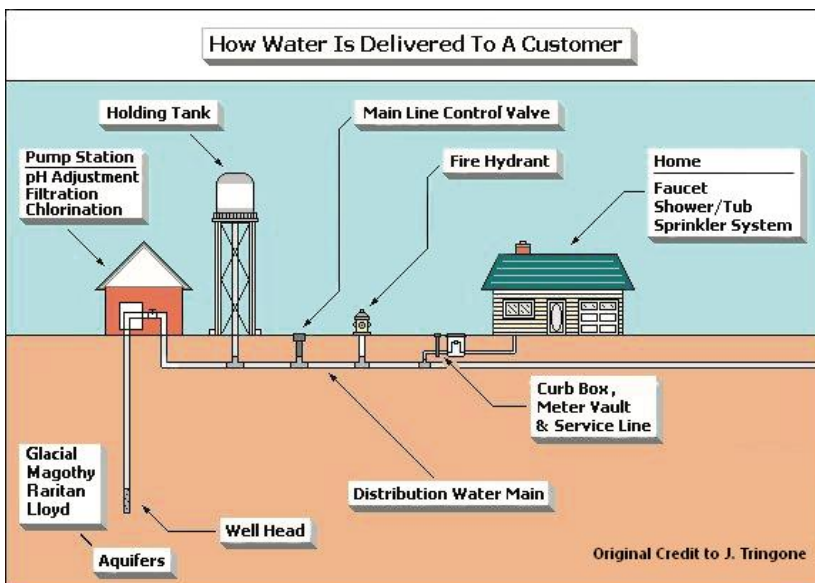
Hydrants and supply lines are two separate topics, but we teach them together because they go hand in hand. This whole segment is about the ways we are able to get water from a water source into our working engine which is putting water into our attack lines and/or attack devices.

Hydrants

In Commack we are fortunate enough to have plenty of fire hydrants throughout our district that they are **TYPICALLY** our main water source. In other places throughout the country, including some of our neighboring departments, fire departments don't have the luxury of having so many hydrants in close proximity to one another that they have to rely on other ways of getting water. This comes in the form of either drafting out of bodies of water or utilizing tanker trucks. While we can't say that we will **ALWAYS** have a hydrant nearby, there usually is. Later on in the Supply portion of this lesson we will discuss how we overcome not having a hydrant nearby.

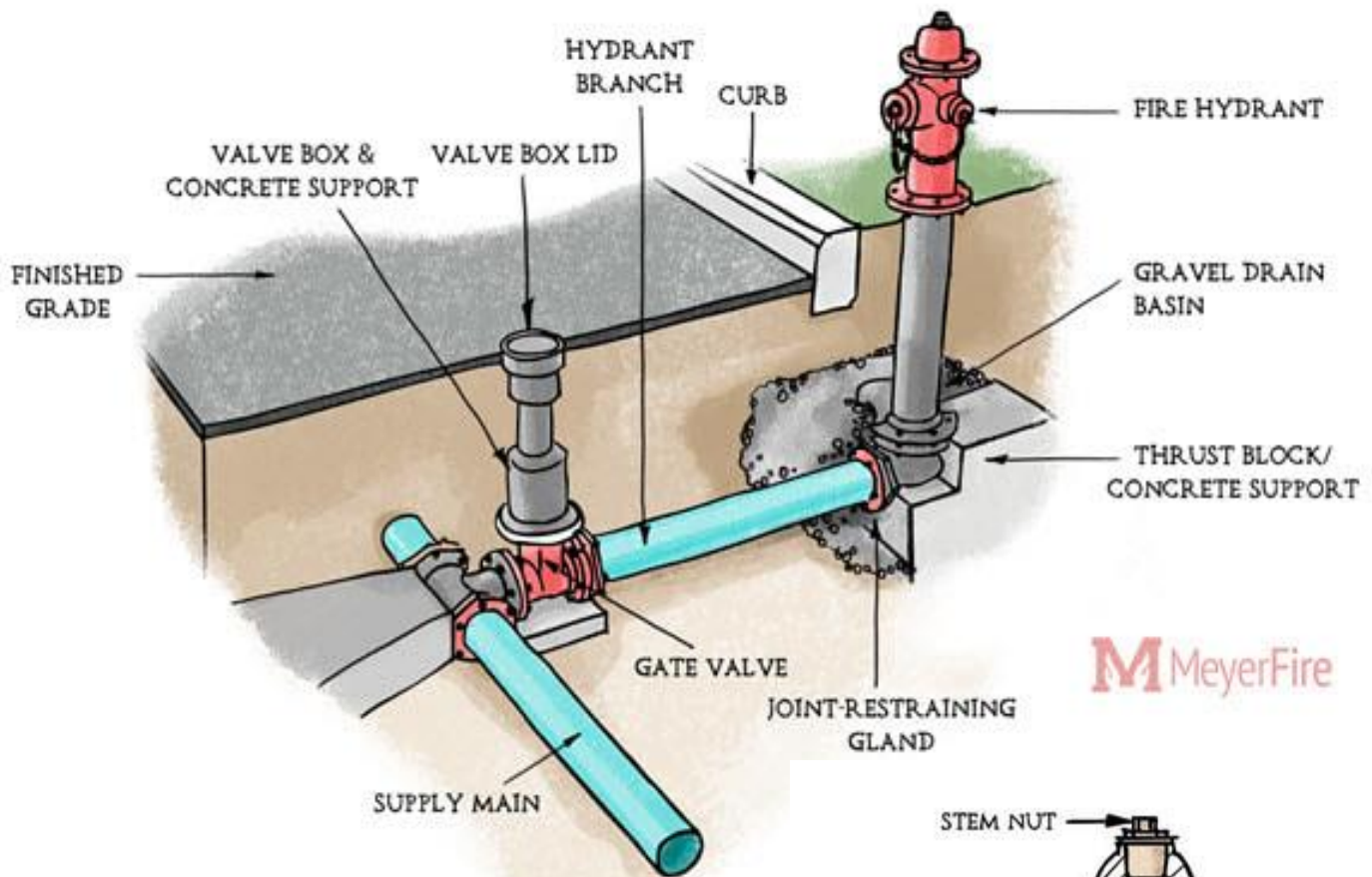
Where does the water come from? Before we get into the workings of the hydrant, we need to understand a little bit about how water is delivered to the hydrant as well as water pressure and water volume. If you see the picture below, water is extracted from a well and goes to a pump station. Here in the pump station some treatment is done to the water in order to make it up to the necessary standards for our area. From there the water is pumped to a holding tank (Water tower). From there water flows through a main, which is then subdivided into other smaller distribution main supply lines which then begin to feed fire hydrants and individual homes or businesses. The water pressure you receive comes from gravity, since the water is being stored high up in the holding tank gravity is exerted onto the water. Just like anything else, water wants to flow from high to low so whenever the end user opens their faucet, sprinkler system or us as the fire department opens a hydrant that water begins to flow from the holding tank. Depending on how tall it is will determine how

much pressure you are getting. *Keep in mind that not all hydrants will get the same water pressure.* The further away from holding tanks or pump stations, the less pressure you will have. On the other side of pressure is volume. For us volume is the amount of gallons per minute (GPM) you will get. GPM is more associated with the size of pipe in diameter that is supplying your hydrant. The larger diameter main supply line you have, the more GPM you will get. Whether it's solid pipe or firehose you cannot increase GPM by increasing pressure. There is only so much water that can fit through pipe/hoses, so while there is an optimal pressure in order to get the most GPM's out of your hose, exceeding that will not give you any more

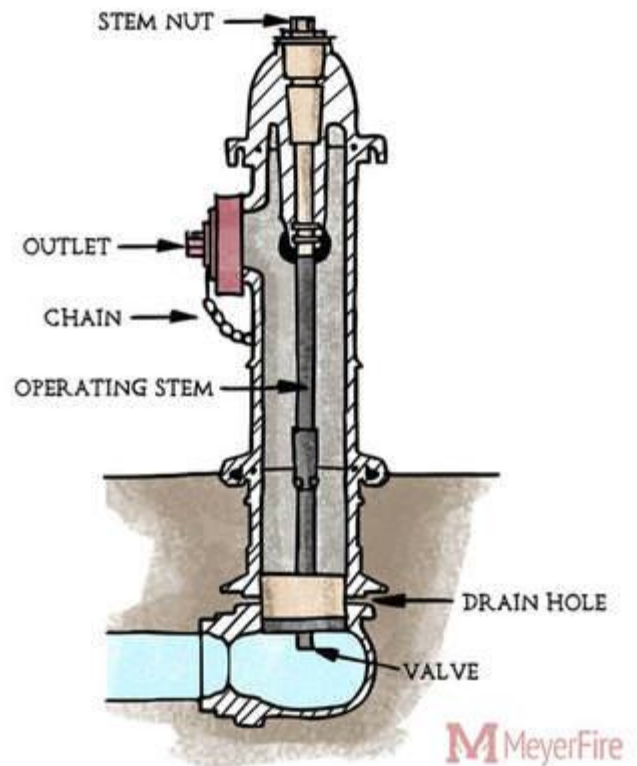


GPM.

How fire hydrants work: In our area you will find what is called **DRY BARREL** hydrants. As it can be implied from its name, these hydrants are not filled with any water until the hydrant valve is opened. This is the most popular type of hydrant you will find throughout the country and what you will find here in Commack. As you can see from the picture, there is a **SUPPLY MAIN** that runs under the ground typically parallel to the roadway. Where needed that main is branched off (known as the hydrant branch) to another pipe to the hydrant assembly.

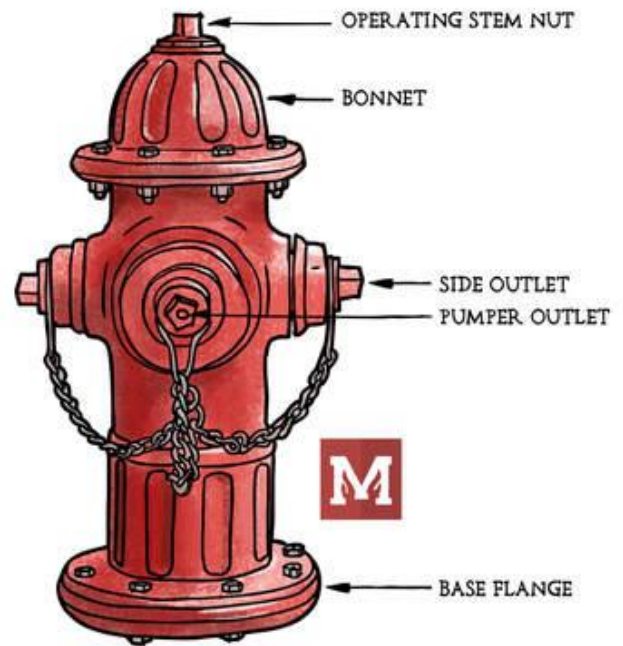


You can see in the picture to the right that there is a valve between the hydrant branch (horizontal line) and the hydrant assembly (vertical line up to hydrant). This valve is where the water is cut off when the hydrant is in the closed position. In order to open the hydrant, one must use a hydrant wrench on the stem nut, this is the key to operating the valve within the hydrant. The nut at the top of the hydrant is shaped as a pentagon, turning it utilizing a hydrant wrench will turn the operating stem allowing the valve to open. Counter-clockwise (to the left) will open and clockwise (to the right) will close the stem. When the valve opens, it raises up, closes off the drain holes and water will flow up the barrel to the hydrant. When the hydrant is turned off or closed, the valve goes back down cutting off the flow of water and at the same time opens up the drain holes that will allow any residual water from the hydrant barrel to drain to prevent freezing.



Hydrant Parts

- **Stem Nut/Operating Nut:** This is the key to operating the valve within the hydrant. The nut at the top of the hydrant, which is typically shaped as a pentagon, will turn the operating stem allowing the valve to open when turned with a hydrant wrench. Counter-clockwise(to the left) will open and clockwise (to the right) will close the stem. It is important to note that once the hydrant is turned on that all 3 outlets will have water flowing through them, so if the outlets do not have caps or appliances on them that water will be flowing out of them
- **Bonnet:** holds the operating stem nut in place and protects the hydrant from mechanical damage and water penetration
- **Outlets:** The hydrants in our area contain three outlets: two 2-1/2 inch side outlets and a single 4-1/2 inch pumper (steamer) outlet. All three outlets have MALE threads.
- **Flange:** This is the point of connection for the hydrant to the rest of the barrel.
- **Valve:** When in the “open” position, the valve at the bottom of the hydrant rises to plug drain holes and permit water to fill the barrel of the hydrant. When in the “closed” position, the valve lowers to block water passage and re-open drain holes at the bottom of the hydrant. This allows water to weep from the barrel to prevent freezing

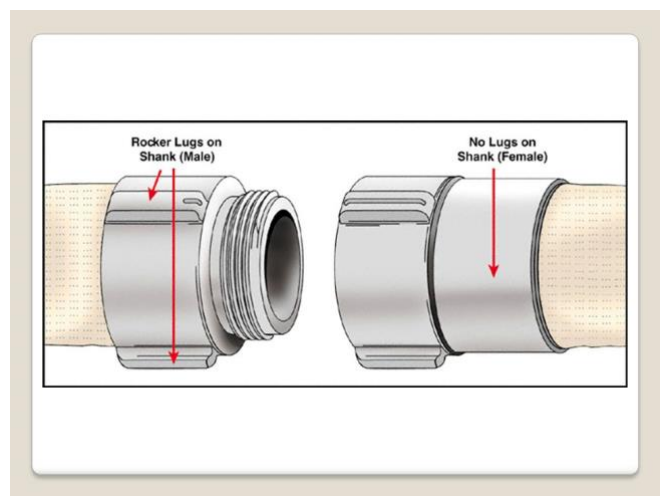


Hydrant Color: You will see a few different hydrant colors throughout or district. *When it comes to hooking up the hydrant and getting water out of it nothing changes though so don't think too much into it.* The information below is more for informational purposes only. We have two water suppliers within our district, Suffolk County Water Authority (SCWA) and Greenlawn Water District. SCWA hydrants are yellow and Greenlawn's are orange. These hydrants are typically maintained with no issues, you will find that the Orange hydrants are substantially shorter and sometimes are very low to the ground making it difficult to open the caps and connect the hoses. There are places that you will see Red or Black hydrants. These colored hydrants are private hydrants and are located within large complexes (example: Fieldstone at Commack, 1126 Jericho Tpke). This type of information is more for the Chauffeur and command as typically these complexes have multiple hydrants that are in a loop all fed from 1 branch off of the main supply line. This becomes a problem with hydrant pressure and or volume of water for the operation. *As stated earlier though, our hydrant hookup in order to get water from it is the same for these types of hydrants.*

Supply Lines: When we talk about supply lines we are talking about either 3" or 5" hoselines. In accordance to our SOG either one of these lines *might* be used to supply our working engine, standpipe/sprinkler system or other appliance depending on the building type and operational needs. There are a few things we need to note about these hoses and how they are packed on our rig.

- **Hose connections:** Otherwise known as couplings, are how multiple lengths of hose are connected together as well as how they are connected to appliances and/or apparatus. These connections are referred to as thread types. In Commack you will find two types of thread.

- **National Standard:** Gender specific, one end of the hose has a male fitting, and the other end has a female fitting. Similar to a nut and bolt, the female end (nut) screws onto the male end (bolt) in order to make a connection. (reference picture to the right)



- **Storz:** Is a sexless thread, meaning that both ends of the hose have the same connection that lock into one another with about a ¼ - ½ rotation turn to the right. Newer style Storz have spring loaded locking latches that will engage once the coupling has been turned enough. Note that the 5" hose is the only hose that has this thread type (reference picture to the left)

- **Hose lengths:** This is how we refer to how long the individual lengths of hose are in feet. As you can see from the chart below that the different hose sizes come in a variation of lengths. So how do we know what we are getting when we pull it off the rig?

- **5" hose:** The typical length of this type of hose is 100 feet. The hose bed should only contain 100' lengths of hose. The smaller sizes will typically be found as a "donut roll" underneath the large diameter intake in the pump panel compartment or in some other designated compartment on the apparatus. These smaller lengths are intended to extend if needed in order to make a connection, the smaller lengths are more manageable than pulling a full additional 100' length if it's not needed. You will also find a short length on the front bumper that is preconnected on one side and has a Storz to 4 ½" female adapter (reference picture to the right) on the other side for the Hydrant. This is what's known as the front suction and it is usually around 15'.



- **3" Hose:** This hose, just like the majority of the other smaller diameter hoses come in a standard 50 foot length. Any hose that is packed in the 3" hose bed will be in 50' increments. Similar to above, the smaller 25' length would be found in some sort of donut roll configuration either under the pump panel or in the chauffeur compartment with the same purpose to extend the line to make a connection if you fall short.

Hose size	100 ft	50 ft	25 ft	Thread Diameter	Thread Type
5" hose	X	X	X	5" Storz	Sexless

3" hose		X	X	2 ½ "	National Standard
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- Hose Beds:** This is the area above the back step where all of the hose is stored. This is considered a “dead bed” which means that all of the hose lengths are connected to each other in their respective areas, but they are not connected to a pump outlet or inlet. This means that once the proper amount of hose is selected, it needs to be separated from the next length of hose at the coupling and then connected to the apparatus inlet/outlet or other appliance/hose depending on what you are using that hose for. While every engine is slightly different, in regard to supply lines, you will find an area or 3” hose and a different area of 5” hose.
 - 5” hose:** packed flat, front to back, side to side in a vertical configuration. As outlined earlier the 5” hose is sexless so there is no specific direction it should be set up in
 - 3” hose:** packed flat, front to back, side to side in a vertical configuration. Unlike the 5”, the 3” is gender specific and needs to be packed in a certain manner. Since we use 3” hose as a “Supply Line” we configure the hose as if we would be connecting it to a hydrant and then proceeding to the fire scene. As mentioned in the Hydrant section, all 3 outlets of a hydrant have MALE threads. Males threads always point towards the fire. In order to connect to the hydrant, we need the FEMALE coupling, so the hose is packed in a way that the FEMALE coupling is pointed out or the first of the two couplings to be pulled off. You will see in your handline class that your handlines are configured the other way because handlines GO TOWARDS the fire so the MALE end would be coming off first. Some companies might pre-attach a “Gated Wye”(double gate) to the end of the 3” Female so you might see that appliance as the first piece to come out of the hose bed but note that the 3” hose is connected to 1 of 2 of the male outlets and the other side has a FEMALE inlet which will hook up to the MALE outlet from the hydrant. It is the same exact thing except we are now putting an appliance between the hydrant and the hose. By using a gated appliance, it allows us to shut that line down without shutting down the whole hydrant and also allows us to add additional lines to the hydrant if the gate has multiple outlets.



Hydrant Operations: Now that we have some background knowledge in hydrants and supply lines we can discuss hydrant operations and how we actually get water to our fire scene. First, we will discuss how and when it is decided to proceed to a hydrant and then we will talk about how to actually hookup and get water to our working engine.

- **Obtaining a water source:** Outside of a rubbish or small car fire, our operations should always include locating a water source (a hydrant). How we decide to hook up hose to that hydrant depends on a few different things. Considerations need to be made mostly for the location of that hydrant and the direction of travel for the engine that is tasked with hooking into it. A topic within itself, but it is always most advantageous to have an Engine at the hydrant. But as mentioned that is a discussion for another class. For the purposes of this class, we are going to discuss the most common ways we obtain water.

- **“Hitting the hydrant”**

- **Steamer (Front Suction):** This involves nosing the engine into a hydrant and utilizing the short length of 5” hose off of the front bumper that is pre-connected to a pump inlet.
 - This is the most advantageous because it typically gets the engine away from the front of the building unless of course the hydrant is in front of the fire building but it also allows for easier troubleshooting if there is an issue with the hydrant and is also extremely necessary if a water relay is needed (discussed later)
 - Having the engine next to the hydrant also makes it very user friendly in the sense of obtaining necessary tools/appliance to hook up the hydrant.
 - One of the issues is that in order to do this the chauffeur needs to have more than accurate placement of the engine to make sure the hose reaches, but is also not so close that it will kink.
 - *Note: Some of the engines have the front suction on a swivel which allows the hose to be manipulated into a position that it won't kink once hooked up to a hydrant but not every engine has this luxury so again placement becomes a huge part of this operation.*



- **Straight Lay/Forward Lay:** You might also hear this called “laying in”. This is a directional term used to describe when we ***proceed from the hydrant to the fire building.***
 - Engine stops at the hydrant
 - Hydrant member gets off, grabs hydrant bag and appropriate hose
 - Wraps (keys) the hydrant (allows hose to play out from hose bed)



- Has apparatus proceed (use hand signal or radio)
- Hooks up the hydrant
- Radios to chauffeur that hydrant is ready and awaits signal to charge
- Open the hydrant by turning counter-clockwise until it stops turning
- ***Note: as a second or third due engine you might be “laying in” to supply the working engine. Be sure if you are on the hydrant that you know who you are supplying so you can communicate with the proper chauffeur***

- **Reverse lay:** This is also a directional term used to describe when we **proceed from the fire building to the hydrant.**
 - This is typically done by a second or third due engine where they would be dropping supply line at the working engine (near the fire building) and then proceed to the hydrant
 - Member will pull the appropriate hose and can utilize a tire of the working Engine in order to allow hose to play out of Engine proceeding to hydrant.
 - Apparatus proceeds to hydrant
 - Members hook up hydrant
 - Preferable to steamer the hydrant with that Engine and then pump through that engine and through the hose that you just reverse laid to the working Engine. Remember whenever possible it is always most advantageous to have an Engine on the hydrant.
 - Second option would be to hook directly to the hydrant.
 - Radios to chauffeur that the hydrant is ready and awaits signal to charge
 - Open the hydrant by turning counter-clockwise until it stops turning
 - ***Note: If doing a reverse lay with 3" hose the couplings will now be backwards, there would be a need for adapters (double male on the working engine end and a double female on the hydrant end) in order to make the proper connection. Remember 5" is sexless so there is no need for adapters when hooking into the Engine but you will need the Storz x 4 1/2 " if you intend on connecting into the hydrant.***
- **Other Terminology**
 - **Back stretching or hand stretching-** This is the manual pulling of hose off of the hose bed to a determined location. Depending on the fire scene an engine might pull just past a hydrant. If it's within a reasonable distance (house or two), whoever is tasked with the hydrant will have to "Back Stretch" to the hydrant. You might have the reverse situation where the Engine stops short and the hydrant is a house or two past where the Engine is, same concept but the terminology would be to "hand stretch" to the hydrant.
 - **Fly stretching:** This is more of an attack line tactic but if the hydrant is only a house or two past the fire building this might be used. This is when we stop at the fire building and the crew stretches an attack line like normal. Instead of the line getting broken and hooked into the stationary engine, the engine actually proceeds to the hydrant dropping more attack line out of the hose bed. This basically just makes a long hoseline but doesn't burden the engine company crew into having to stretch it from so far away. This is a very rare practice and can only be done if the hydrant is within a reasonable distance. Hose lengths and friction loss play a huge factor into this so it's not typical practice. In situations like this the engine will typically proceed past the building and the chauffeur and another crew member will hand stretch a supply line up to the hydrant if within reasonable distance.
- **Overcoming distance:** While we might always think that we have a hydrant within a reasonable distance, that's not always the case. Worst case scenarios we have to set up a water relay or what's sometimes called 'In-line Pumping' using Large Diameter Hose (LDH) or 5"(see diagram below). By doing this and leaving an Engine at the Hydrant, we are able to deliver water over long distances and overcome the friction loss of the distance it needs to travel by having Engines throughout to boost up the pressure to

get to the working Engine.



BOOSTING TO OVERCOME DISTANCE

- **Hydrant Hookup:** This is the terminology for attaching appliances and hose to the hydrant with the intentions of getting water to our working Engine. You might also here the phrase “*dressing the hydrant*”. Whether the Engine is at the hydrant or not, the tools that you are bringing are always the same, you need some type of hose and either a hydrant bag or most of the rigs have a compartment on the front bumper housing all of the necessary equipment. **Once you get situated be sure to flush the hydrant.** Over the years there has been many in depth discussions on the need to flush the hydrant. Bottom line, you never know if the hydrant works or if there might be something that is stuck in there. By flushing it, we know it works, if we don't and we hook everything up and wait for the chauffeur to tell us to charge it and then find out it doesn't work, or we send a bag of chips up the hose just to get clogged then all we did was waste time and create a bigger problem than just finding out there was an issue from the beginning and going on to plan B.
 - **Hydrant bag:** should contain all of the tools and appliances needed to hook up the hydrant. This includes but is not limited to a hydrant wrench, spanner wrenches, gate(s), adapters (2-1/2" double male and 2-1/2" double female) and a rubber mallet.
 - **5" hook-Up**
 - Open front cap and flush the hydrant
 - 5-inch hose threads onto the 4 ½ “ steamer discharge from the hydrant
 - Single gate or Gated Wye on one side typically pointed towards the fire
 - **Note: If you have 2 gates put them both on. More gates the better**



- 3" Hook-Up

- Open side cap in the direction towards the fire building and flush the hydrant
- 3" hose or the gated wye that the 3" hose is pre-connected to gets threaded onto open hydrant outlet
- Place a second gate on the other side 2 ½ discharge.
- ***Remember: if you are reverse laying with the 3" you will need a double female to be attached to the hydrant and a double male at the working Engine.***
- ***Note: There is no need to open the steamer cap if you are not using the 5" this just adds an unnecessary step, you will still get a good "flush" from the 2 ½ " hydrant discharge.***



- **Engine Discharge and Intakes:** The final part of this is understanding where hoses should be hooked onto the Engine. Engines have Discharges and Intakes all throughout the rig. Discharges or outlets pump water away from the engine and Intakes or inlets receive water.
 - **So how do we identify them? For starters they should be color coded and labeled accordingly**
 - Discharges
 - Male thread
 - Top half of the pump panels
 - Typically have a slight elbow slanted downward
 - Intakes
 - Female thread
 - Bottom half of pump panel
 - Straight into rig

Summary: Remember the basics of how the hydrant gets hooked up. **FLUSH THE HYDRANT, EVERYTIME!** Can't stress that enough, don't add to the problems. If a problem exists with the hydrant you want to identify it ASAP. Males go towards the fire, start with remembering this, it will help you when you are thinking of what coupling has to go where. Efforts should always be made to drag hose to the side of the roadway to allow other apparatus access to get up towards the building.

Key Terms

- **Water source/supply:** Hydrant, you might hear, "locate a water source"
- **Hydrant:** This is typically our main water source. Hydrants are fed by water mains
- **Working Engine:** the engine that is pumping all of the attack handlines/ appliances
- **Supply Engine:** Engine supplying water
- **Drafting:** The process of raising water from a static source to supply an engine. This is an operation that we are not typically set up to do and would occur from lakes, ponds or portable tankers
- **Front suction:** The pre-connected 5" hose on the front bumper.
- **Wrap/key/keying a hydrant:** wrapping the hose around the hydrant to anchor it there so the rig can proceed and hose will play out of the hose bed as it goes
- **Flush a hydrant:** Opening a cap and turning the hydrant on to ensure it works and nothing is stuck in it. Flush it for a few seconds, turn it off and continue to hook up the hydrant.
- **Hook up a hydrant:** Process of connecting the hose and gates to the hydrant
- **Gate a hydrant:** Placing a gate on the 2-1/2 outlets allows us to control those lines without shutting down the entire hydrant.
- **Lay a line:** This is what it is called to play out supply line from one spot to another.
- **Charge a line:** the process of putting water into the hose lines. For the purposes of hydrants, charging the line refers to turning on the hydrant in order to put water in the supply line.

References

Hydrant Wrench



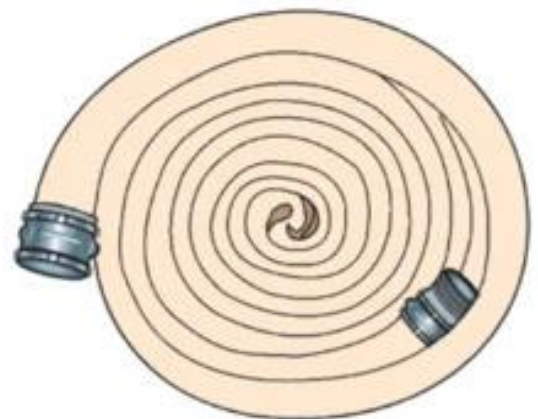
Small Spanner Wrench



Large Spanner Wrench



Donut Roll



Double Male adapter



Double Female adapter



Single Gate



Double Gate/ Gated Wye







Commack Fire Department

Training Division



Badge#	Name:
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Date _ / _ / _

HYDRANTS / SUPPLY LINES

TASK	Pass	Fail	COMMENTS
Identifies hydrant discharges and sizes			
Demonstrates how to properly flush a hydrant			
Identifies supply lines (3" and 5")			
Identifies tools and adapters in hydrant bag by name and use			
Demonstrates how to properly hook up a hydrant for front suction			
Demonstrates how a properly hook up a hydrant with 3"			
Correctly verbalizes what "steaming they hydrant" is			
Correctly verbalizes what a forward lay is			
Correctly verbalizes what a reverse lay is			
Able to identify and tell the difference between intakes and discharges			
Able to hook up hydrant completely with both 3" and 5" scenarios			

PASSED ALL SKILLS

Evaluator:	Signature
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Version #1

Revision #: _____

Date: _____

Revision #: _____

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Revision 1: _____

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