



The 2 1/2” Wye Line

An in-depth look at the capabilities of this flexible hose lay.

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CRFD Hydraulics

- 150’ Finish Load, 15/16” smooth bore nozzle flowing 185 gpm = 125 psi
- One smooth bore Finish Load = 10 psi per 100 feet of 2.5” hose
- Two smooth bore Finish Loads = 30 psi per 100 feet of 2.5” hose
- 10 psi for wye appliance flowing over 350 gpm
- 5 psi per floor or for every 10 feet of elevation

The addition of the 2.5-inch Wye Line has greatly enhanced the operational effectiveness of the Castle Rock Fire and Rescue Department Engine Companies. Companies can now quickly and efficiently deploy long and complicated stretches at apartment complexes, large square footage homes, and homes with large set backs to name a few. In the past crews had to carry, and combine a 100 foot hotel pack with fog nozzle, then deploy a static bed of 2.5” hose at the point of entry to the fire. The current set up is much

more efficient and consists of *(from the bottom of the hose bed up)* 600 feet of static 2.5” with the last 100 feet split into two stacked, 50 foot dog eared layers, a pre-connected 2.5” to 1.5” gated wye, finished off with 150 feet of 1.75” with a 15/16” smooth bore nozzle. This load is commonly referred to as “The Finish Load” “The Horse Shoe” or “The Wye Line”.

This hose bed can also be utilized as a static stretched 2.5” attack line. The Finish Load is removed including the gated wye and replaced with a 2.5” nozzle.





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The company now has the ability to quickly put up to a 600 foot 2.5" attack line into operation, preferably with a smooth bore nozzle to keep operating pressures lower and the line more manageable. On a side note the maximum stretch of 2.5" for a single CRFD Engine Company is 850 feet. This lay would consist of all the 2.5" hose on the Engine, a 2.5" smooth bore nozzle with a 1 1/8" tip flowing 266 gpm, 15 psi friction loss per 100 feet of 2.5" resulting in a pump discharge pressure of around 177 psi. Additionally, let's not forget that the blitz line and the Finish Load bed can also be used to quickly deploy portable master streams. The hose lay possibilities are endless, but the maximum distance possible by a single Company with just 2.5" is worth reviewing.

Possible Stretches

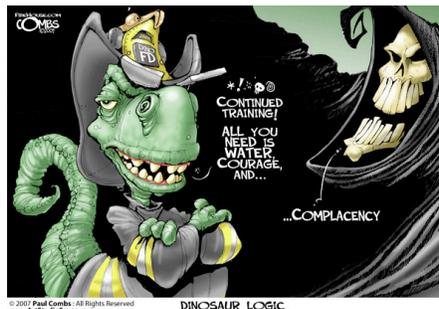
- Garage Alleys
- Alleyways
- Craig and Gould
- Meadows Town Center
- Apartments / Town Homes
- Large Set Backs
- Large Square Footage Homes
- Reverse Lays
- Need another 1.75" line?
- Many more possibilities and situations

WHAT IS THE FINISH LOAD REALLY CAPABLE OF?

Firefighters, Engineers, Company Officers, and Incident Commanders alike need to know the capabilities of the Wye Line, and more importantly it's limitations.

Take the following scenario: The first due Engine arrives on-scene at a structure fire and stretches the Finish Load. The 2.5" Wye Line is 400 feet long. Quick! Can you add a second Finish Load to the first due Engine's Wye line? The answer is NO!

The maximum **safe** stretch of the Wye Line with two Finish Loads flowing smooth bore nozzles is 300 feet, and that is with zero elevation. Let's take a look at the numbers and figure out why 300 feet is our cut off for two Finish Loads flowing from one Wye Line.



As we know the Finish Load consists of a gated wye, 150 feet of 1.75" hose, and a smooth bore nozzle with a 15/16" tip which flows 185 gpm. This load requires 125 psi to flow 185 gpm. When supplying one Finish Load the friction loss in the 2.5" Wye Line is 10 psi per 100 feet. When supplying two Finish Loads the friction loss in the 2.5" Wye Line jumps up to 30 psi per 100 feet. Why the big jump in friction loss? Because you are now flowing 370 gpm through your 2.5" Wye Line. Also note that

because the wye appliance is now flowing over 350 gpm a one time addition of 10 psi must be added into determining the overall PDP (pump discharge pressure). So add it up, 90 psi for the 2.5", 10 psi for the wye appliance, 125 psi to for the Finish Load. Grand Total? 225 psi PDP for a 300 foot lay. Remember that this is not including any elevation. Elevation requires an addition of 5 psi per floor or for every 10 feet of elevation. Utilizing 300 feet as the maximum stretch when two lines are going to be placed into service leaves room for the addition of elevation to the PDP. For the Engineer's out there, also don't forget that when pumping at 200 psi your pump is putting out 75% of it's rated capacity and at 250 psi the pump is mustering up 50% of the rated pump capacity.



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Now if you think that is complicated start changing nozzles around. Add one Fog nozzle to the equation. I highly recommend that you get out your pump chart, a calculator, a cup of coffee and start drawing things out. Just remember that when you start playing with all the numbers that todays fire flows require 185 gpm based on the BTU's put out at residential structure fires nowadays.

elevated pump discharge pressures, a single water supply and two attack lines relying on a single 2.5" line there are too many variables putting firefighters at risk. Pump failure, a burst length, a bad water supply are all realistic scenario's. When Wye Line / Finish load stretches are deployed, separate Engines, stretches, and water supplies should be utilized as soon as possible based on available resources.



STRATEGIC CONSIDERATIONS

When utilizing the Wye Line to flow two attack lines at a structural fire, Incident Commanders should ensure that they are not "putting all their eggs in one basket". With the

Don't forget that very long stretches are easily made with the Wye line, as long as only one Finish Load is placed into operation keeping PDP manageable.

The Wye Line and Finish Load concept has increased the versatility and efficiency of the CRFD Engine Company's. The possible variations and combinations of this lay are limitless. Forward lays, reverse lays, rope drops, alley lays, mansions, apartment buildings etc. etc. Like any other tool on the rig though it does have it's pro's and con's, it's limits and appropriate uses. Get out and flow this line. Try out all the different ways your company could

deploy it. What really happens to your handline when one of two Finish Loads is shut down and you are pumping the Wye Line at 225 psi? Throw a fog on there. Our company found that the fireground hydraulics were running the lines a little "hot" and that the streams were of poor quality. Backing off by 10 psi seemed to do the trick. Try it out.....pass it on.



Thanks to Lieutenant Eckels and Engineer Bersagel-Briese for their hard work implementing the Wye Line / Finish Load within the CRFD. Also thanks to my crew Engineer Piper and Firefighter Allen for helping knock the rust off of my Engine Company operations upon transferring to the Engine.