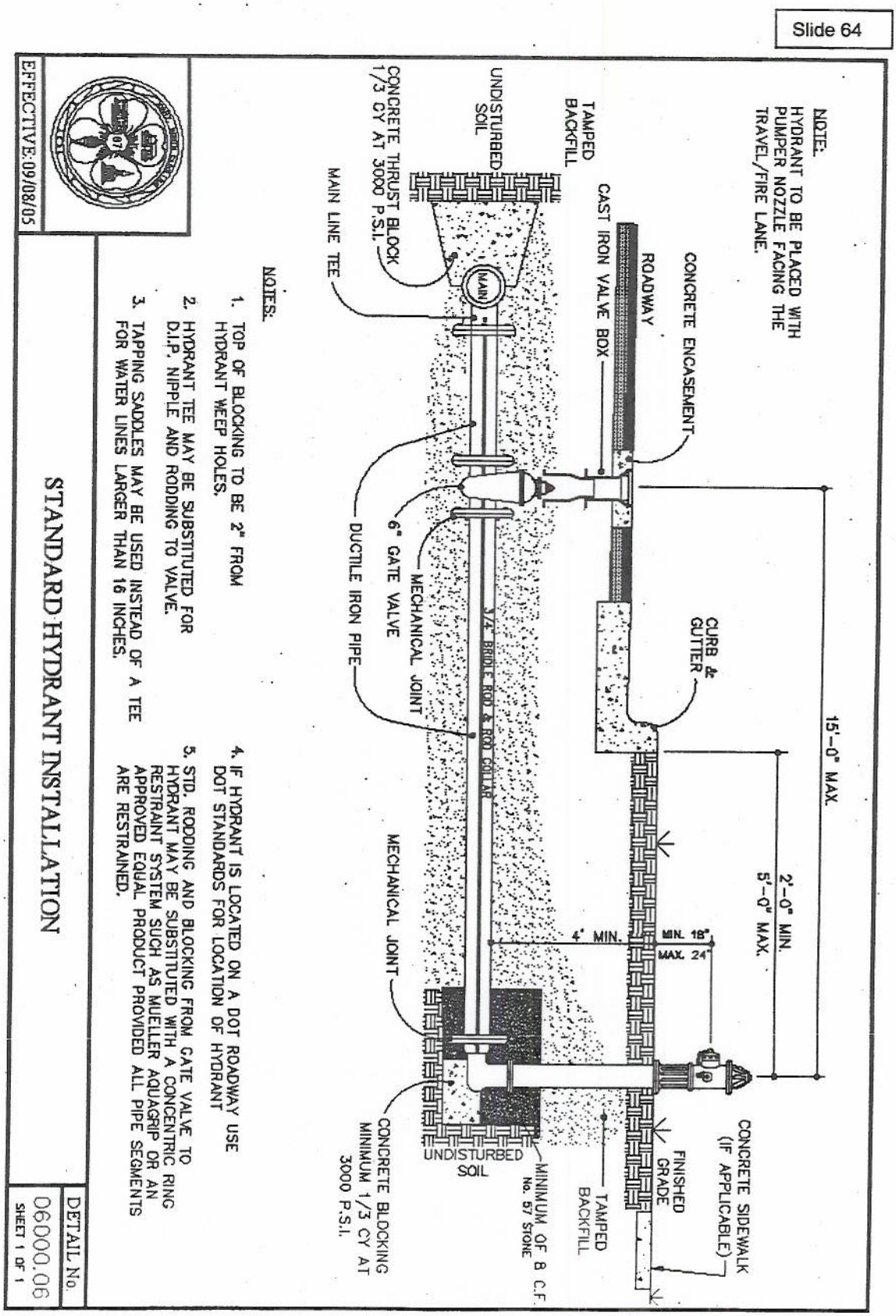
Changeover Procedures

Slide 131

Step 1	Position the apparatus in a safe position, and immobilize it by setting the parking brake and blocking the wheels.
Step 2	Engage the pump and select the proper gear in the road transmission. Lock the gear into place.
Step 3	Open the tank-to-pump valve.
Step 4	Set the transfer valve to the SERIES (PRESSURE) position if necessary.
Step 5	Increase the throttle setting to obtain the desired pressure, prime if necessary.
Step 6	Set the relief valve or pressure governor.
Step 7	Open the circulator valve or partially open the tank fill valve.
Step 8	When an external water supply becomes available, reduce the discharge pressure by 50 psi. Open the intake valve while closing the tank-to-pump valve. Check the discharge pressure and adjust as needed. Readjust the pressure relief device. (If equipped with a pressure relief device, the reduction of 50 psi will be approximately the needed discharge pressure when the incoming water source valve is opened completely and the bleeder valve closed) Remember the tank fill valve was opened in Step 7. Adjust the flow of the tank fill as needed. Readjust the throttle and check the setting of the relief device. If necessary, the electronic governor will adjust automatically when the incoming line is opened.
Step 9	Check to make sure the tank to pump valve is closed completely. The older pumpers may not be equipped with a check valve in the tank-to-pump line, causing the tank to back fill.

Slide 64



NOTES:

1. TOP OF BLOCKING TO BE 2" FROM HYDRANT WEEP HOLES.
2. HYDRANT TEE MAY BE SUBSTITUTED FOR D.I.P. NIPPLE AND RODDING TO VALVE.
3. TAPPING SADDLES MAY BE USED INSTEAD OF A TEE FOR WATER LINES LARGER THAN 16 INCHES.
4. IF HYDRANT IS LOCATED ON A DOT ROADWAY USE DOT STANDARDS FOR LOCATION OF HYDRANT
5. STD. RODDING AND BLOCKING FROM GATE VALVE TO HYDRANT MAY BE SUBSTITUTED WITH A CONCENTRIC RING RESTRAINT SYSTEM SUCH AS MUELLER AQUAGRIP OR AN APPROVED EQUAL PRODUCT PROVIDED ALL PIPE SEGMENTS ARE RESTRAINED.

EFFECTIVE: 09/08/05

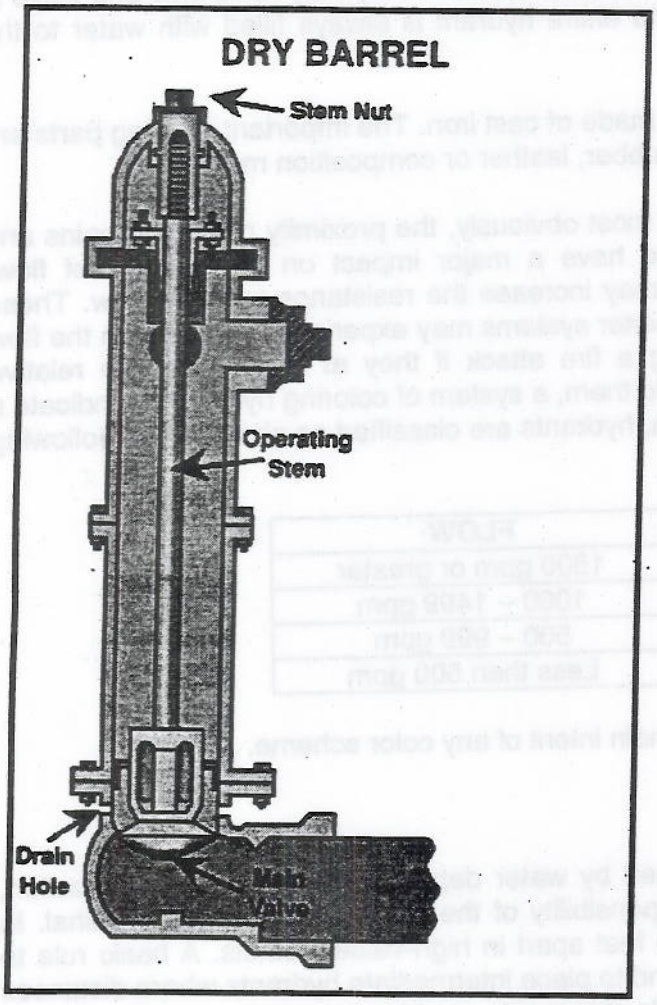
STANDARD HYDRANT INSTALLATION

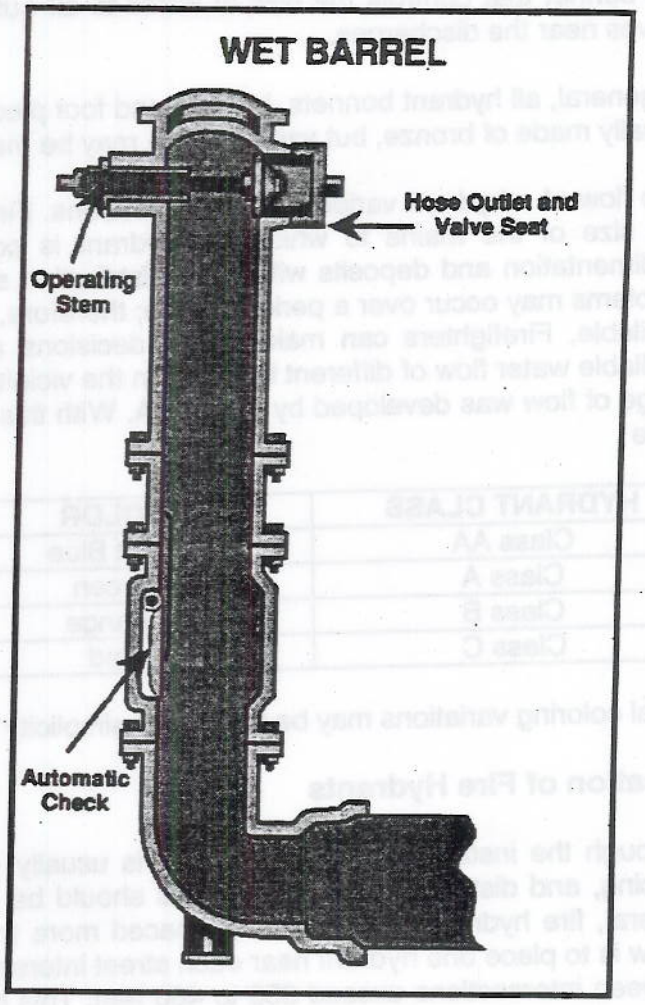
DETAIL No. 06000.06

SHEET 1 OF 1

Fire Hydrants

NFPA 1001: 3-3.14; 3-3.14(a); 4-5.4; 4-5.4 (a); 4-5.4 (b)





The two main types of fire hydrants are dry barrel and wet barrel. The dry-barrel hydrant, used in climates where freezing weather is expected, is usually classified as a compression, gate or knuckle-joint type that opens either with pressure or against pressure. The actual valve holding back the water is well below ground, below the anticipated frost line for that geographic location. When the hydrant is closed, the barrel from the top of the hydrant down to the main valve should be empty. Any water that remains in a closed, dry-barrel hydrant empties through a small drain at the bottom of the hydrant near the main valve. This draining feature of a dry-barrel hydrant is very important in determining hydrant usability. The drain on the dry-barrel hydrant is open when the hydrant is not flowing water and is closed when the hydrant is operating. If the hydrant is not completely open, the drain is left partly open. The resulting flow from the hydrant contributes to ground erosion. This explains the old adage that a hydrant must be completely open or completely shut – there is no halfway point.

The hydrant's ability to drain may be tested in the following manner: after allowing the hydrant to flow some water, close it and cap all discharges except one. Place a hand over the discharge. At this time, a person should feel a slight vacuum pulling the palm toward the discharge.If this vacuum is not felt, notify the waterworks authority and have them inspect the hydrant because it is probably plugged. If this situation occurs cold climates, the hydrant must be pumped to prevent the water from freezing.

Wet-barrel hydrants may only be used in areas that do not have freezing weather.
Wet-barrel hydrants usually have a compression- type valve at each outlet, or they may have only one valve in the bonnet that controls the flow of water to all outlets. The entire hydrant is always filled with water to the valves near the discharges.

In general, all hydrant bonnets, barrels, and foot pieces are made of cast iron. The important working parts are usually made of bronze, but valve facings may be made of rubber, leather or composition materials.

The flow of a hydrant varies for several reasons. First, and most obviously, the proximity of feeder mains and the size of the mains to which the hydrant is connected have a major impact on the amount of flow. Sedimentation and deposits within the distribution system may increase the resistance to water flow. These problems may occur over a period of time; therefore, older water systems may experience a decline in the flow available, Firefighters can make better decisions affecting a fire attack if they at least know the relative available water flow of different hydrants in the vicinity. To aid them, a system of coloring hydrants to indicate a range of flow was developed by the NFPA. With this system, hydrants are classified as shown in the following table

HYDRANT CLASS	COLOR	FLOW
Class AA	Light Blue	1500 gpm or greater
Class A	Green	1000 – 1499 gpm
Class B	Orange	500 – 999 gpm
Class C	Red	Less than 500 gpm

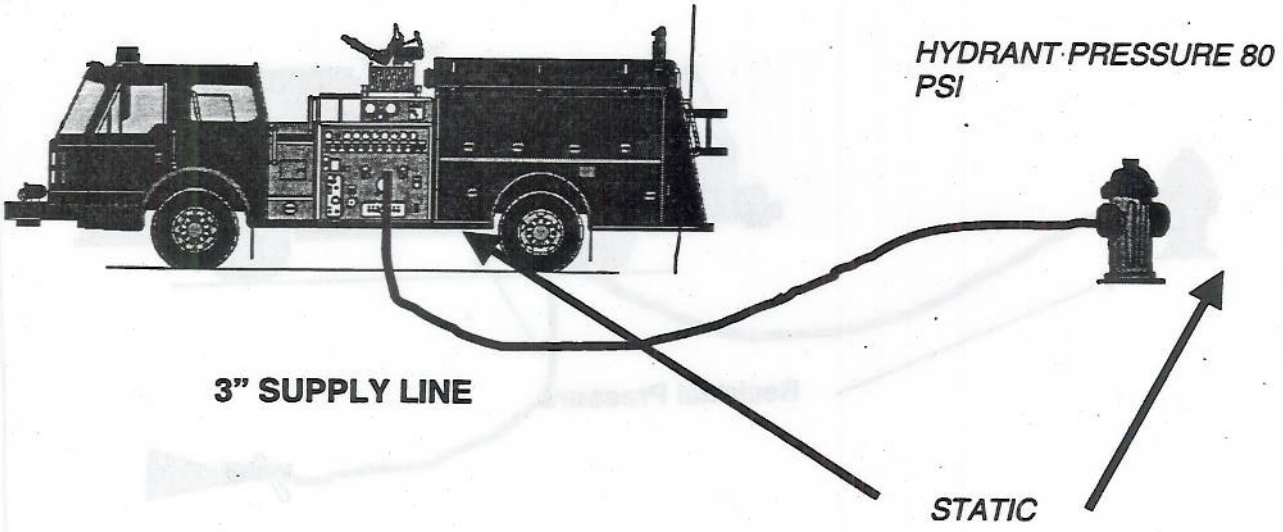
Local coloring variations may be found, but simplicity is the main intent of any color scheme.

ocation of Fire Hydrants

Although the installation of fire hydrants is usually performed by water department personnel, the location, spacing, and distribution of fire hydrants should be the responsibility of the fire chief or the fire marshal. In general, fire hydrants should not be spaced more than 300 feet apart in high-value districts. A basic rule to follow is to place one hydrant near each street intersection and to place intermediate hydrants where distances between intersections exceed 350 to 400 feet. This basic rule represents a minimum requirement and should be regarded only as a guide for spacing hydrants. Other factors more pertinent to the particular locale include types of construction, types of occupancy, congestion, the sizes of water mains, required fire flows and pumping capacities.

FIREGROUND HYDRAULICS

Static Pressure - Stored potential energy that is available to move water through pipes, hoses and appliances. This pressure is shown on the compound gauge with NO water flowing.

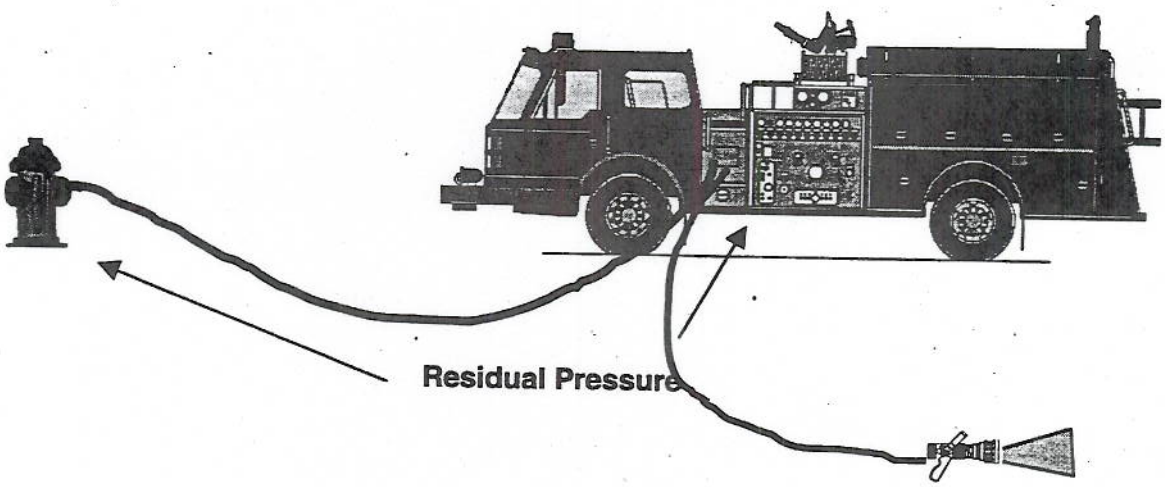


NOTE: Static pressure will be the same at any point in a closed system if the elevation is the same, regardless of the diameter of the waterway.

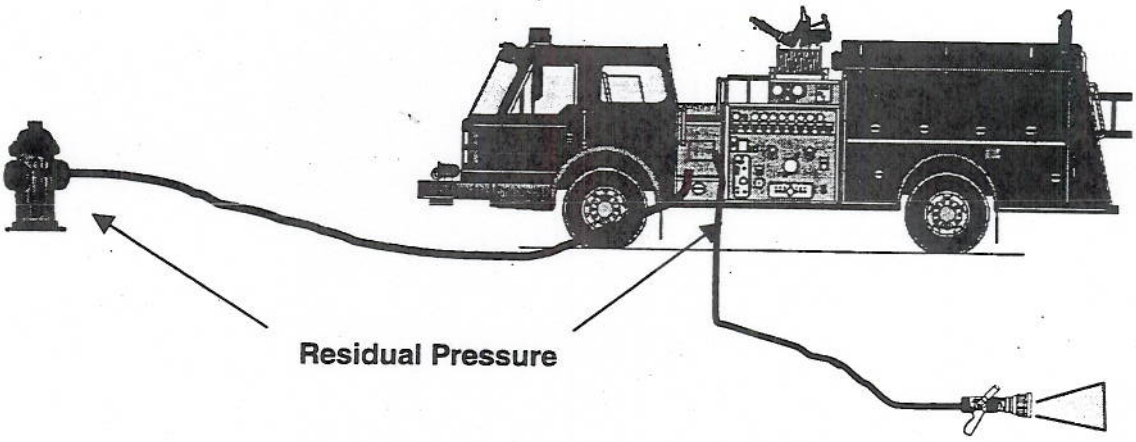
Operating Pressure – Pressure in the water distribution system under normal demand for domestic and industrial use. (Shows as static pressure on the compound gauge).

Residual Pressure - Kinetic energy that is available to perform work.
Water pressure that is not used to overcome back pressure due to elevation or friction loss.

Shown on the compound gauge **with water flowing.**

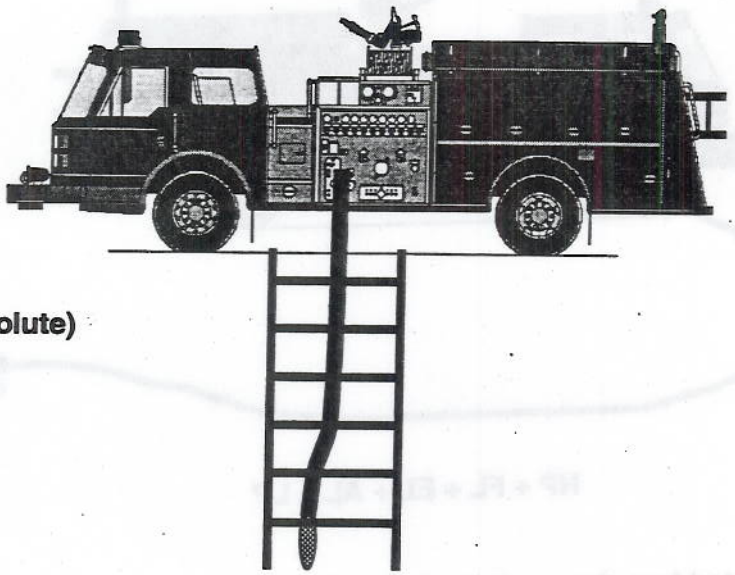


Residual pressure will vary at different points due to elevation and friction loss.



Why is there a difference between the residual pressure at the hydrant and that at the ction side of the pump?

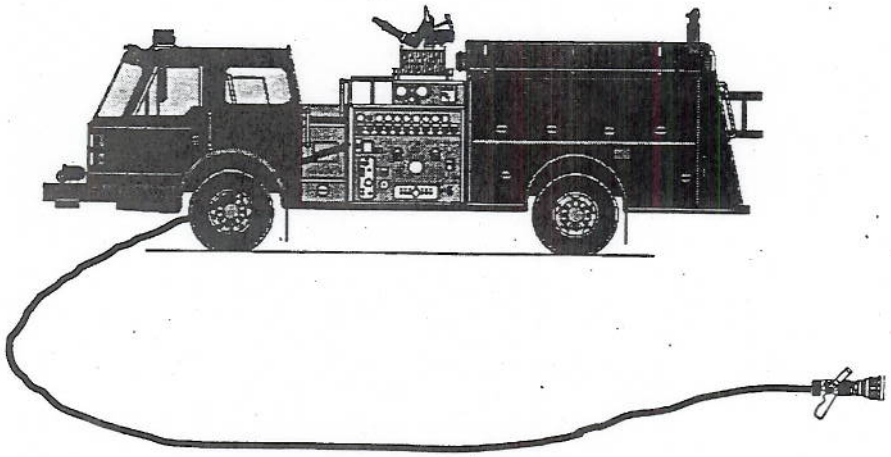
Negative Pressure – any pressure less than atmospheric



14.7 psia
(per square inch absolute)

	Height of Lift	Suction Size	Inches Hg
Single Suction	20'	4-1/2"	Approximately 7
	20'	5"	Approximately 7.5
	20'	6"	Approximately 7
Dual Suction			
	20'	5"	Approximately 2
	20'	6"	Approximately 2

Line Pressure – Pressure required to provide proper nozzle pressure with a given hose layout.



NP + FL + EL + AL = LP

Line pressure is usually calculated from the nozzle back to the pump.

Discharge Pressure – in situations requiring multiple lines, the pump must develop adequate pressure for the line receiving the greatest pressure and all other lines run at reduced pressure (gated back).

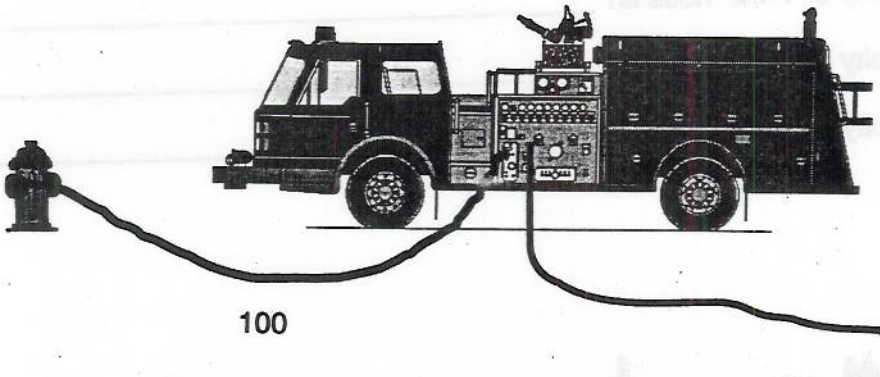
Pressure Source Evaluation – Static/Residual Rule

Pressure drop 10% / 15 = 3x present flow still available

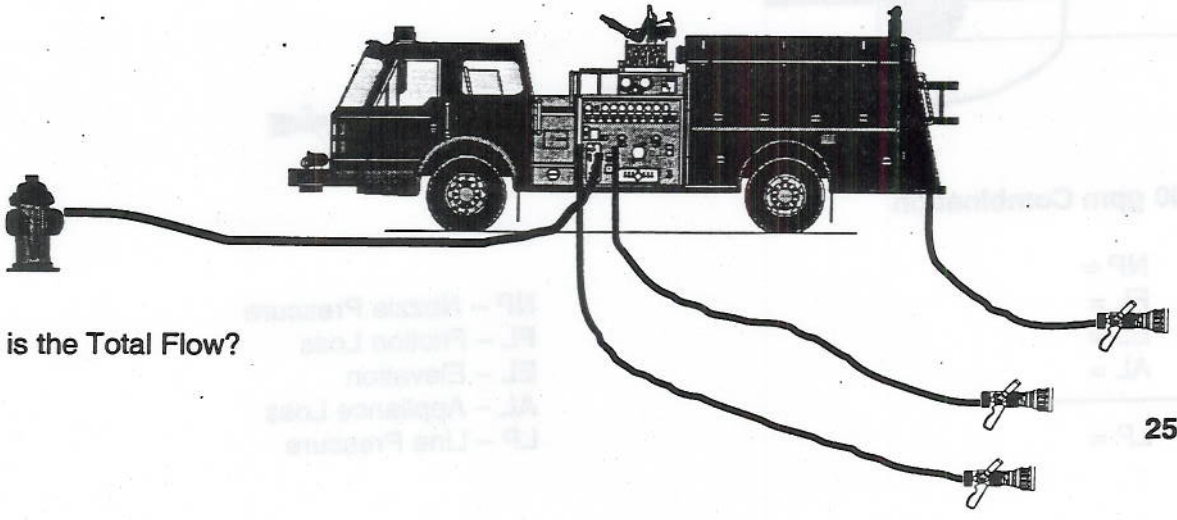
Pressure Drop 15% / 25 = 2x present flow still available

Pressure Drop more than 25% = 1x present flow still available

These calculations are an approximation and decisions must be balanced by the pump operator's judgment.



Static Pressure 100
psi
Residual Pressure 85 psi
Pressure Drop 15%
500 gpm still available



What is the Total Flow?

NO ADDITIONAL 250 GPM LINES MAY BE RUN.
AVAILABLE FLOW IS LESS THAN 250 GPM.

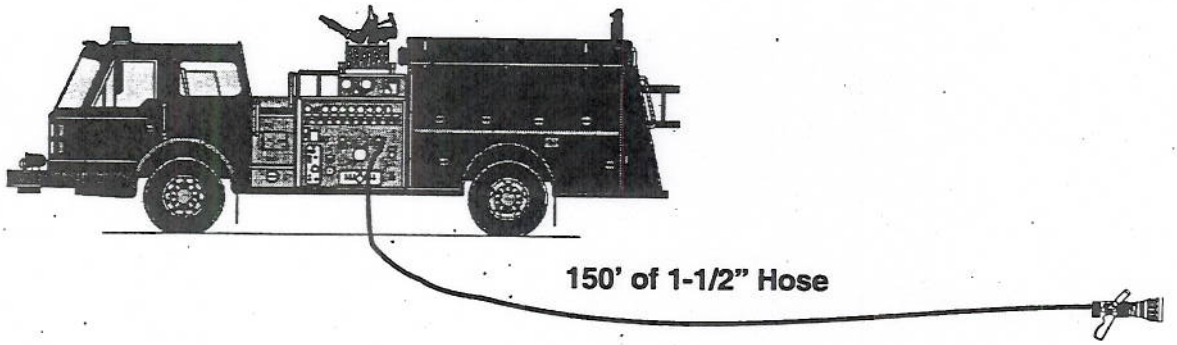
FLOW	1-1/2" Hose FL/100'	1-3/4" Hose FL/100'	2" Hose FL/100'
50 gpm	10 psi	5 psi	
80 gpm	20 psi	10 psi	
100 gpm	30 psi	15 psi	
125 gpm	50 psi	25 psi	10 psi
150 gpm		30 psi	15 psi
200 gpm		60 psi	25 psi
250 gpm			40 psi
300 gpm			55 psi

Required fire flow for a structure or car fire is 100 gpm.

The efficient carrying capacity of 1-1/2" hose is? _____

The efficient carrying capacity of 1-3/4" hose is? _____

The efficient carrying capacity of 2" hose is? _____

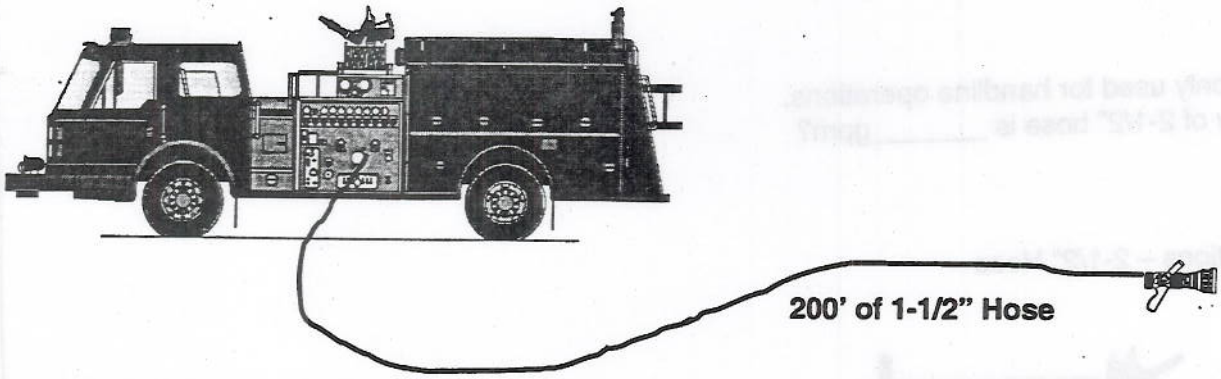


100 gpm Combination

NP =
FL =
EL =
AL =

LP =

NP – Nozzle Pressure
FL – Friction Loss
EL – Elevation
AL – Appliance Loss
LP – Line Pressure

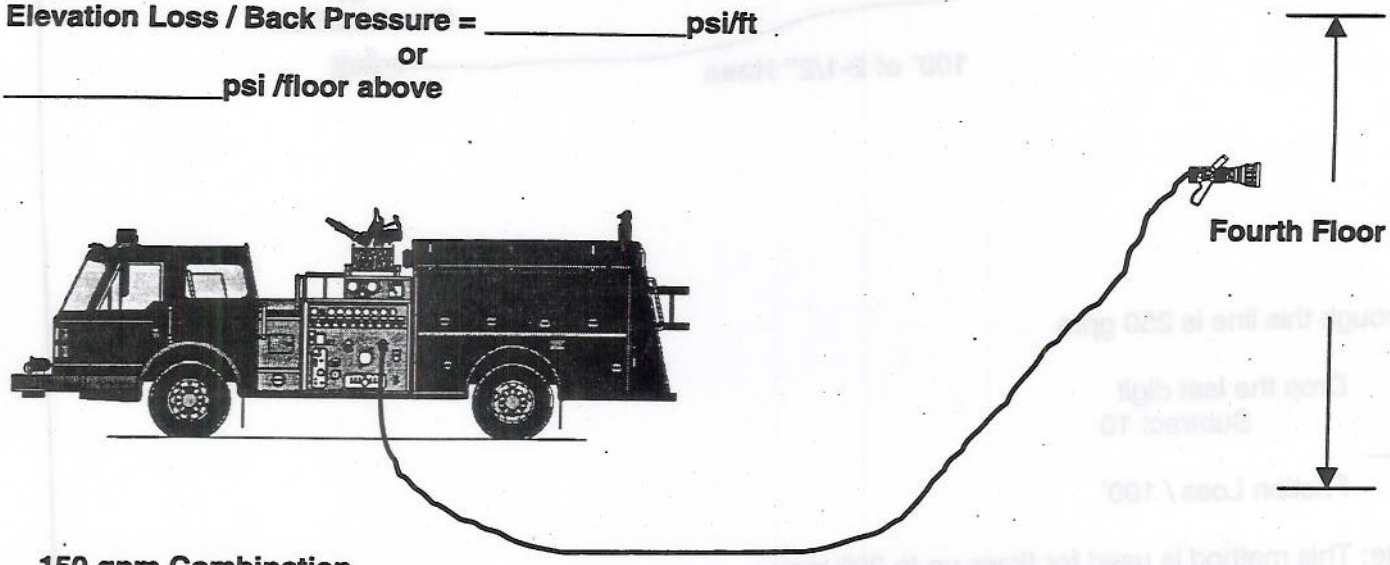


100 gpm Combination

NP =
FL =
EL =
AL =

LP =

Elevation Loss / Back Pressure = _____psi/ft
or
_____psi /floor above



150 gpm Combination

250' of 1-3/4" Hose

NP =
FL =
EL =
AL =

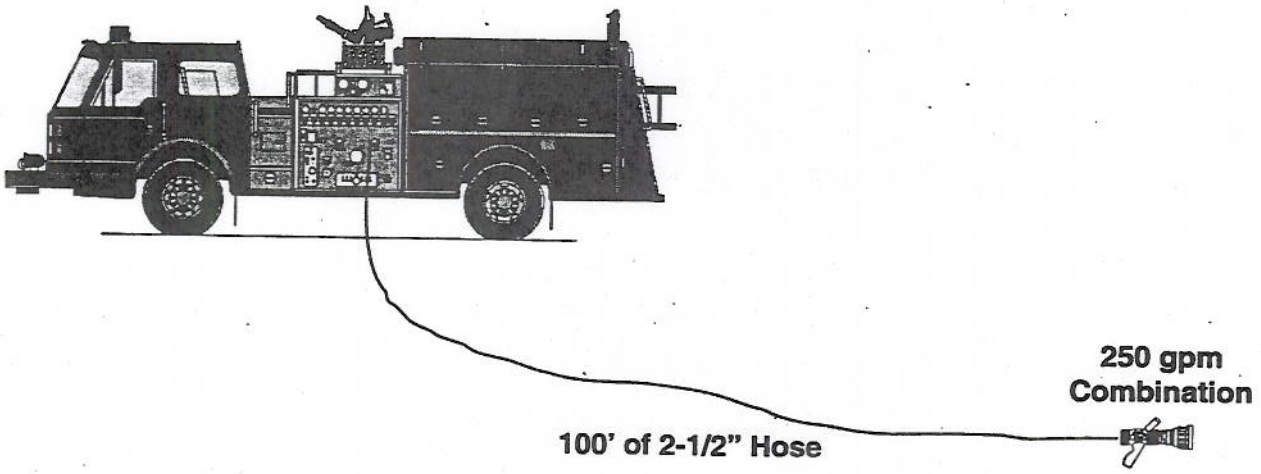
LP =

Elevation should be considered at any level above the first floor or comparable distance. One floor = approximately 10'.

2-1/2" Hose

2-1/2" hose is commonly used for handline operations.
The carrying capacity of 2-1/2" hose is _____ gpm?

Friction Loss Calculations – 2-1/2" Hose



The flow through this line is 250 gpm

250	Drop the last digit
-10	Subtract 10
15	Friction Loss / 100'

Note: This method is used for flows up to 399 gpm.

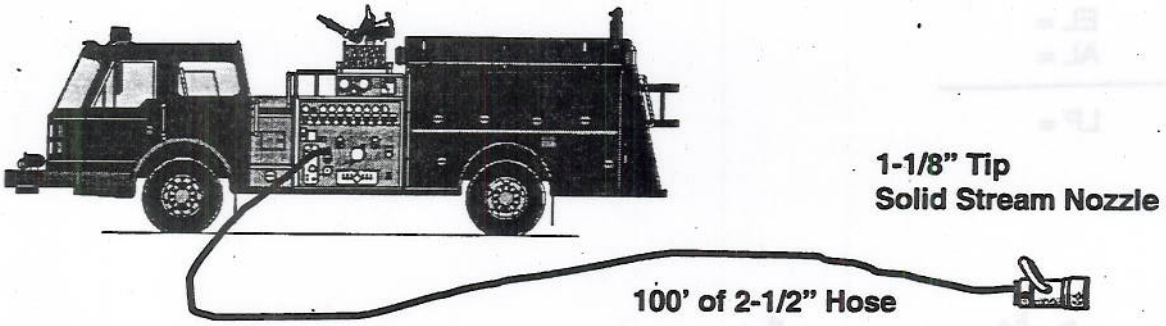
NP =
FL =
EL =
AL =

LP =

With 2-1/2" hand lines, solid stream nozzles are often used for maximum reach and penetration. With solid stream nozzles, tip size (diameter) is known and flow must be determined. Three tip sizes are normally used on 2-1/2" handlines.

1"	200 gpm
1-1/8"	250 gpm
1-1/4"	300 gpm

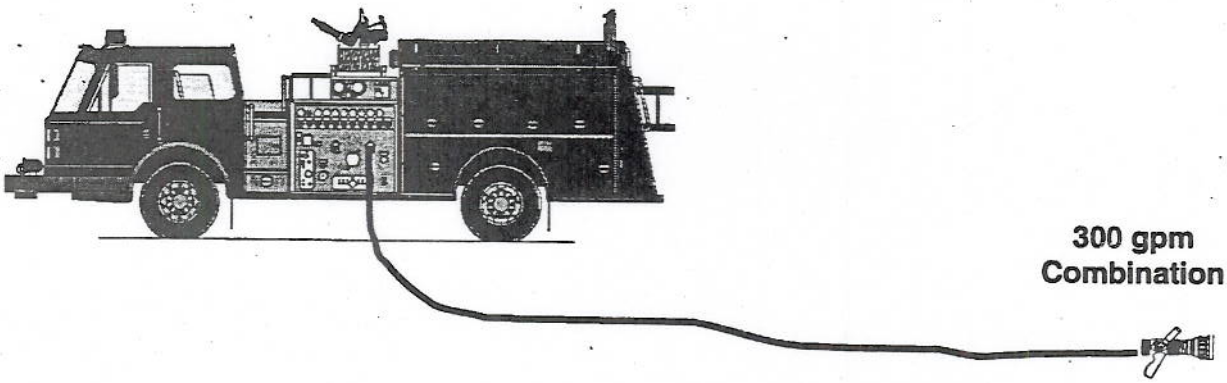
Nozzle pressure for solid stream handlines is 50 psi.
For each increase of 1/8", flow increases by _____gpm.
If a tip size of 7/8" is given, flow will be _____gpm.



NP =
FL =
EL =
AL =
_____
LP =

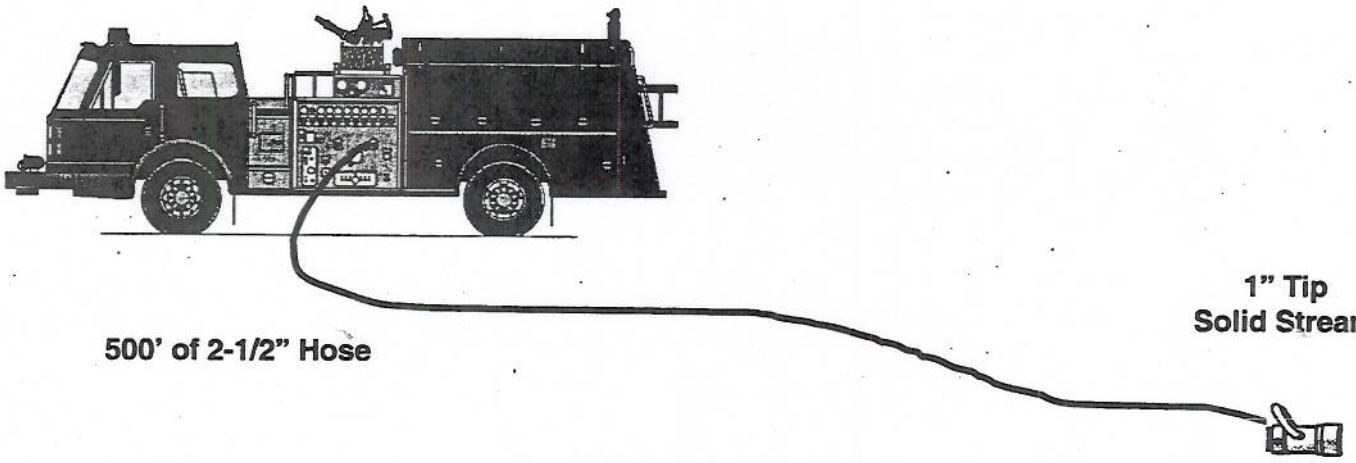
Compare the line pressure above to the line pressure required with 100' of 2-1/2" using a 250 gpm combination nozzle.

NP =
FL =
EL =
AL =
_____
LP =



NP =
FL =
EL =
AL =

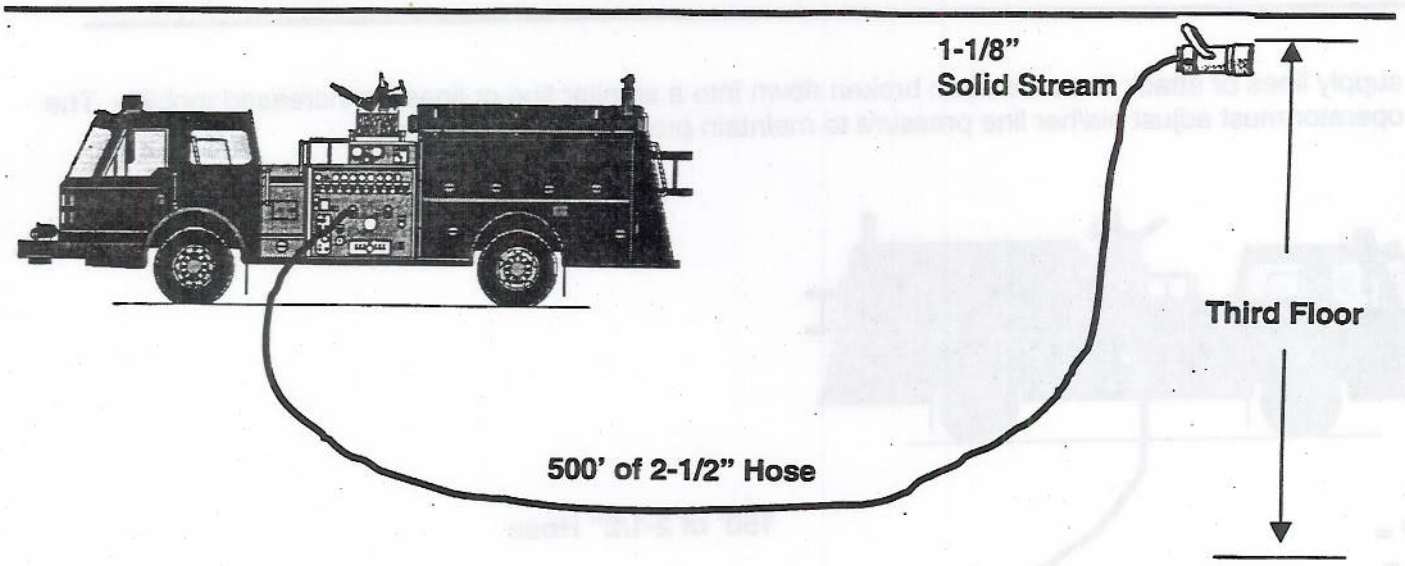
LP =



Flow _____ gpm

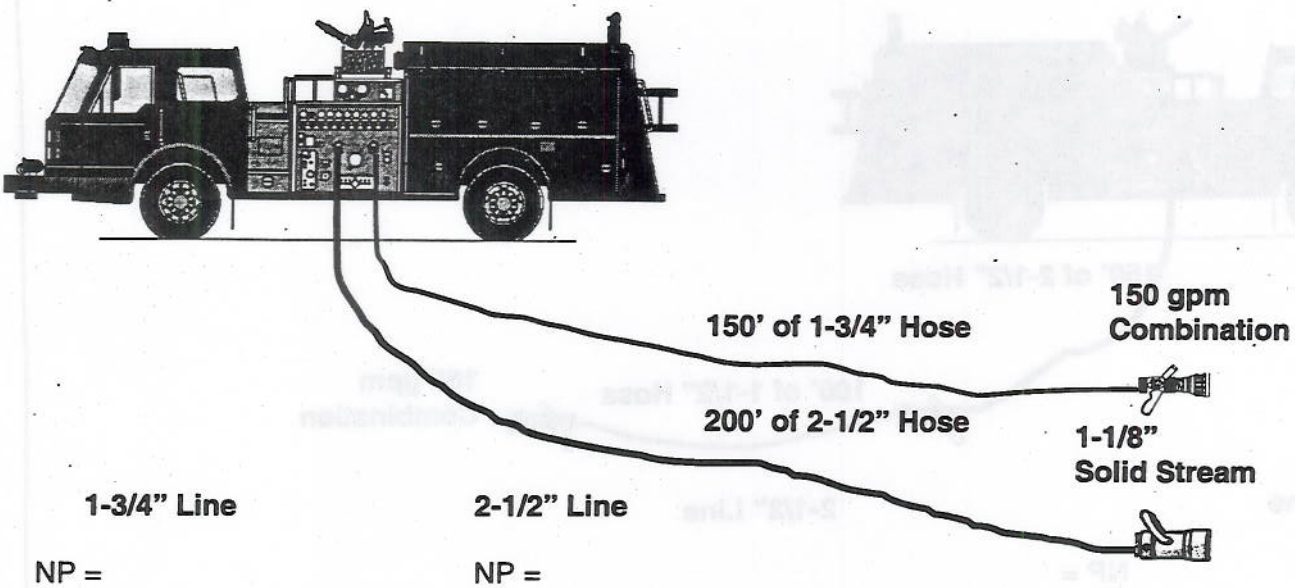
NP =
FL =
EL =
AL =

LP =



NP =
FL =
EL =
AL =

LP =



1-3/4" Line

NP =
FL =
EL =
AL =

LP =

2-1/2" Line

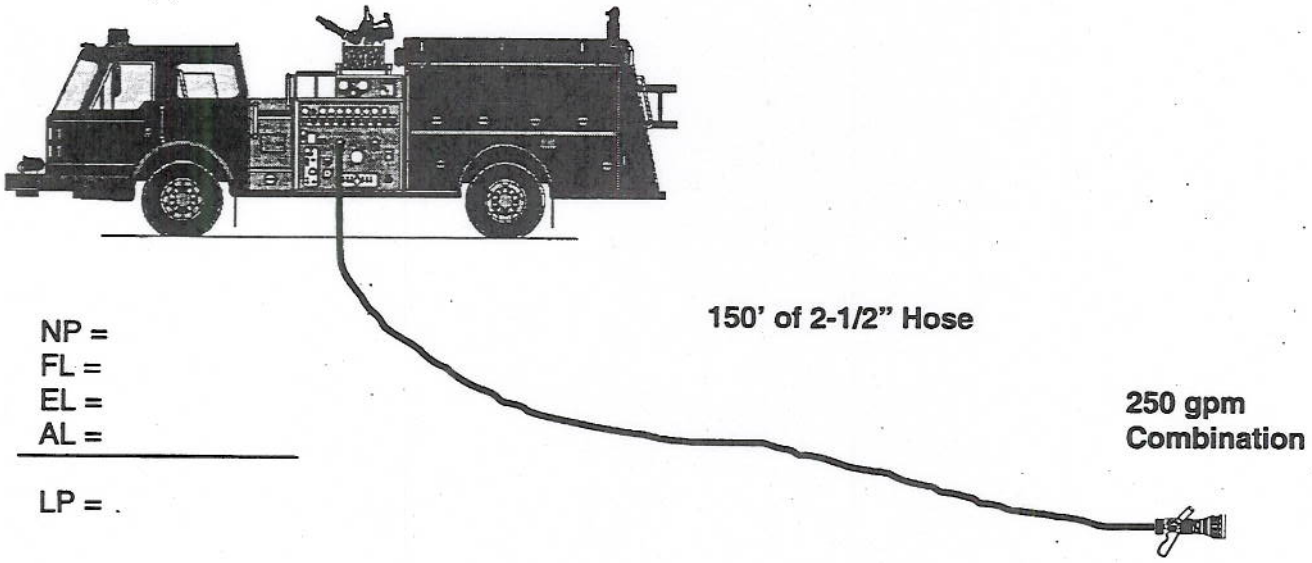
NP =
FL =
EL =
AL =

LP =

Total Flow _____gpm

Engine Pressure_____psi

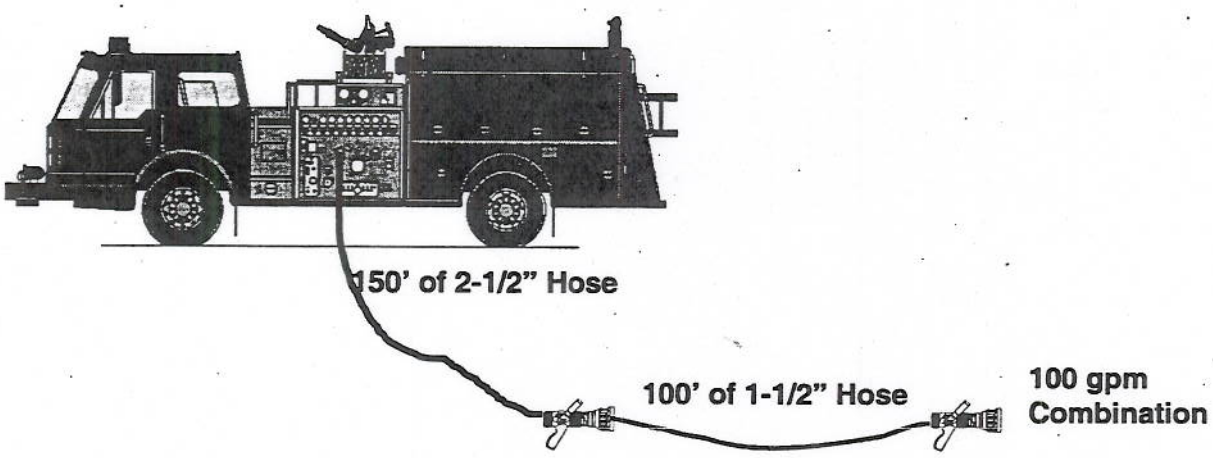
Large supply lines or attack lines are often broken down into a smaller line or lines for increased mobility. The pump operator must adjust his/her line pressure to maintain proper nozzle pressure.



NP =
FL =
EL =
AL =

LP =

The line above is equipped with a variable flow, break-apart nozzle. After the fire is knocked down, the tip is removed and 100' of 1-1/2" is added onto the line and the tip is placed on the 1-1/2" line with the flow reduced to 100 gpm.



1-1/2" Line

NP =
FL =
EL =
AL =

LP =

2-1/2" Line

NP =
FL =
EL =
AL =

LP =

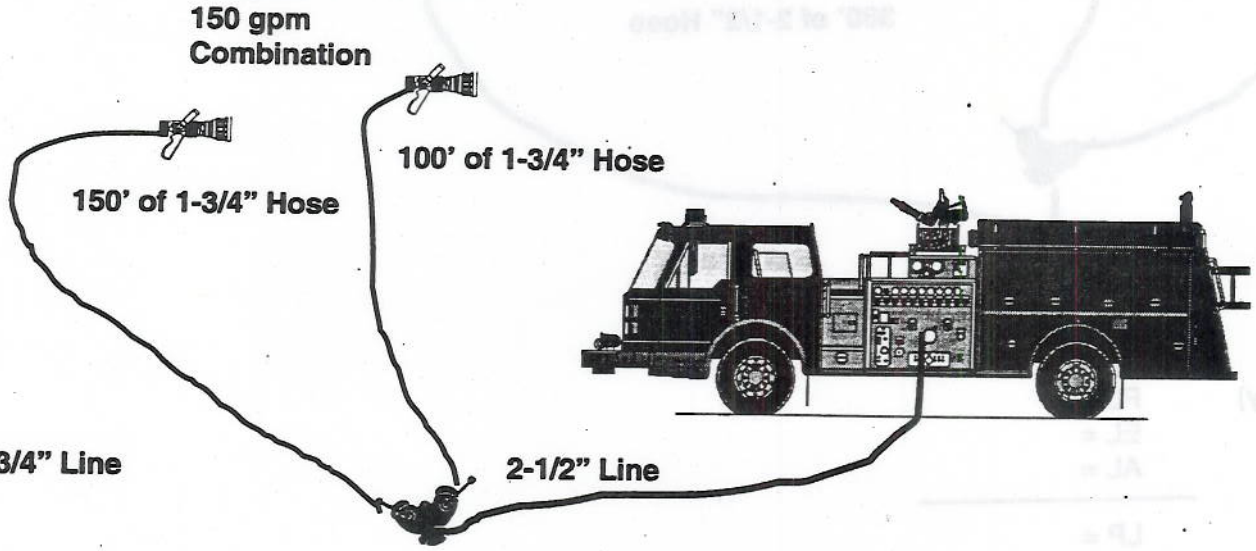
There are several factors that influence the change in line pressure required in the preceding problem:

1. **Flow** – The flow is reduced.
This changes the friction loss in the 2-1/2" hose and determines the friction loss in the 1-3/4" hose.

2. **Length of the 1-3/4" Hose** - The length of the 1-3/4" hose, along with the flow determines the total friction loss in the 1-3/4" hose line.

Both the nozzle pressure and the length of the 1-3/4" hoseline remain the same.

A 2-1/2" x 1-1/2" reducing wye may be used to supply multiple 1-3/4" handlines from one 2-1/2" outlet.
With both lines flowing, what is the total flow from the pump? _____



NP =
FL =
EL =
AL =

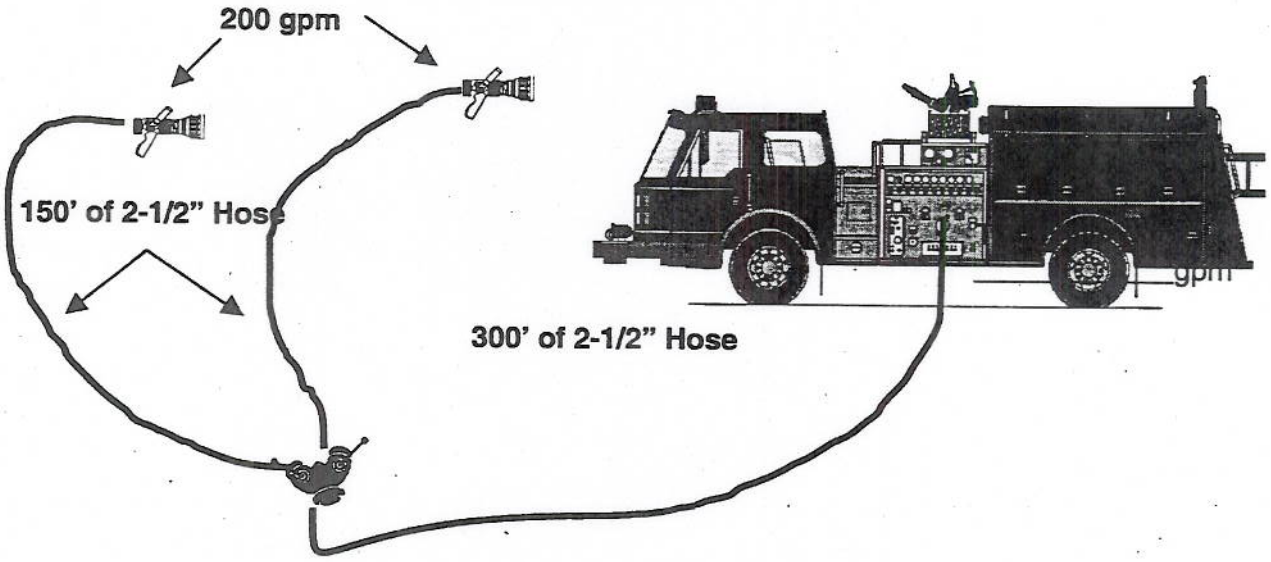
LP =

NP =
FL =
EL =
AL =

LP =

When the efficient carrying capacity of a hose line is exceeded, the friction loss increases and calculations must be adjusted to compensate for this increase.

With 2-1/2" hose, when the flow exceeds 399 gpm, turbulent flow increases and friction loss is calculated as follows: Drop the last digit of the flow



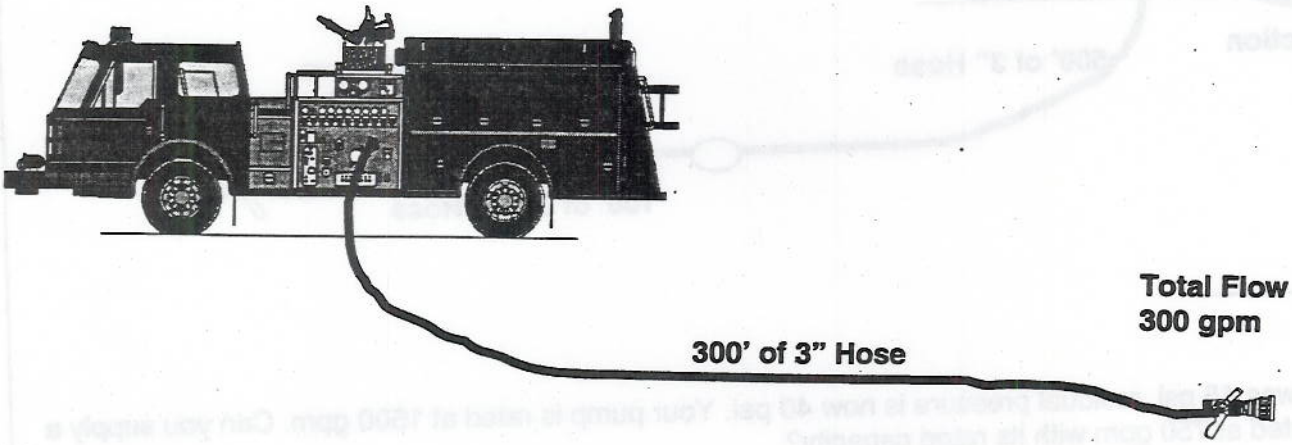
2-1/2")
(2-1/2" Supply)

NP =
FL =
FL =
EL =
AL =

LP =

3" hose is often used as a supply line feeding pumps, appliances or handlines.
The efficient carrying capacity of 3" hose is _____gpm.

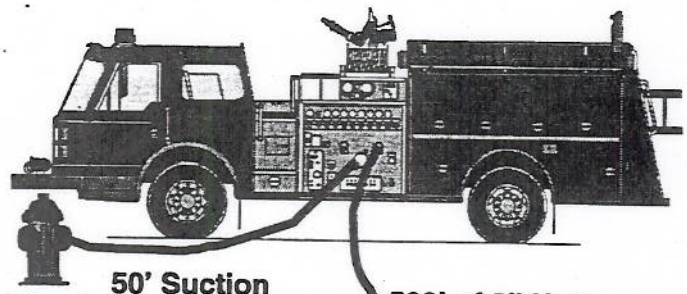
Friction loss in 3" hose is calculated by squaring the first digit of the flow.



3x3 = 9 psi – Friction Loss / 100' in 3" hose

NP =
FL =
EL =
AL =

LP =



50' Suction

45 psi

500' of 3" Hose

250 gpm
Combination Nozzle

100' of 2-1/2" Hose

NP =
2-1/2" FL =
3" FL =
EL =
AL =

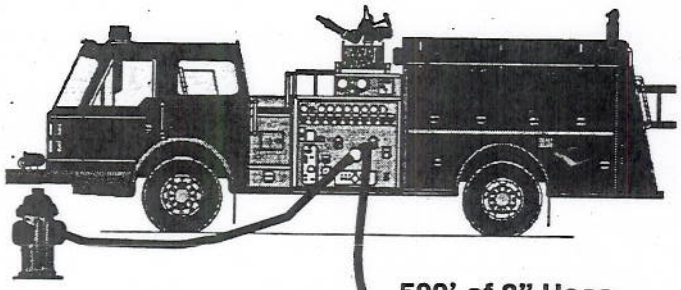
LP =

Static pressure was 45 psi, residual pressure is now 40 psi. Your pump is rated at 1500 gpm. Can you supply a second pump rated at 750 gpm with its rated capacity?

What is the percentage of drop? _____

Why? _____

You are informed that the nozzleperson has broken down to 1-1/2" line and has added 100' of 1-1/2" hose and has reduced the flow to 100 gpm. Calculate the required line pressure.



Pump rated at 1000 gpm

500' of 3" Hose

100' of 1-1/2" Hose

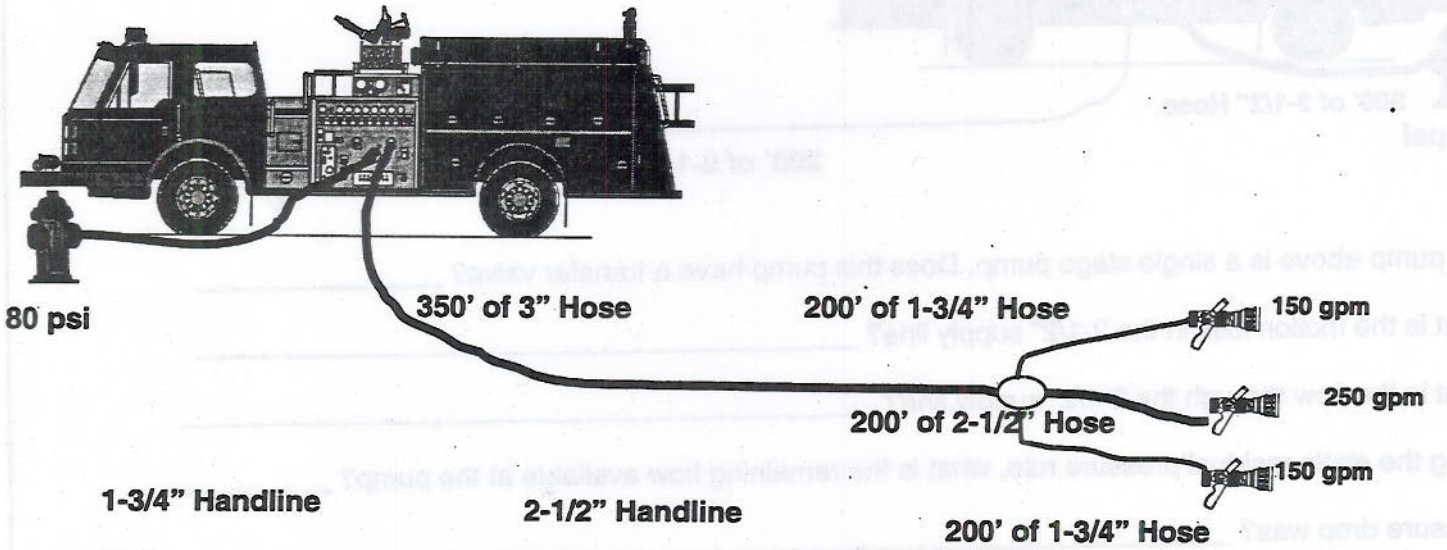
100' of 2-1/2" Hose

NP =
1-1/2" FL
2-1/2" FL =
3" FL =
EL =
AL =

LP =

The pump in the preceding problem is rated at 1000 gpm. What position should the transfer valve be in?
Pressure or Volume

3" hose can be used to supply wyed lines or in the following problem, a water thief.



1-3/4" Handline	2-1/2" Handline
NP =	NP =
FL =	FL =
EL =	EL =
AL =	AL =
LP =	LP =

In this problem, different size hoselines and flows necessitate calculation for both 2-1/2" and 1-3/4" handlines to determine if the pressure required for each is the same.

What is the friction loss in the 3" supply line? _____

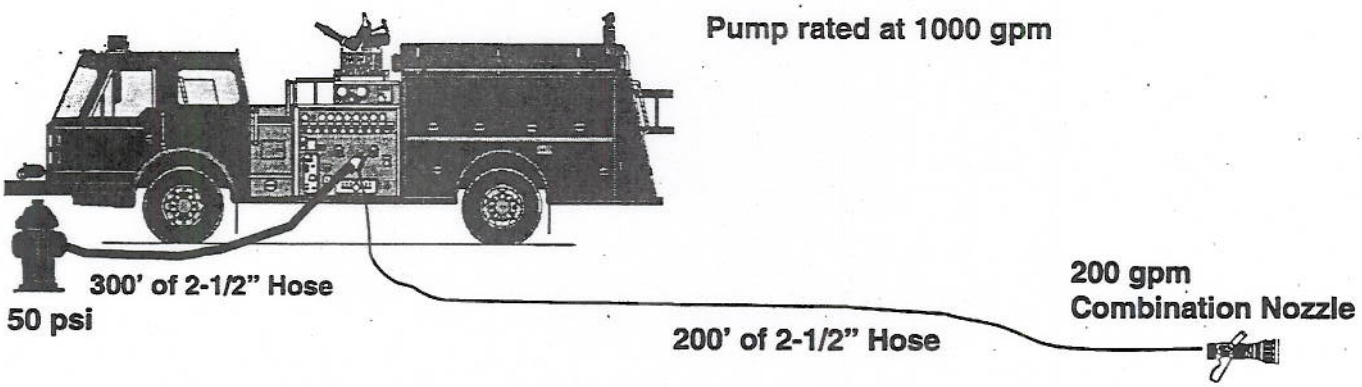
What is the flow through the 3" line? _____

The hydrant residual pressure is 60 psi with all lines flowing.

What is the percentage of drop? _____

What is the remaining flow? _____

Why? _____



The pump above is a single stage pump. Does this pump have a transfer valve? _____

What is the friction loss in the 2-1/2" supply line? _____

What is the flow through the 2-1/2" supply line? _____

Using the static residual pressure rule, what is the remaining flow available at the pump? _____

Pressure drop was? _____

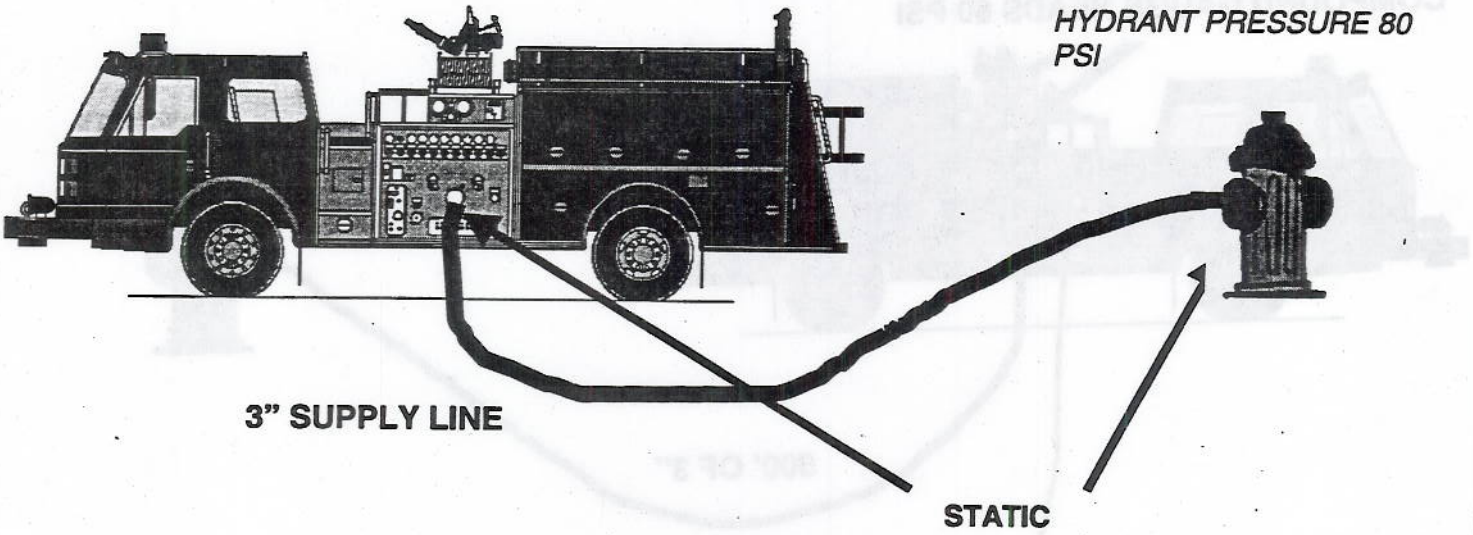
What %? _____

.ow available? _____

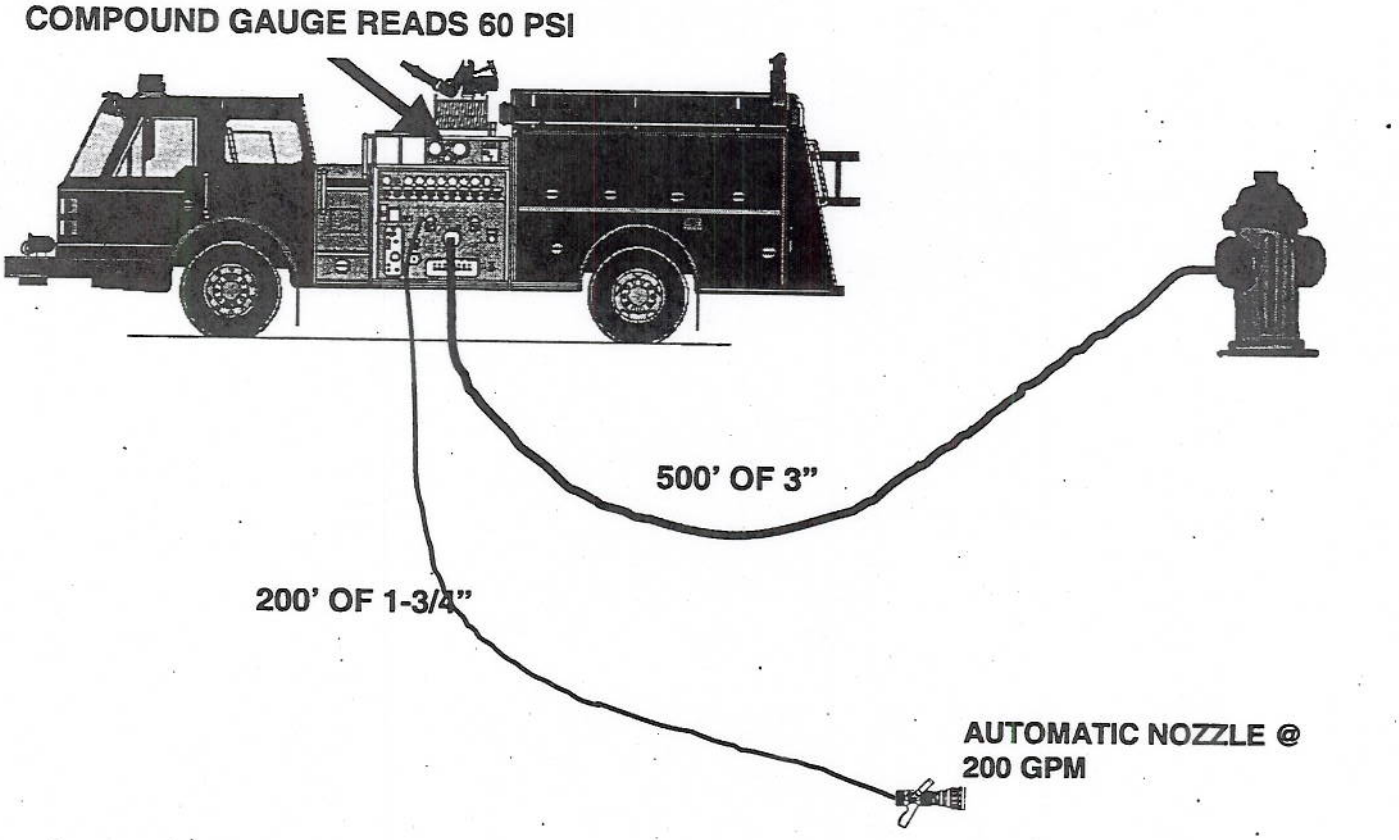
How can the flow in the problem be increased? _____

_____

STATIC - Stored potential energy that is available to move water through pipes, hoses and appliances. This pressure is shown on the compound gauge with NO water flowing.



RESIDUAL - Kinetic energy that is available to perform work. This pressure is shown on the compound gauge with water flowing.
(NOTE: The pressure will vary at different points in the system due to elevation as well as friction loss.)

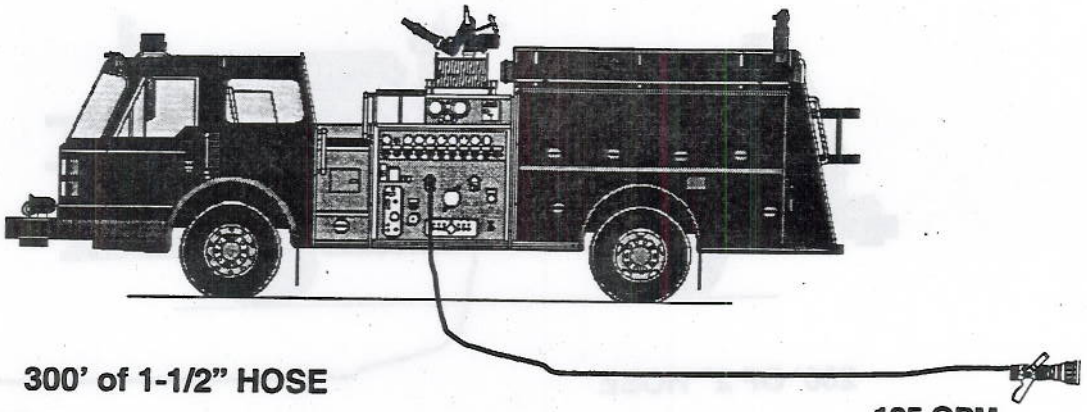


What is the % of drop? _____

What is the remaining flow available from the hydrant? _____

Why? _____

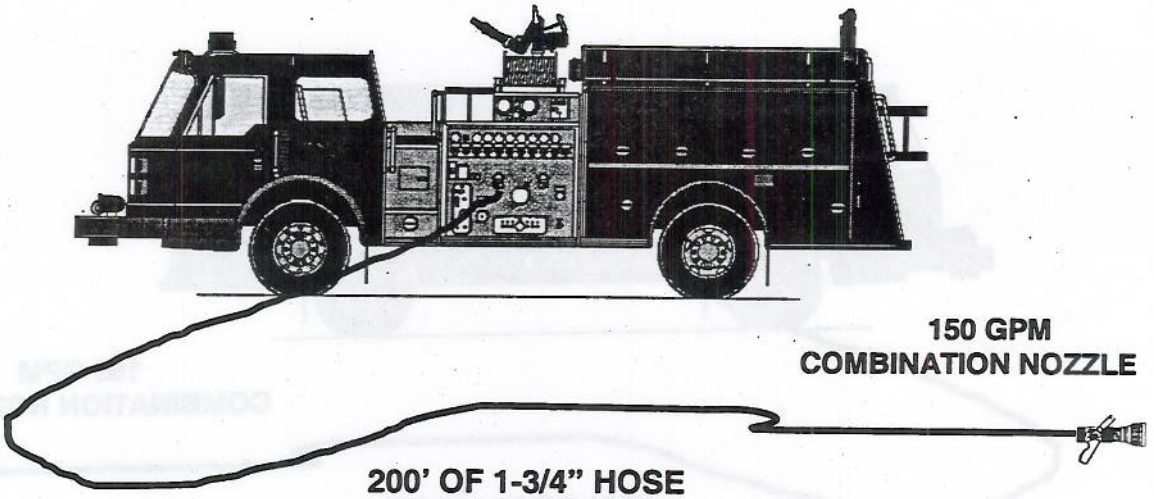
1-1/2" & 1-3/4" EXAMPLE



300' of 1-1/2" HOSE

125 GPM
COMBINATION NOZZLE

Nozzle Pressure	100 psi	(Combination)
Friction Loss	90 psi	(30 psi per 100 feet)
Elevation (+ or -)	0 psi	(Same level as pump)
Appliance Loss	0 psi	(No Appliances)
		190 psi Line Pressure



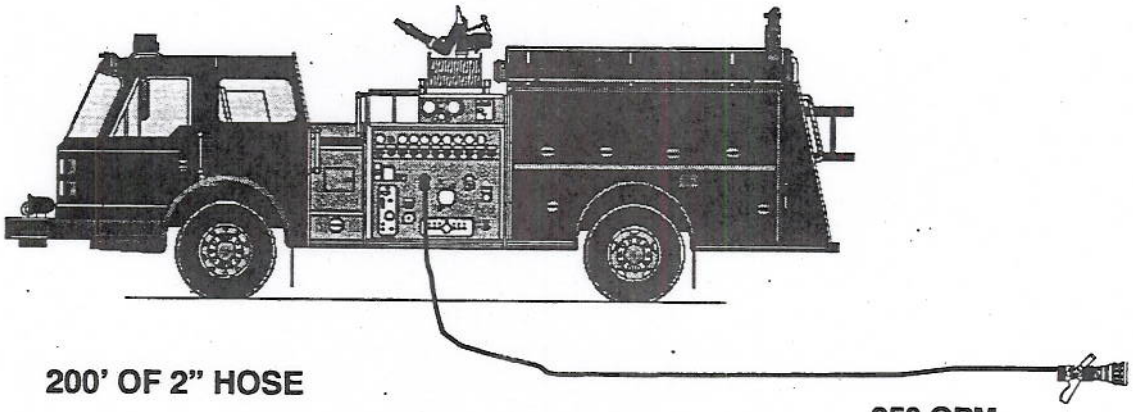
150 GPM
COMBINATION NOZZLE

200' OF 1-3/4" HOSE

NP =
FL =
EL =
AL =

LP =

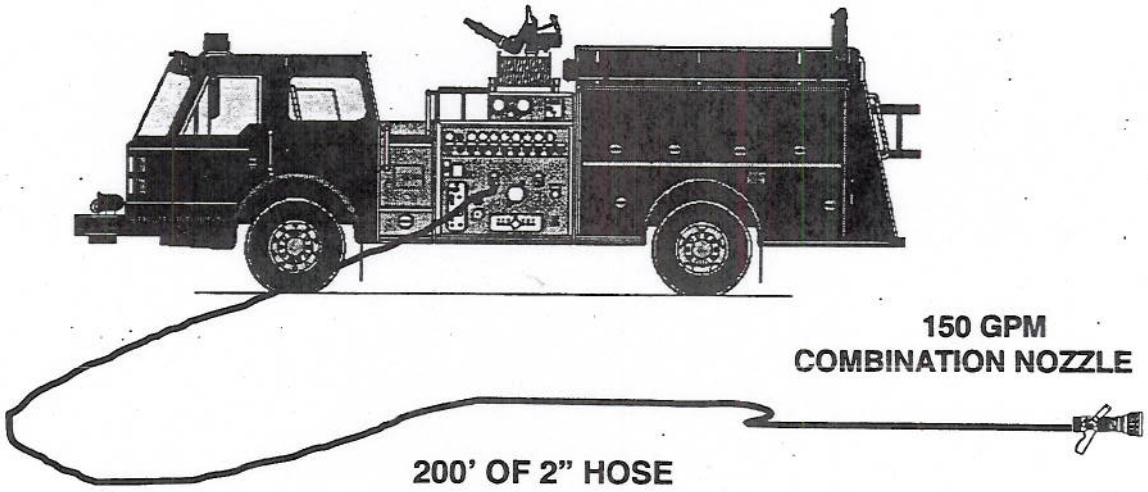
2" EXAMPLE



200' OF 2" HOSE

250 GPM
COMBINATION NOZZLE

Nozzle Pressure	100 psi	(Combination)
Friction Loss	80 psi	(40 psi per 100 feet)
Elevation (+ or -)	0 psi	(Same level as pump)
Appliance Loss	0 psi	(No Appliances)
		180 psi Line Pressure



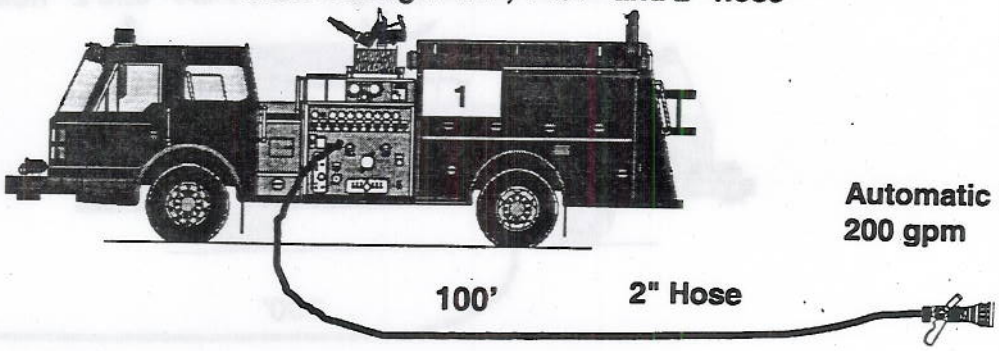
150 GPM
COMBINATION NOZZLE

200' OF 2" HOSE

NP =
FL =
EL =
AL =

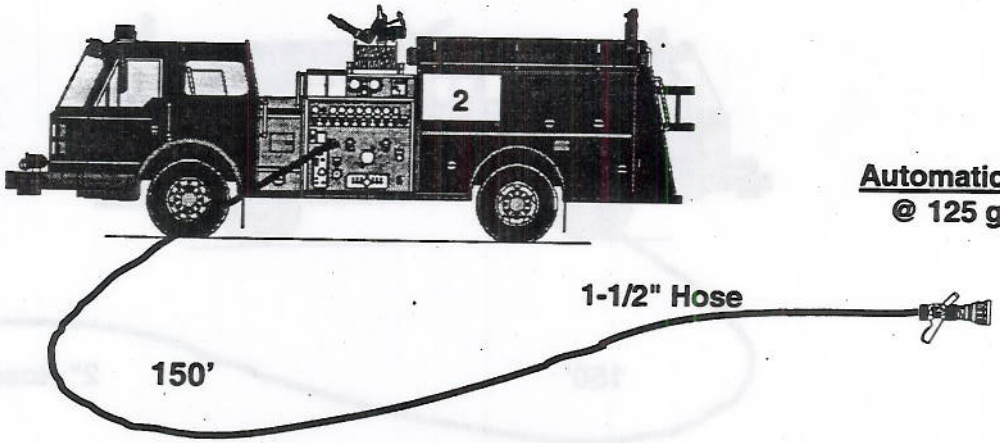
LP =

Do all of these calculations using 1-1/2", 1-3/4" and 2" hose



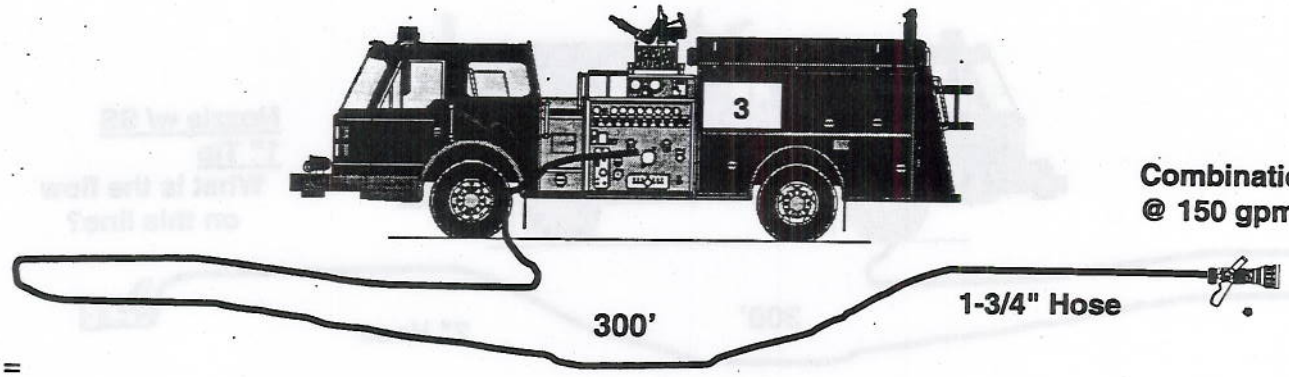
NP =
FL =
EL =
AL =

LP =



NP =
FL =
EL =
AL =

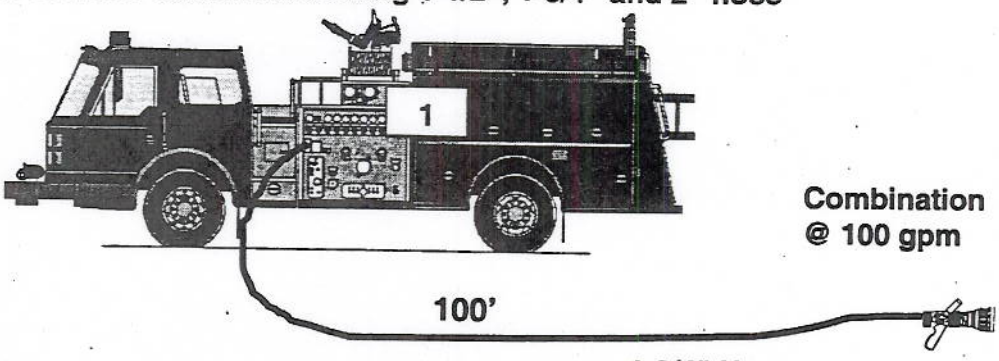
LP =



NP =
FL =
EL =
AL =

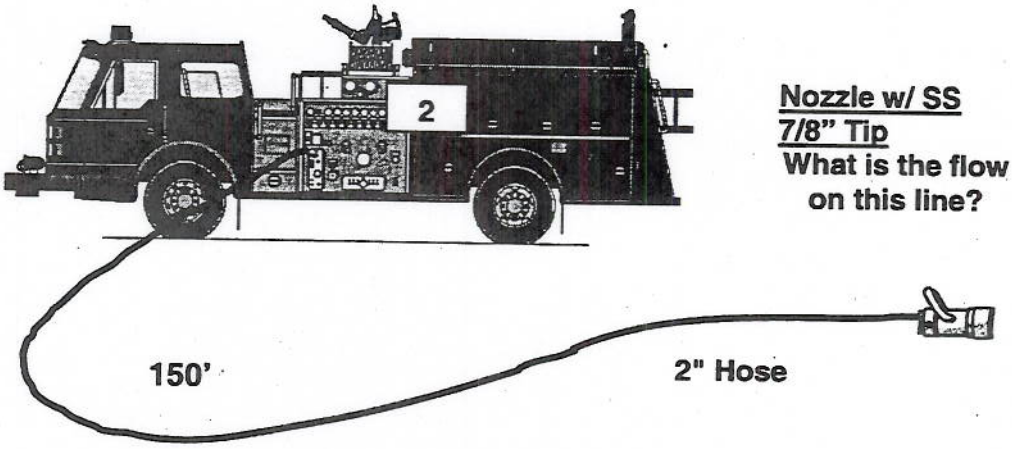
LP =

Do all of these calculations using 1-1/2", 1-3/4" and 2" hose



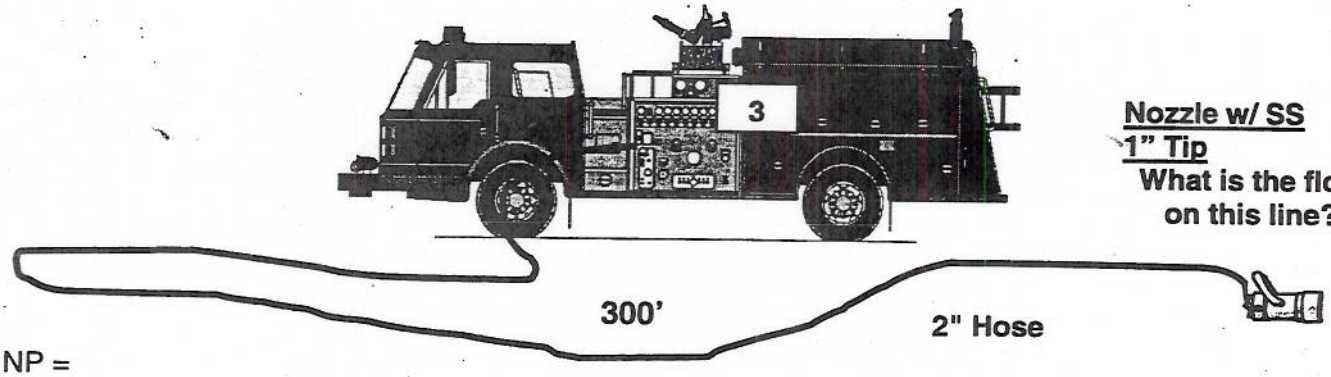
NP =
FL =
EL =
AL = _____

LP =



NP =
FL =
EL =
AL = _____

LP =



NP =
FL =
EL =
AL = _____

LP =

FRICTION LOSS IN 2-1/2" HOSE

To find friction loss in 2-1/2" hose we first need to know what gallons per minute will be flowing in the line:

From 0 to 399 Gallons per Minute: drop the last digit and subtract 10.

200' of 2-1/2" hose with a 250 gpm combination nozzle

250 drop the last digit = 25
Minus 10

15 psi friction loss per 100'

NP = 100 psi
FL = 30 psi
EL =
AL =

LP = 130 psi

om 400 gpm up: drop the last digit.

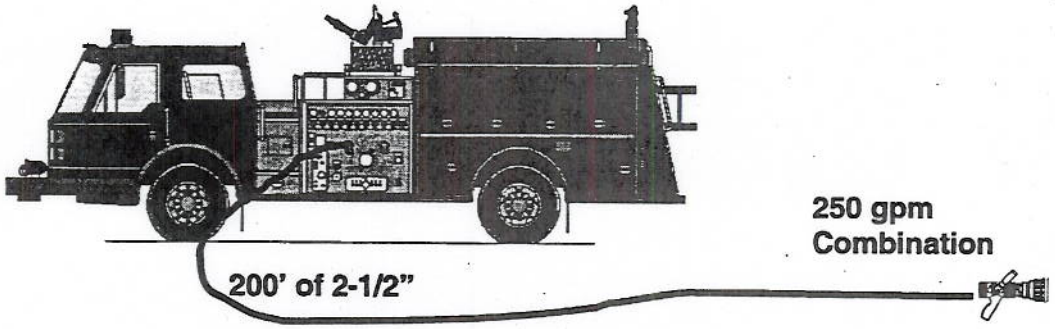
200' of 2-1/2" hose with a 1-1/4" tip

400 gpm drop the last digit = 40 psi per 100'

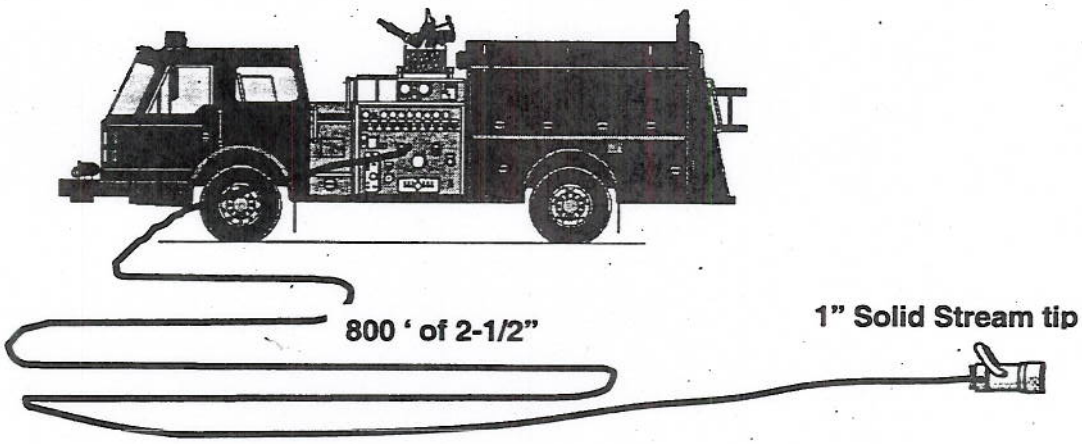
NP = 50 psi
FL = 80 psi
EL =
AL =

LP = 130 psi

2-1/2" EXAMPLE



Nozzle Pressure	100 psi	Combination
Friction Loss	30 psi	Flow drop last digit less 10 = 15 psi/100'x2
Elevation (+ or -)	0 psi	Same level as pump
Appliance Loss	0 psi	No appliances
	130 psi Line Pressure	

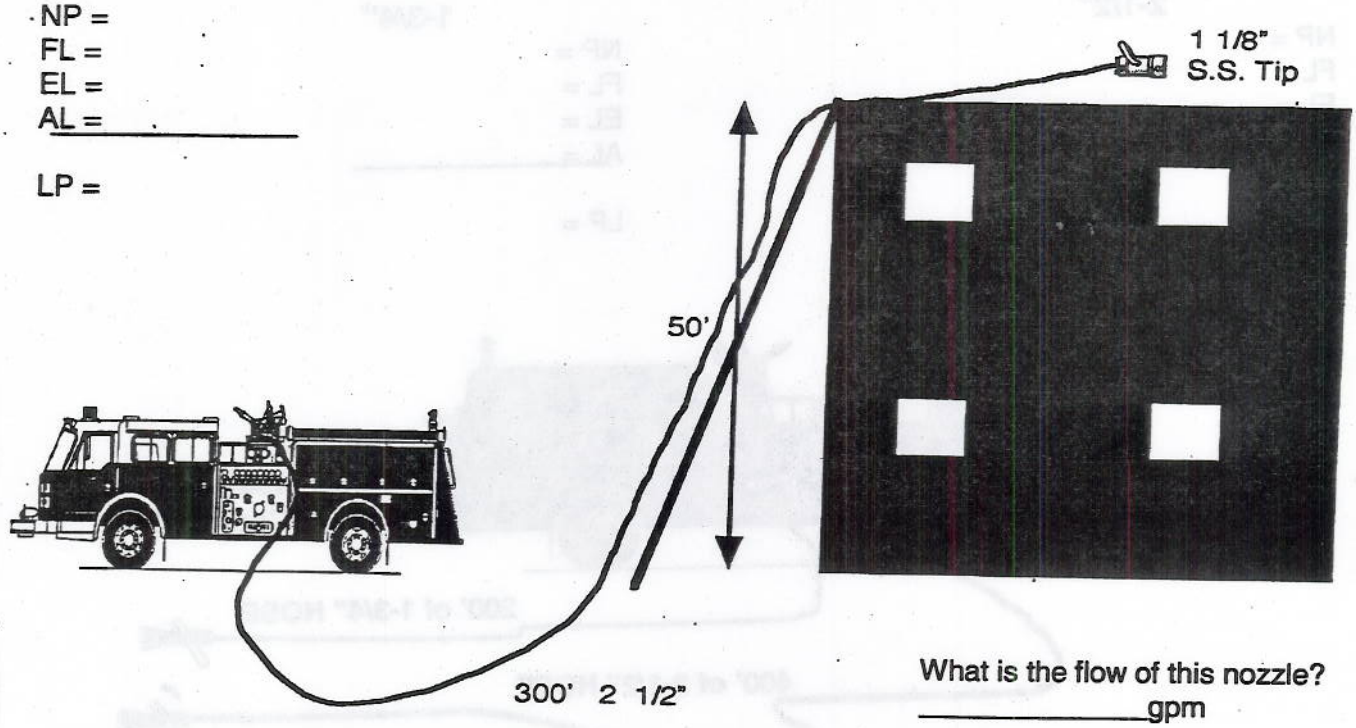


NP =
FL =
EL =
AL =

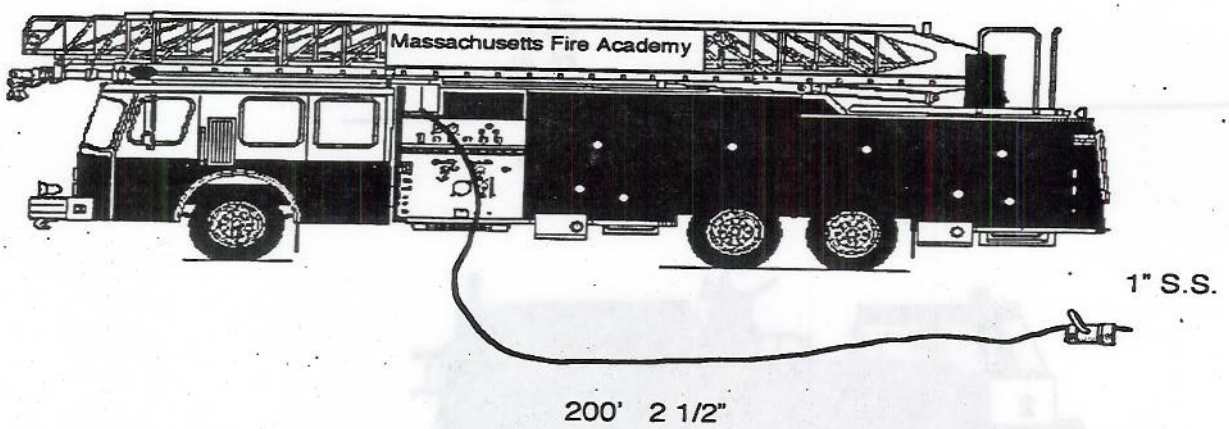
LP =

NP =
FL =
EL =
AL = _____

LP =



What is the flow of this nozzle?
_____gpm



What is the flow of this nozzle?
_____gpm

NP =
FL =
EL =
AL =
_____

LP =

2-1/2"

NP =
FL =
EL =
AL =

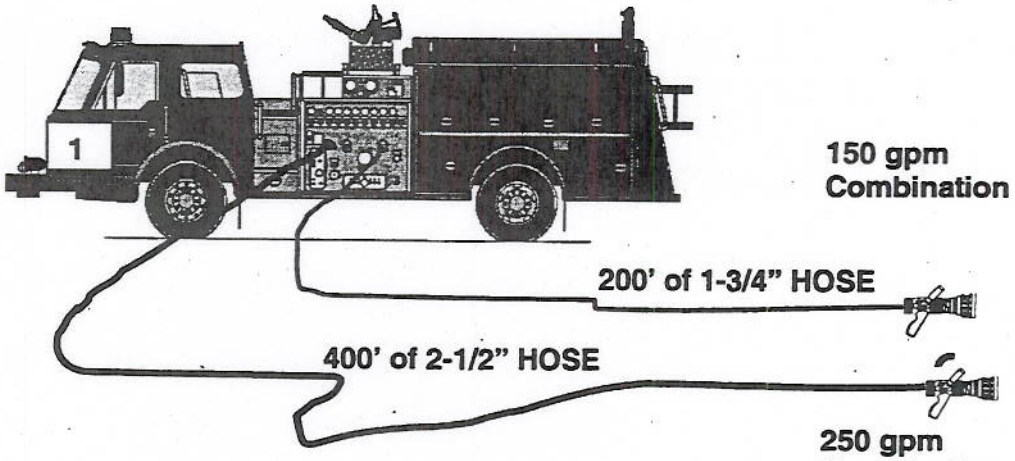
LP =

1-3/4"

NP =
FL =
EL =
AL =

LP =

Total Flow =



1-3/4"

NP =
FL =
EL =
AL =

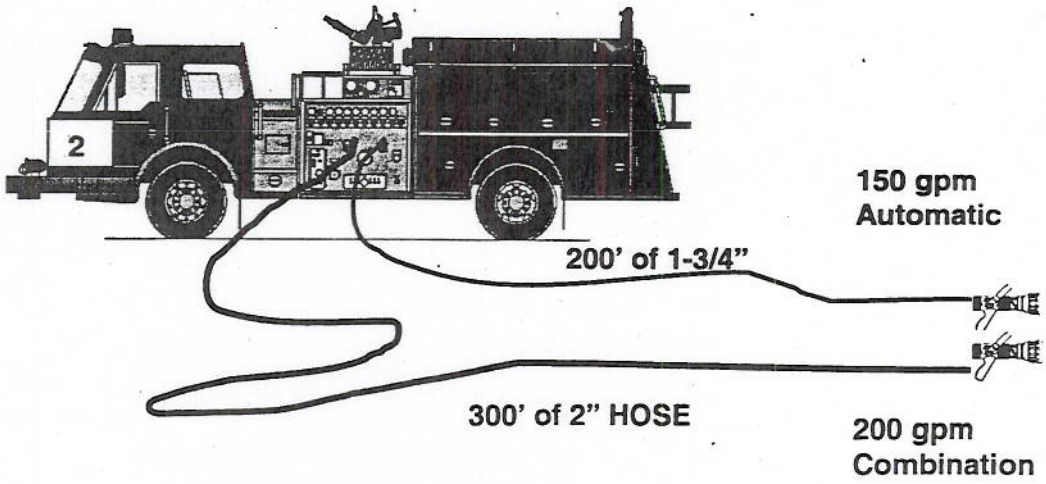
LP =

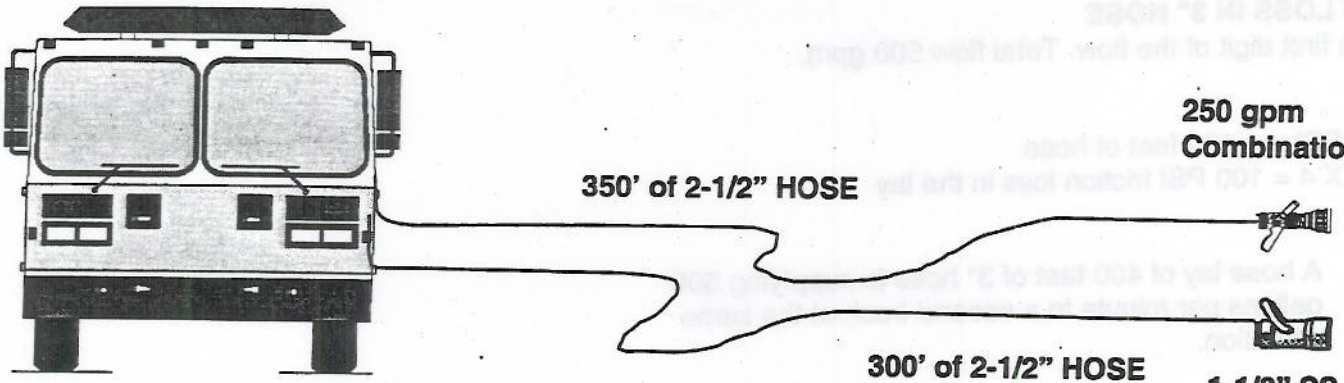
2"

NP =
FL =
EL =
AL =

LP =

Total Flow =





SOLID STREAM NOZZLE

NP =
FL =
EL =
AL =

LP =

COMBINATION NOZZLE

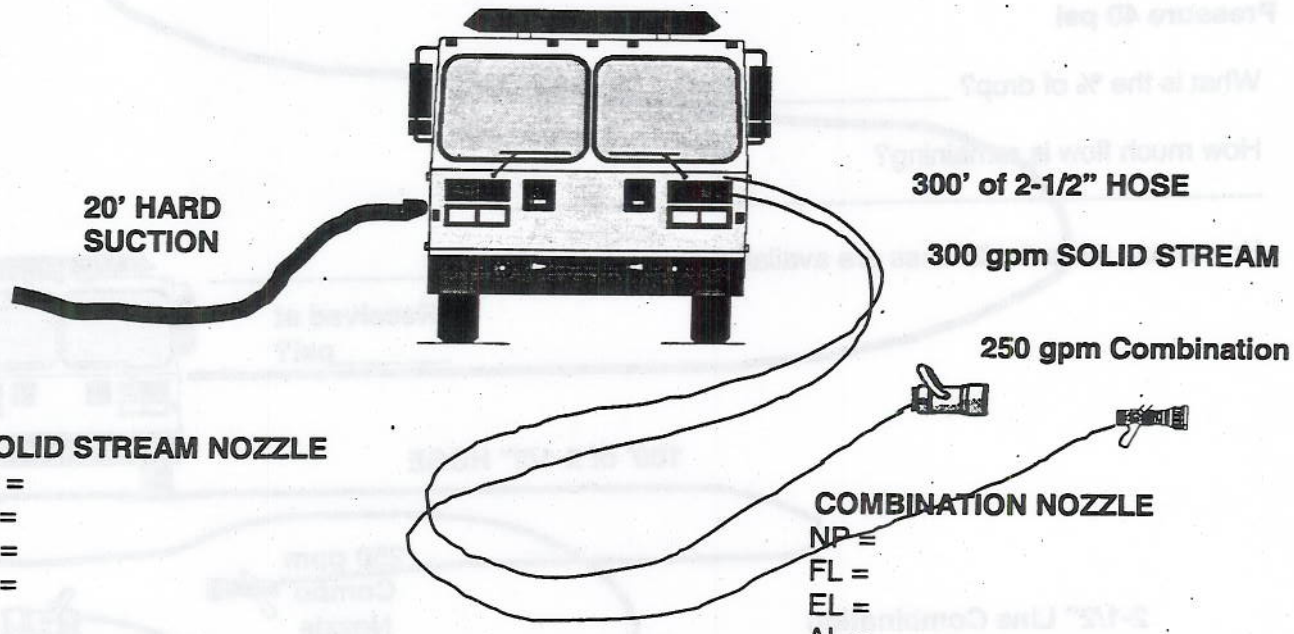
NP =
FL =
EL =
AL =

LP =

What is the Total Flow?

_____ gpm

What is the Total Flow with a 1-1/8" SS? _____ gpm



SOLID STREAM NOZZLE

NP =
FL =
EL =
AL =

Line Pressure _____

COMBINATION NOZZLE

NP =
FL =
EL =
AL =

Line Pressure

What is the Total Flow? _____ gpm

What size tip is on the 300 gallon SS? _____

Will a 1000 gpm pump supply these lines properly? _____

FRICTION LOSS IN 3" HOSE

Square the first digit of the flow. Total flow 500 gpm.

5X5=25

25 PSI per 100 feet of hose

25 X 4 = 100 PSI friction loss in the lay

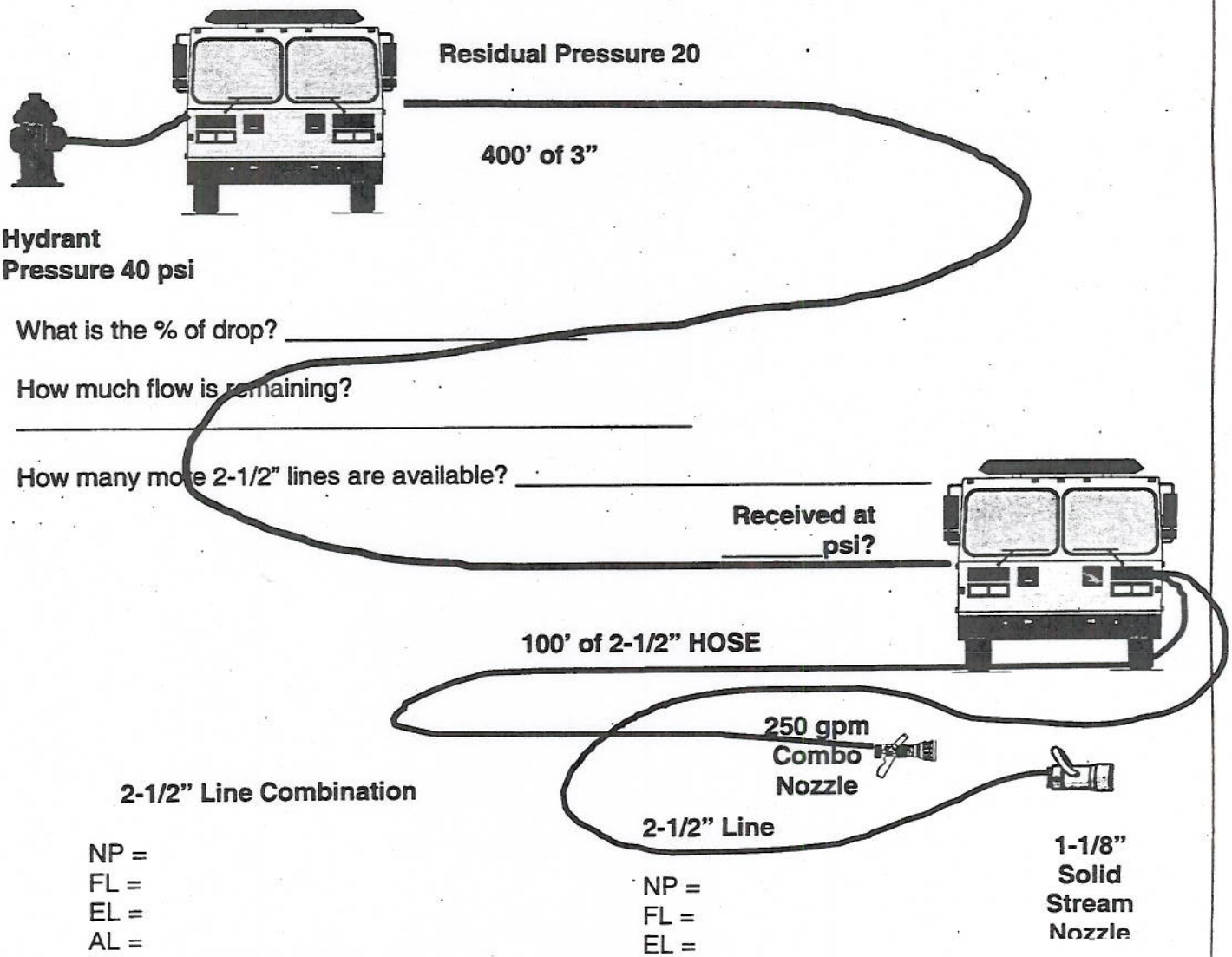
A hose lay of 400 feet of 3" hose is supplying 500 gallons per minute to a second truck at the same elevation.

Total flow of 500 divided by 100 = 5

5 x 5 = 25

25 PSI per 100 feet of hose

25 x 4 = 100 PSI friction loss in the lav



2 1/2" OR 3" BROKEN DOWN TO SMALLER

Often times larger handlines are broken down to one or more smaller lines. To find the friction loss, work from the nozzle back in each line until you reach the one feeder line. From the wye, figure the total flow in the large feeder line by adding the flow of all the small lines.

100 feet of 2-1/2" hose reduced to 100 feet of 1-3/4" feeding a 100 GPM nozzle

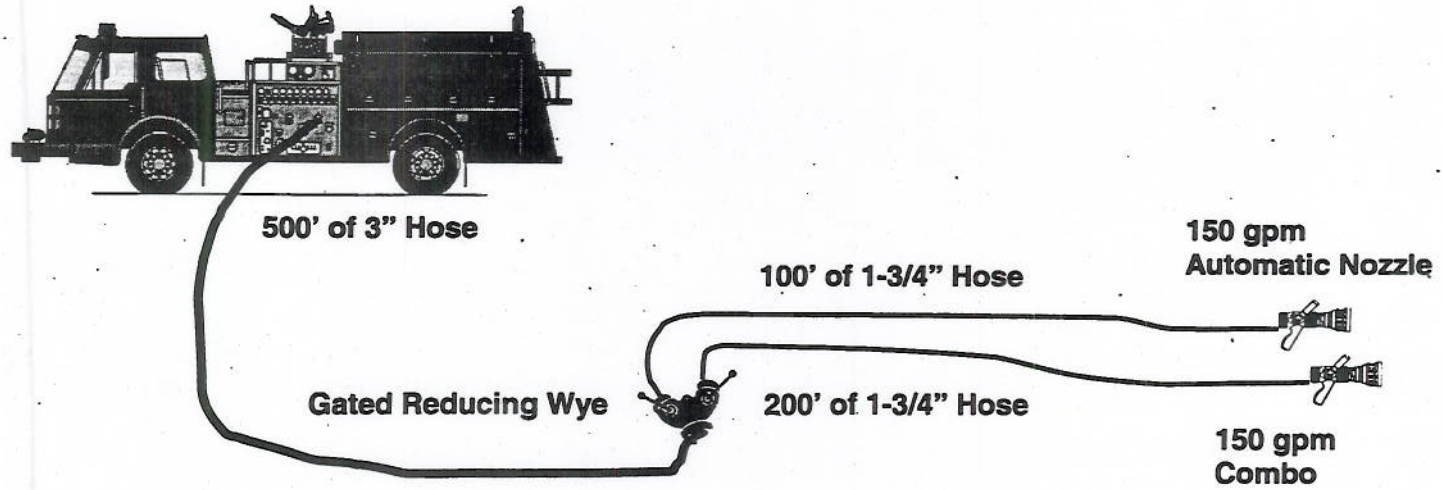
NP =
FL 1-3/4" =
FL 2-1 /2" =
AL =
LP =

500 feet of 3" hose wyed to two 1 3/4" lines one 100 feet the second 200'. Both lines have 150 gpm nozzles.

Line 1 – 200'
NP =
FL =
AL =
EL =
LP =

Line 2 – 100'
NP =
FL =
AL =
EL =
LP =

Line 3 – 3"
NP =
FL =
AL =
EL =
LP =



What is the pump pressure?

Why?

What is the total flow on both lines?

PRESSURE SOURCE EVALUATION

STATIC /RESIDUAL RULE:

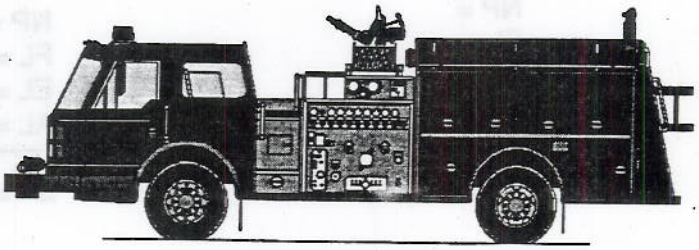
Pressure Drop of 10% = 3 X present flow available
Pressure Drop of 15% = 2 X present flow available
Pressure Drop of 25% = 1 X present flow available

Static Pressure of 100 psi
One line working delivering 250 gpm
Residual pressure of 85 psi

100 psi (static)
- 85 psi (residual)

15% drop

2 or more lines or a total of 500 gpm available

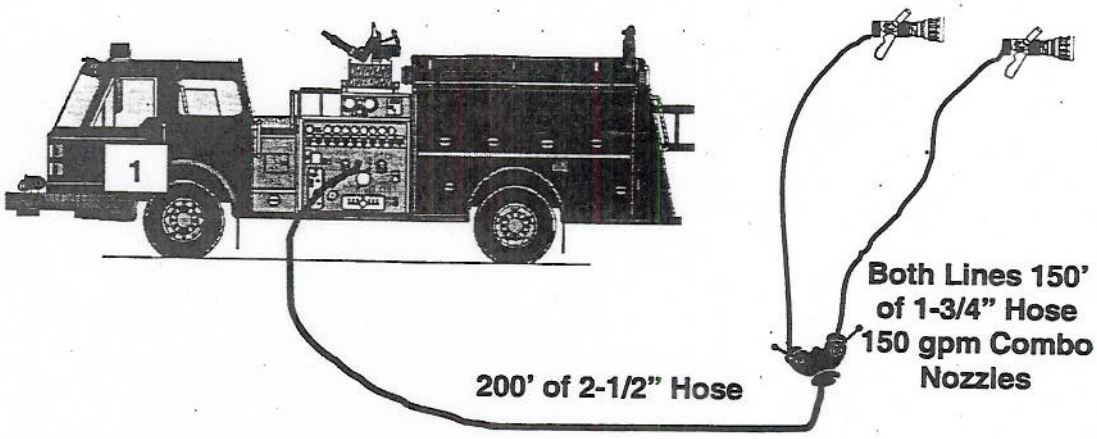


Static Pressure of 100 psi
Three lines working deliver 250 gpm each (750 gpm)
Residual pressure of 60 psi

100 psi (static)
- 60 psi (residual)

40% drop

No more 250 gpm lines available
Total Flow left is less than 250 gpm



2-1/2" Line

NP =
FL =
EL =
AL =

LP =

Line 1

NP =
FL =
EL =
AL =

LP =

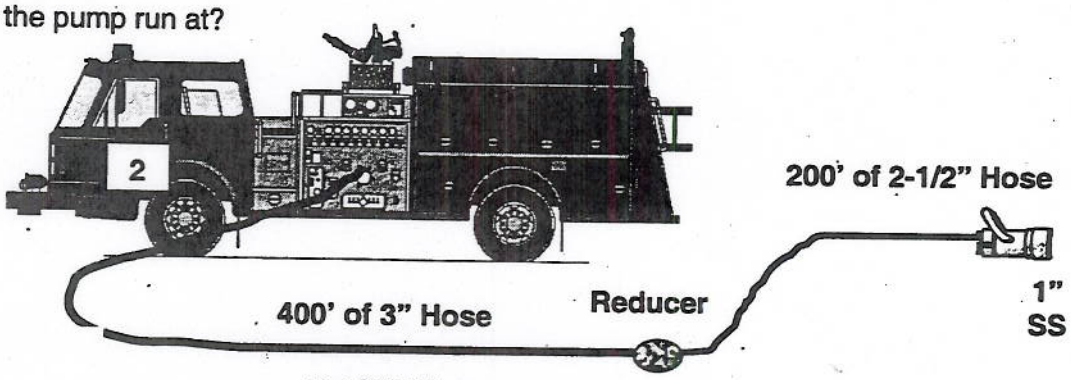
Line 2

NP =
FL =
EL =
AL =

LP =

Total Flow?

What pressure is the pump run at?



3" Line

NP =
FL =
EL =
AL =

LP =

2-1/2" Line

NP =
FL =
EL =
AL =

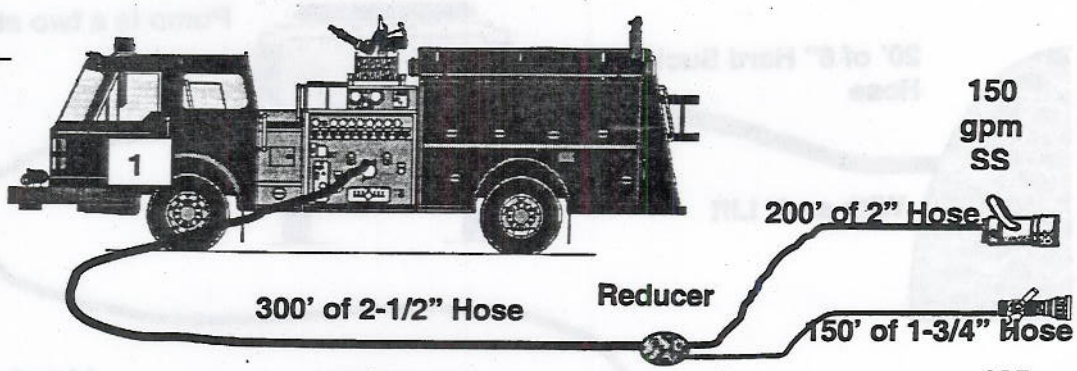
LP =

Total Flow? _____

What pressure is the pump run at? _____

What is the total flow?

_____

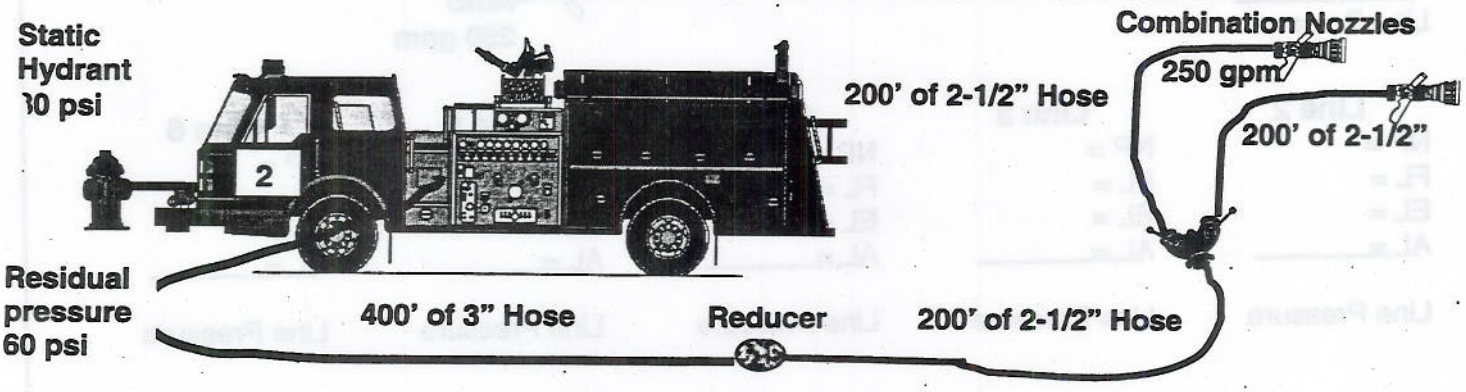


3" Line	1-3/4" Line	2" Line
NP =	NP =	NP =
FL =	FL =	FL =
EL =	EL =	EL =
AL = _____	AL = _____	AL = _____
LP =	LP =	LP =

125 gpm Comb

What pressure is the pump run at? _____

What size is the SS tip? _____



3" Line	2-1/2" Line	Line 1	Line 2
NP =	NP =	NP =	NP =
FL =	FL =	FL =	FL =
EL =	EL =	EL =	EL =
AL = _____	AL = _____	AL = _____	AL = _____
LP =	LP =	LP =	LP =

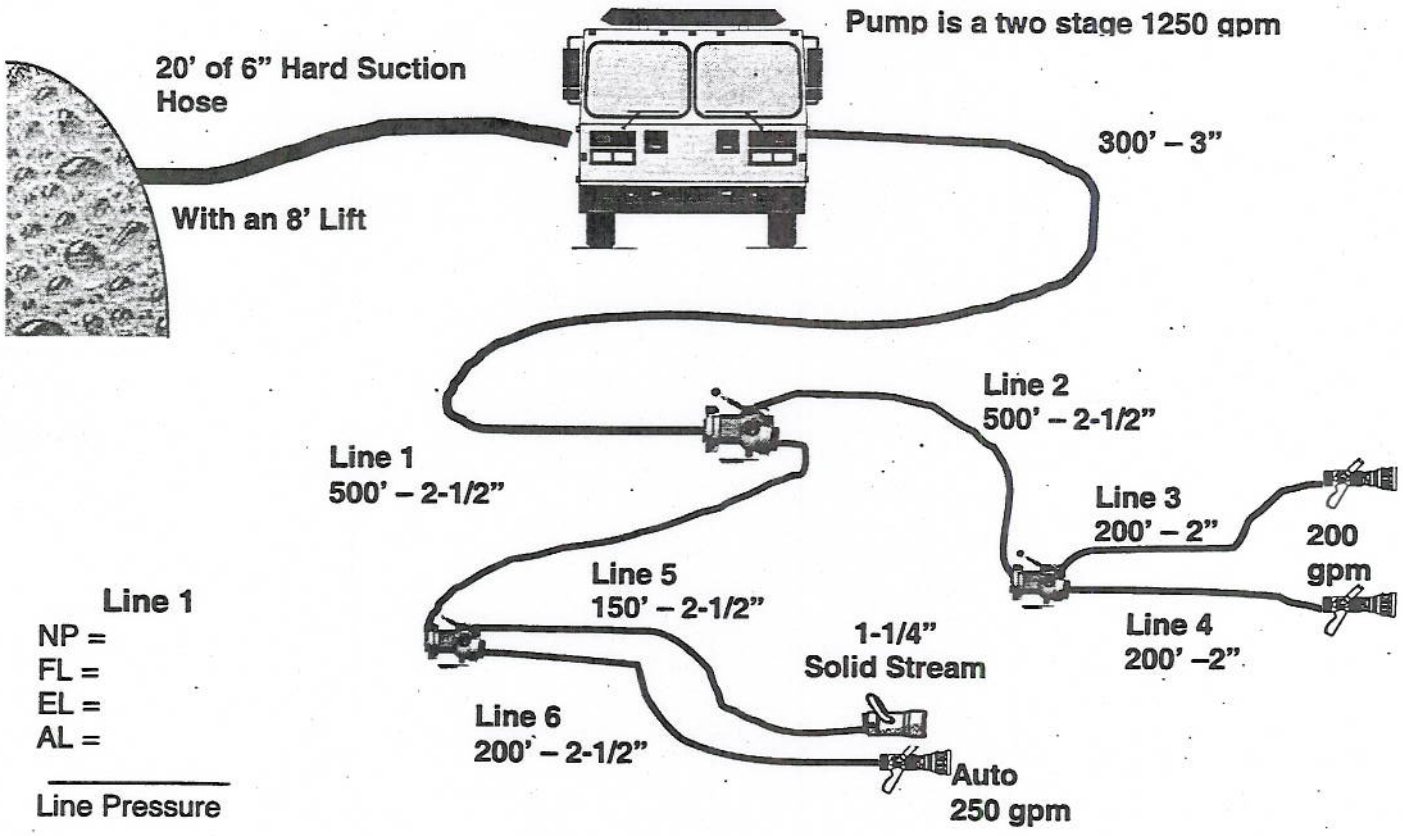
What is the Total Flow? _____

What is the pump pressure? _____

What is the pressure at the gated wye? _____

What is the percentage of drop? _____

How much flow is available? _____



Line 1
NP =
FL =
EL =
AL =

Line Pressure

Line 2	Line 3	Line 4	Line 5	Line 6
NP =	NP =	NP =	NP =	NP =
FL =	FL =	FL =	FL =	FL =
EL =	EL =	EL =	EL =	EL =
AL =	AL =	AL =	AL =	AL =
Line Pressure	Line Pressure	Line Pressure	Line Pressure	Line Pressure

What stage should this pump be in? _____

What is the flow in 3" hose? _____

What is the friction loss per 100'? _____

What is the total flow? _____

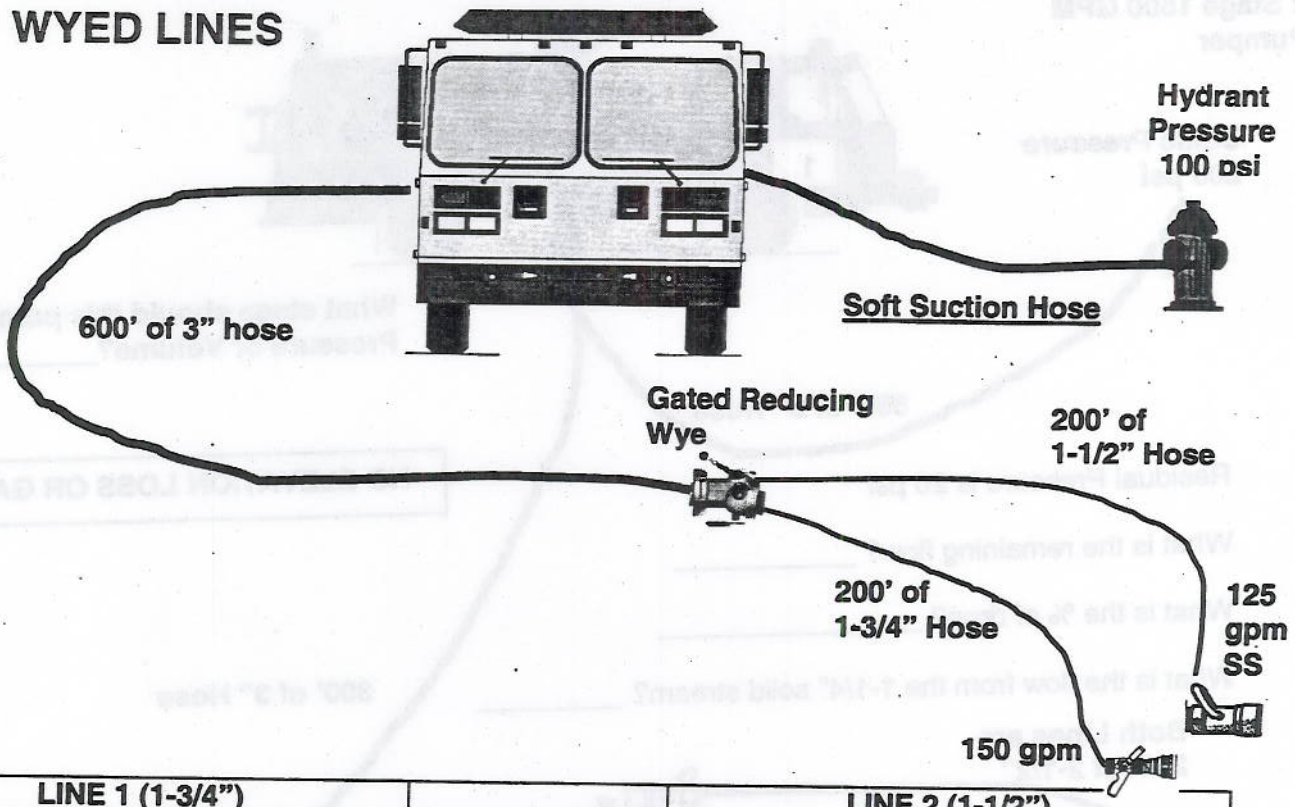
What flow is the 2-1/2" Solid Stream?

_____

Is this a practical hose layout? _____

Why? _____

WYED LINES



LINE 1 (1-3/4")		LINE 2 (1-1/2")
50 psi	NP	50 psi
60 psi	FL	100 psi
0 psi	EL	0 psi
0 psi	AL	0 psi
110 psi		150 psi

Pressure = 150 psi (Pressure at the wye)
FL = 55 psi (Total Flow in 3" 3x3 = 9 9x6=54 round up to 55)
AL = 5 psi
EL = 0 psi
210 psi = Discharge Pressure

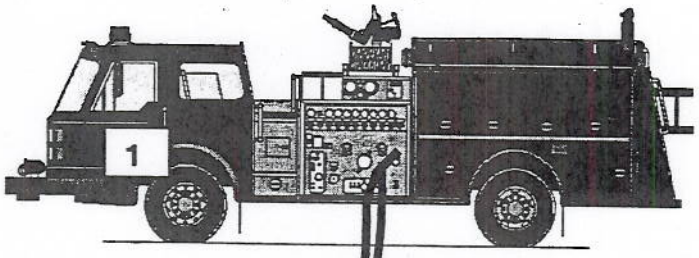
Line 1 is gated back to 100 psi at the wye

The hydrant pressure static is 100 psi. The residual pressure is 90 psi.

What is the % of drop? _____

What is the remaining flow available? _____

2 Stage 1500 GPM Pumper



Static Pressure 200 psi

What stage should this pump be in? Pressure or Volume?_____

550' of 3" Hose

NO ELEVATION LOSS OR GAIN

Residual Pressure is 20 psi

What is the remaining flow? _____

What is the % of drop? _____

What is the flow from the 1-1/4" solid stream? _____

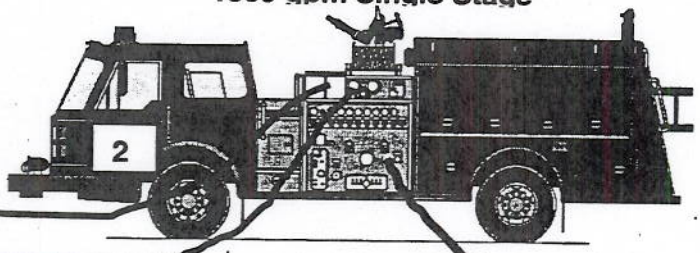
300' of 3" Hose

Both Lines are 200' of 2-1/2"

1-1/4" SS

Line 1

1500 gpm Single Stage



Line 2

What is the Total Flow? _____

What is the Friction Loss between E-1 and E-2? _____

What is E-2 discharge pressure? _____

What would the pressure be at E-1 if both of E-2's lines are shut down? _____

If equipped with a governor, it would go to? _____

What is the Friction Loss is 3" hose between the hydrant and E-1? _____

Notes: