FD International

# Water Supply

# Water Supply

Most common types of water supplies

- Booster tank water
- Hydrant (Pressurized source)
- Drafting (Static source)

# Water Supply

## Booster Tank Water

- Static water source
- Limited amount yet always available
- Common tank sizes
  - Engines 500 – 1500 Gallons
  - Tanker / Pumpers 1500 – 3000 Gallons
  - Quints or other aerial apparatus typically limited to 500 Gallons or less

# Water Supply

## Booster Tank Water

Key Point: Apparatus are not designed to flow their pumps at full capacity with water from the booster tank!

Why you ask?

# Water Supply

## Booster Tank Water

The plumbing from the booster tank to the pump intake is typically only large enough to flow about 75% of the capacity of the apparatus pump.

# Water Supply

# Water Supply

## Fire Hydrants

Two main types:

Dry barrel

&

Wet barrel

# Water Supply

Which type of hydrant is this?

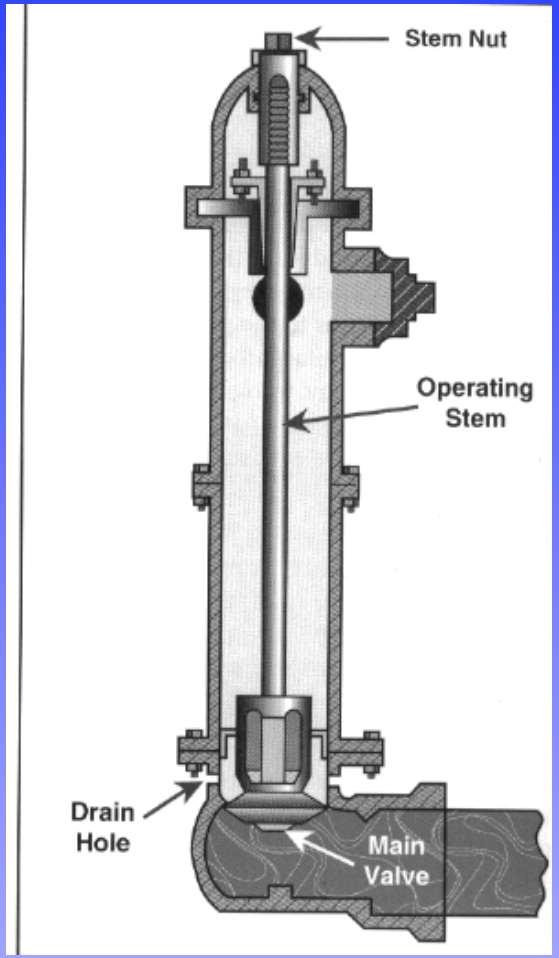
**DRY BARREL**

Characteristics:

- Water is held below anticipated frost line.

- Barrel drains through an opening at bottom of the hydrant.

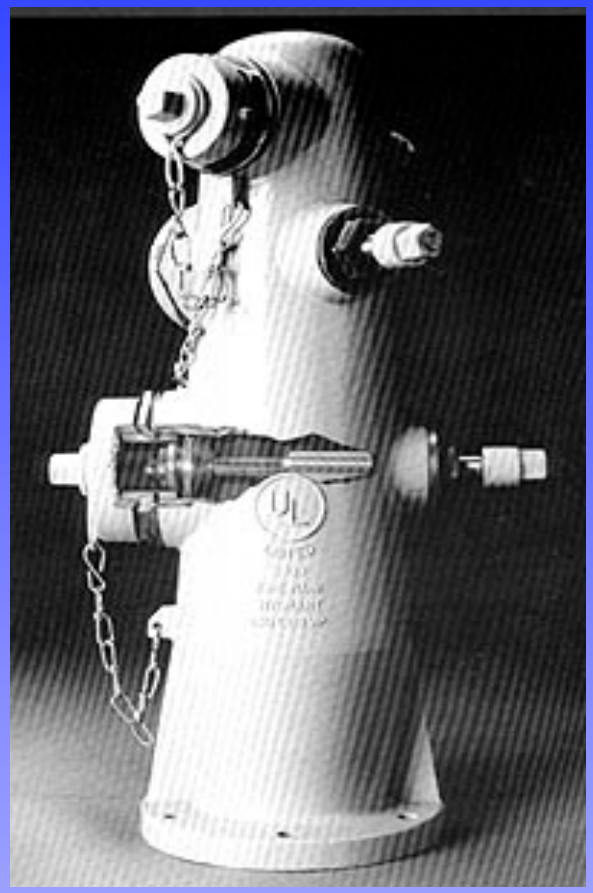
- **Key Point**: Remember to completely open and completely close main valve to prevent water loss



# Water Supply

## Wet Barrel Hydrants

- Common only where freezing is not a possibility.
- Typically have a compression-type valve for each outlet.
- Entire hydrant is always full of water.



# Water Supply

## Hydrant Color Codes

- Know your territory
- Know the emergency contact numbers to your water distribution facility!
- Know if a hydrant is out of service!

| Hydrant Class | Color | Flow |
|---|---|---|
| AA | Light Blue | 1,500 gpm or more |
| A | Green | 1,000 – 1,499 gpm |
| B | Orange | 500 – 999 gpm |
| C | Red | Less than 500 gpm |

# Water Supply

Many fire departments have already calculated the pump discharge pressures for

pre-connected hose lines.

This is not possible for fire hydrants because:

- they are dynamic
- No two hydrants are the same

# Water Supply

Of all of the hydraulic calculations that an engineer is required to know, the most important calculation is to determine how much water you have available to you from a fire hydrant.

Although there are three calculations available, we believe the **percentage method** is the easiest to use.

# Water Supply

How to figure the available water from a hydrant

**Percentage Method**

- Percentage drop = (Static – Residual)(100) / Static
- Example – One line flowing 200 gpm
- Static pressure 70 psi
- Residual pressure 63
- Percentage drop = (70-63)(100)/70
- Percentage drop = (7)(100) / 70
- Percentage drop = 700 / 70
- Percentage drop = 10%

# Water Supply

- Use this chart for the percentage method.
- Note the word **MIGHT** in the lower right box! We will come back to that later.

| % decrease of pumper intake pressure | Additional water available |
|---|---|
| | |
| 0-10% | 3 times amount of water being delivered |
| 11-15% | 2 times amount of water being delivered |
| 16-25% | same amount of water being delivered |
| Over 25% | More water **MIGHT** be available |

# Water Supply

I know what your thinking.  What if I start flowing the initial attack lines off of the booster tank?  Then, how will I know what my static pressure is when I do get a pressurized water supply?

Good question….I'm glad you asked.

Try this "Rule of Thumb" method.

# Water Supply

- 1st - Record the residual pressure on the intake pressure gauge
- 2nd - IF your residual pressure is ***more than*** 80 psi then…
- 3rd - Add 12 PSI to your residual pressure for your ESTIMATED static pressure

# Water Supply

- If your residual pressure is ***less than*** 80 psi, then…

- Add 8 PSI to your residual pressure for your ESTIMATED static pressure.

QUESTIONS?

Clear as mud right!

# Water Supply

After you have your ESTIMATED static pressure, use the estimated static pressure in the percentage method formula.

- Percentage drop = (Static – Residual)(100) / Static
- Example – One line flowing 200 gpm
- Static pressure 70 psi
- Residual pressure 63
- Percentage drop = (70-63)(100)/70
- Percentage drop = (7)(100) / 70
- Percentage drop = 700 / 70
- Percentage drop = 10%

Then use the “percent drop” chart to determine how much water is available.

# Water Supply

So the big question is….How much water do I have available?

ANSWER:

As much as the hydrant will allow you to have! You can **NEVER** flow more than you are receiving!

# Water Supply

It is common for engineers to say they can not flow any additional lines if their intake gauge is at 20 psi.

This in many cases is not true. You maybe challenged with a similar problem during the hands-on portion.

So, be thinking about how you will recognize an attempt to flow more water than you are receiving.

# Water Supply
## Drafting

- Excellent way to obtain a source of water in the rural setting.
- Several different source options… i.e. Lakes, Ponds, Rivers & Swimming Pools.
- Access is always a problem to consider.
- Height of lift is a limiting factor. Consider the chart on the following page.

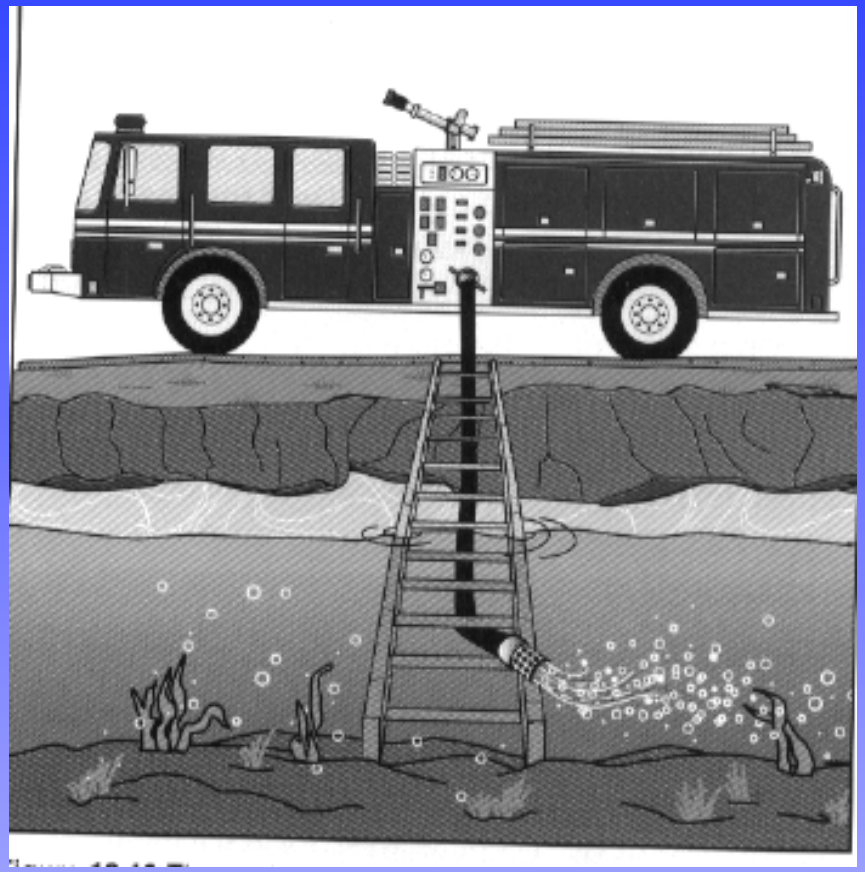
# Water Supply

| Rated Pump Capacity | → | | | 1,250gpm |
|---|---|---|---|---|
| | Feet of Lift | | GPM | |
| | 10 | | 1250 | |
| | 12 | | 1175 | |
| | 14 | | 1100 | |
| | 16 | | 1020 | |
| | 18 | | 900 | |
| | 20 | | 790 | |

# Water Supply

How can you position the hose for lift?

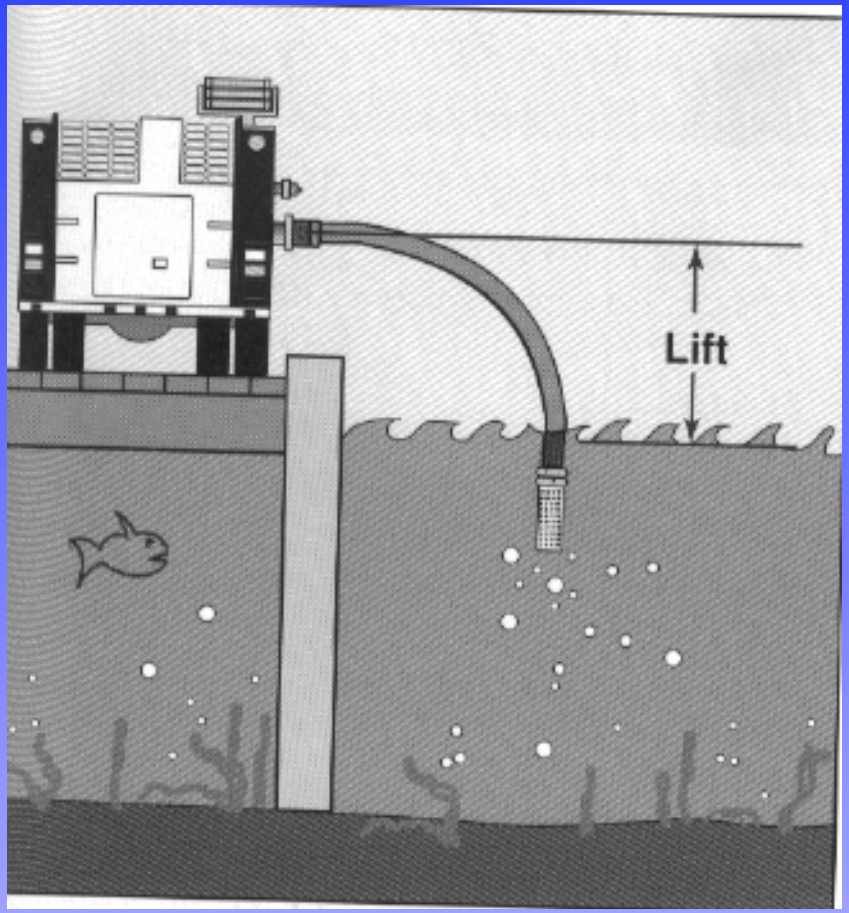
Use a ladder to stabilize the hard suction hose and to help position the end with a minimum of 24 inches of water surrounding.



# Water Supply

**Remember:**

When parking your 30,000 lb. fire truck on a boat dock, firmly connect it to a very large tow truck. Also think about the "Dear Chief" letter you are about to write.

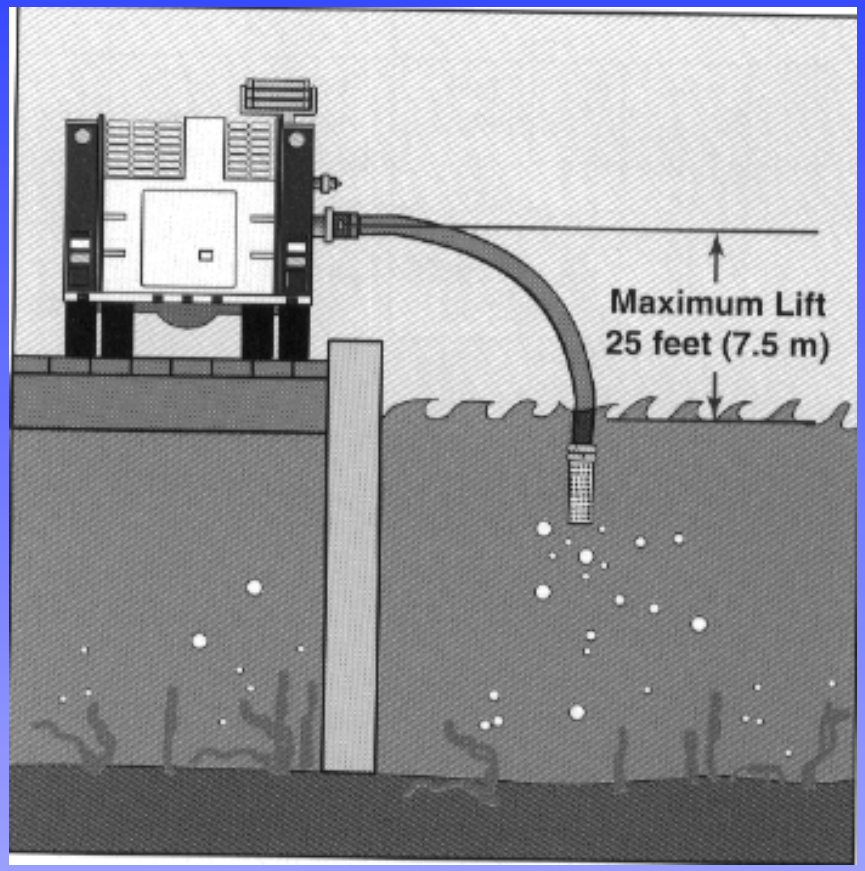


# Water Supply

Fire apparatus pumps are not capable of lifting water more than 25 ft. The amount of lift will also decrease as you go up in altitude.

**Key Point:**

Atmospheric pressure decreases 0.5 psi with every 1000 ft of altitude. Thus, limiting our drafting capabilities.



# Water Supply

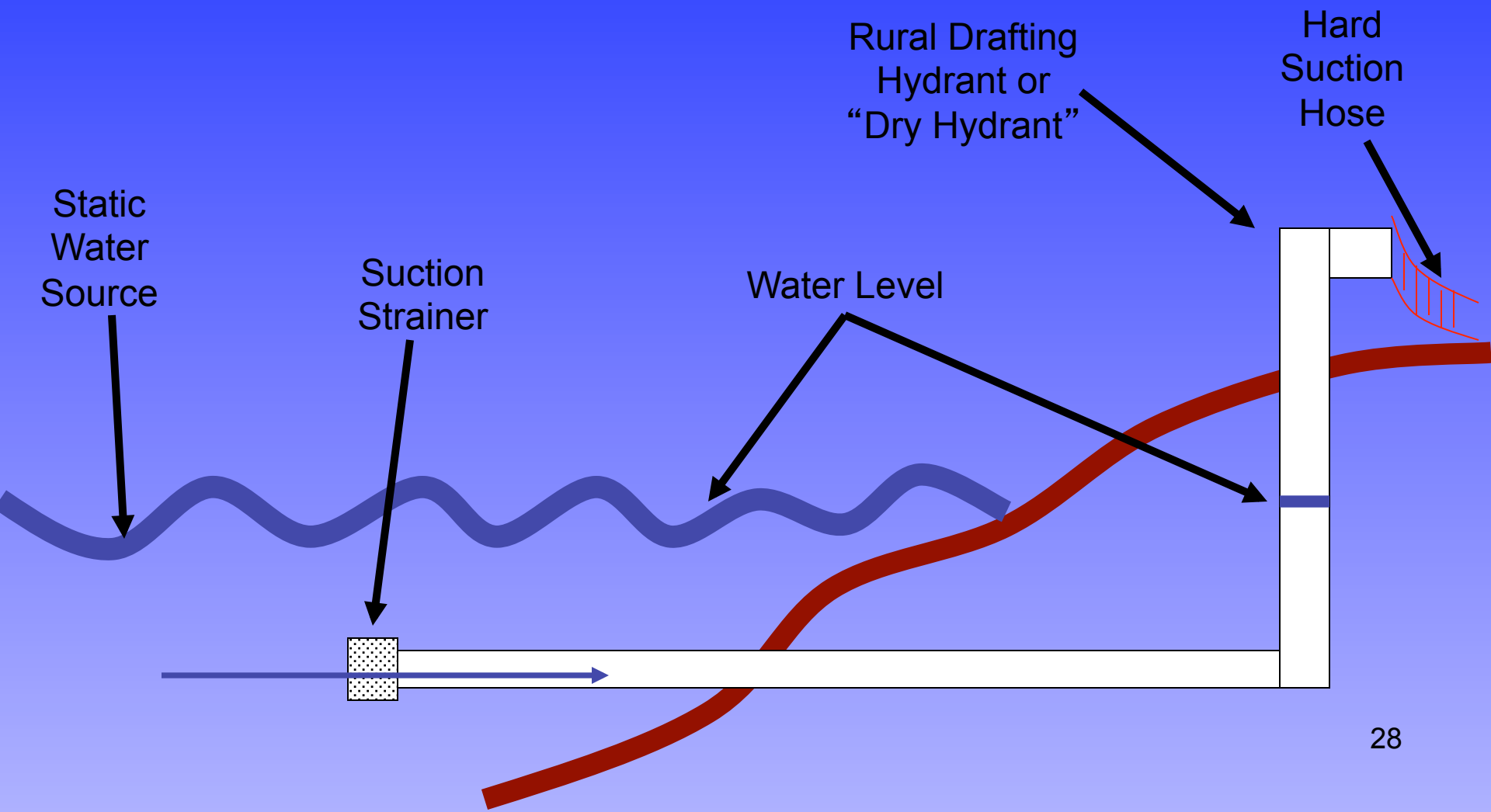
As a general rule, for every one inch of vacuum that is created in the apparatus pump, one foot of water will be lifted.

# Water Supply

**Rural Drafting Hydrant**

- Excellent way to utilize a natural water source in a inaccessible location.
- Makes for faster setup time.
- Government grant funding available for installation.

# Water Supply



# Water Supply

A rural drafting hydrant or “dry hydrant” use the same principle of drafting as a ‘normal’ drafting operation.

The BIG advantage to this type of hydrant is that the engineer still has a source of water, but the engine can be placed well away from the edge of the water.

# Water Supply

## Water Supply Operations

Water Shuttles

Relay Pumping

Dual Pumping
&
Tandem Pumping

# Water Supply

## Water Shuttle

These are sometimes referred to as tender shuttles or tanker shuttles. Water shuttles are commonly employed to supply water to fire scenes that are very remote from the water supply. Many times the distance is to great for relay pumping to be ***practical***. Wildland fires are also a good example in which the water supply is constantly moving forward with the firefighting apparatus.

# Water Supply

## Water Shuttle

- Recommended for distances over a ½ mile or if distance is greater than hose lay capabilities.

Key Point: Your supply line hose size will determine your hose lay length, unless utilizing relay pumping.

- It is critical to have an adequate number of water tankers to maintain necessary fire flow.
- Requires an apparatus at the fill site
- The largest disadvantage of a water shuttle operation is the time it takes to setup and to become efficiently operated.

# Water Supply

## Relay Pumping

Utilizes two or more pumpers to move supply water over long distances.

The pumper at the water source pumps water under pressure to next pumper in line. This pumper takes this water and boosts the pressure in order to send it to the next pumper in line.

# Water Supply

## Relay Pumping

- Water supply must be capable of maintaining the necessary fire flow during the entire incident.
- Establish the relay early enough to make it worthwhile.
- Place the apparatus with greatest pumping capacity nearest to the water source.
- Generally do not supply more than 50 psi to the apparatus pumping at the fire scene.
- When supplying LDH average 25 psi per 100 ft.
- ***NEVER EXCEED*** 200 psi on LDH

# Water Supply

## Relay Pumping

With the 25 psi average, what is the longest hose lay that can be made?

800 ft.

Reason:

200 psi is the maximum test pressure for LDH

# Water Supply

## Relay Pumping

Can relay pumping be utilized on a static water source?

Can you use relay pumping with a pressurized water source?

I know you said… **YES**

# Water Supply

Intake To Intake?

What is wrong with this picture?

# Water Supply

Nothing right?

Absolutely Not!

This is

**Dual Pumping**

Often incorrectly referred to as

***Tandem Pumping***.

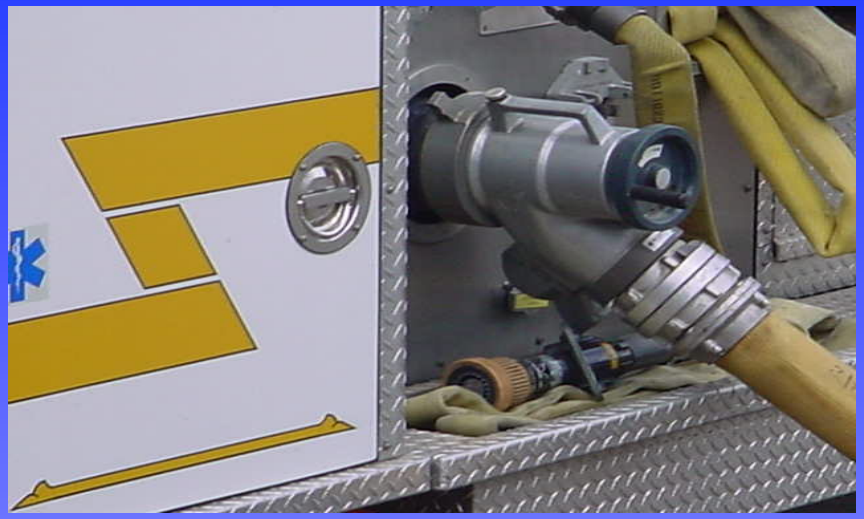
# Water Supply

## Dual Pumping

Operation used to supply water to two pumpers by connecting intake-to-intake.

The first pumper is attached to the water supply and the second receives excess water the first pumper is not using.

# Water Supply




## Dual Pumping

One very strong hydrant can supply water to two separate pumping apparatus.

Ex. You are flowing 1200 gpm but are attached to hydrant capable of flowing 1800 gpm. You could dual pump by attaching the first engine's intake to the second engine's intake and supply them with about 600 gpm.

# Water Supply

## Dual Pumping

**Can dual pumping be used in combination with relay pumping?**

**YES**

This is the wonderful thing about pump operations. Our engineering abilities and imaginations are our limitations. Granted we must have the water and apparatus available. I encourage you to look beyond the "*way we have always done it*" of the past and be creative. The future of the fire service is counting on us to move forward and not be afraid to look at new ideas and welcome change.

# Water Supply

## Tandem Pumping

Used when the pressure needed are higher than the capabilities of a single pump.

The pumper at the water supply discharges to the intake of the attack pumper. This pumper can now boost the pressure even more to reach the desired pressure.

# Water Supply

## Tandem Pumping

-Often used when pressures that are needed are more than one pumping apparatus is capable of supplying.

-Name a couple of scenarios where tandem pumping could be beneficial.

- High rise sprinkler or standpipe systems.
- When pumping water up steep grades.

# Water Supply

## Tandem Pumping

Sounds very similar to relay pumping, right.

Let's separate the two operations.

Relay Pumping- Used to move ***supply water*** over long distances.

Tandem Pumping- Utilized to overcome ***pump pressure*** needs by placing two pumps into series operation.

# Water Supply

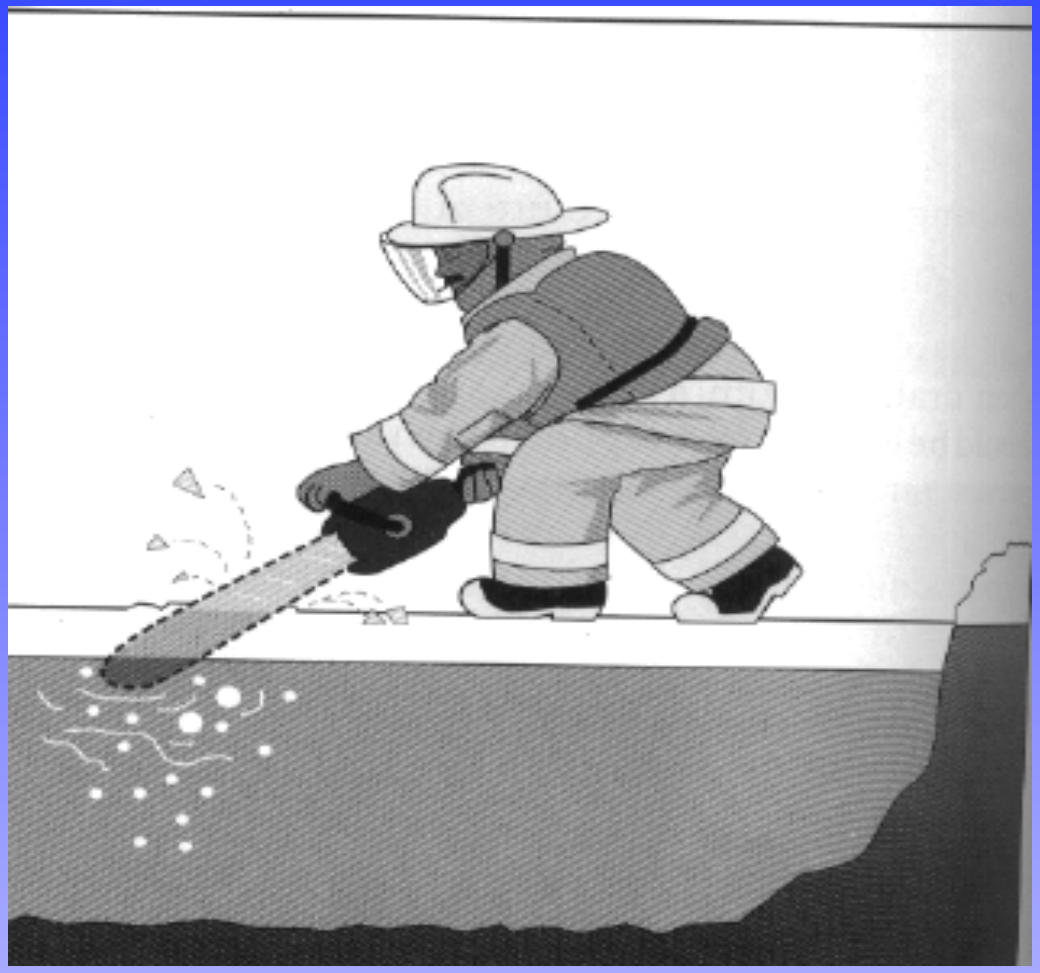
Think outside the box!

Use everything to your advantage!

Training evolutions are a great time to experiment and try new techniques. Don't limit yourself just because someone has told you "that's the way we have always done it."

# Water Supply

**NOT LIKELY IN TEXAS!!!**



# Water Supply

## Summary

We must know where we are going to receive our water supply and be confident that it will sustain our fire flow needs throughout the entire incident.

**BUT…**

If you, the engineer, experience a momentary or long term loss or partial loss of water you ***MUST*** know how to…

- 1st Recognize the problem.
- 2nd Determine how you are going to handle the situation.
- 3rd Make quick short term adjustments, at the pump panel, to cure the problem.
- 4th Determine what the long term cure for the problem is.
- 5th Notify the Incident Commander of the problem and tell them what you need to stabilize the issue.
- 6th Stabilize the problem!