

## Special Edition

### Back To Basics



### Apparatus Operation



A Review of Apparatus Operator Duties and Skills



This special edition is devoted to specific skills and duties relating to operation of emergency apparatus.

Members should always consult department operational procedures and training materials when using any of the Weekly Fire Drill materials.

Instructors should use these worksheets as guides for company level training sessions using your department SOG's and equipment.

#### Special Edition Subjects

- Know Your Lines
- Large GPM Water Flow
- Hydraulic Calculations
- Pump Parts
- Forward Lead-outs
- Reverse Lead-outs
- Apparatus Positioning
- Aerial Outrigger Set-up
- Backing Up Apparatus
- Pump Operator Duties



# Firefighter Close Calls.Com



## Home of The Secret List

Back To Basic Special Edition  
 "Apparatus Operator"  
 Apparatus Operator #1

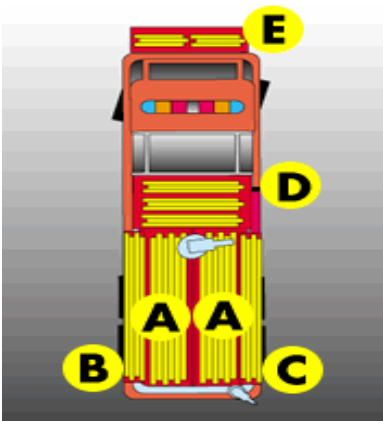
### Know Your Lines



Variable	Crosslay 1	Crosslay 2	Crosslay 3* <i>If Applicable</i>	2 1/2" Preconnect	Prepiped Deck Gun	Wyed Line(s)	Supply Lines
Nozzle Type							
Nozzle Size							
Tip Pressure							
Hose Size							
Length of Hosebed							
GPM							
Net Discharge Pressure							

Complete the required information for the table above for the engine companies assigned to you.

-For wyed lines, use a 300' lead-out of the supply line before the wye and your length of attack line after the wye to complete discharge pressure calculations.



Legend (Use Your Dept. Terms)

A-Supply Lines  
 B-Rear preconnects, wyed lines or other beds  
 C-Rear preconnects, wyed lines or other beds  
 D-Preconnected or stock hosebeds  
 E-Bumper lines or trash lines

Complete the same table information for other companies within your department or from mutual aid companies.

**KNOW YOUR APPARATUS**



Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #2

### Large GPM Water Supply

#### Discussion Questions

1. How many ways can your company supply "big water" (+500 gpm) to a fire upon initial attack? After 5 minutes?
2. What safety considerations must be observed when placing big lines into operation?
3. How can additional water be supplied after a hydrant is "maxed-out"? Can the municipality supply additional water pressure or volume for you?
4. Are there occupancies in your district that may require immediate big-water attack due to contents or building construction?
5. Can your engine supply more than it's rated capacity? How is this accomplished?
6. What are the hydraulic rules of thumb for friction loss in your largest supply line/100'?



# Firefighter Close Calls.Com



## Home of The Secret List

Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #3

### Hydraulic Calculations

Calculate the engine pressure for the following hose layouts.

150 feet of 2 1/2 inch hose with a 1 1/8 inch SOLID STREAM TIP.



150 FT - 2 1/2" hose



1 1/8" S.S.

400 feet of 3 inch hose **Wye**d into two (2) 250 feet lines of 2 1/2 inch hose each with a 1 1/8 inch Solid Stream Tip

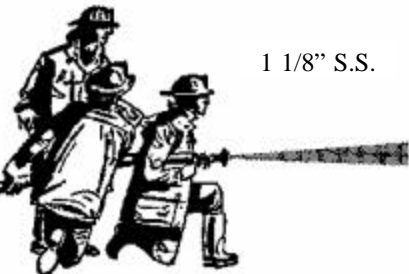


400 FT - 3" hose

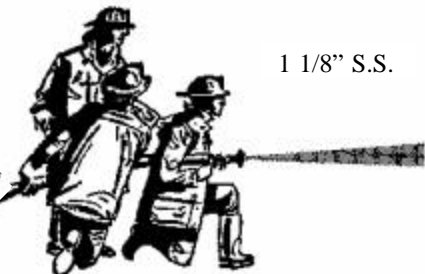


250 FT - 2 1/2" hose

250 FT - 2 1/2" hose



1 1/8" S.S.



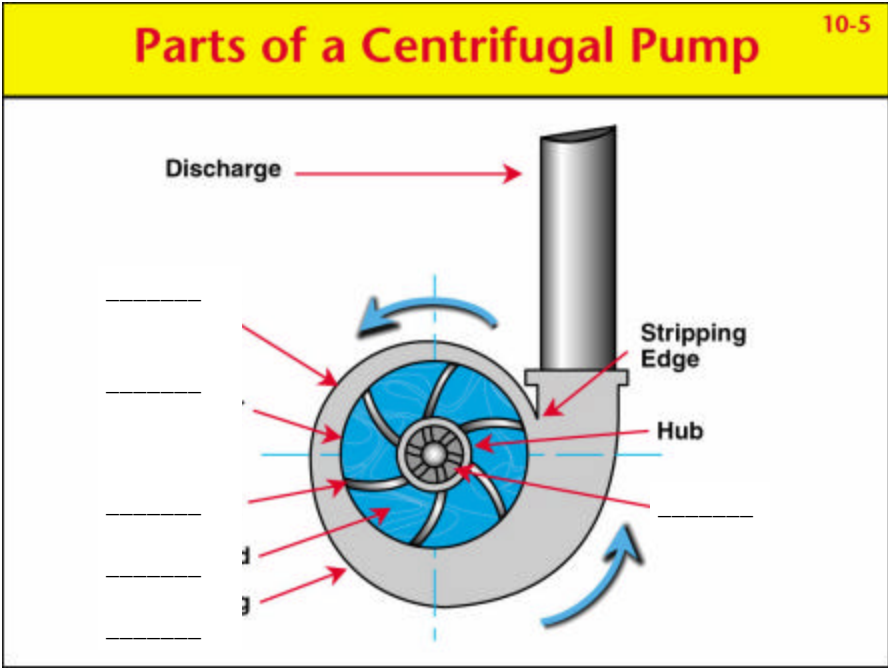
1 1/8" S.S.

Substitute your nozzle types and tip sizes from your assigned apparatus in these examples.



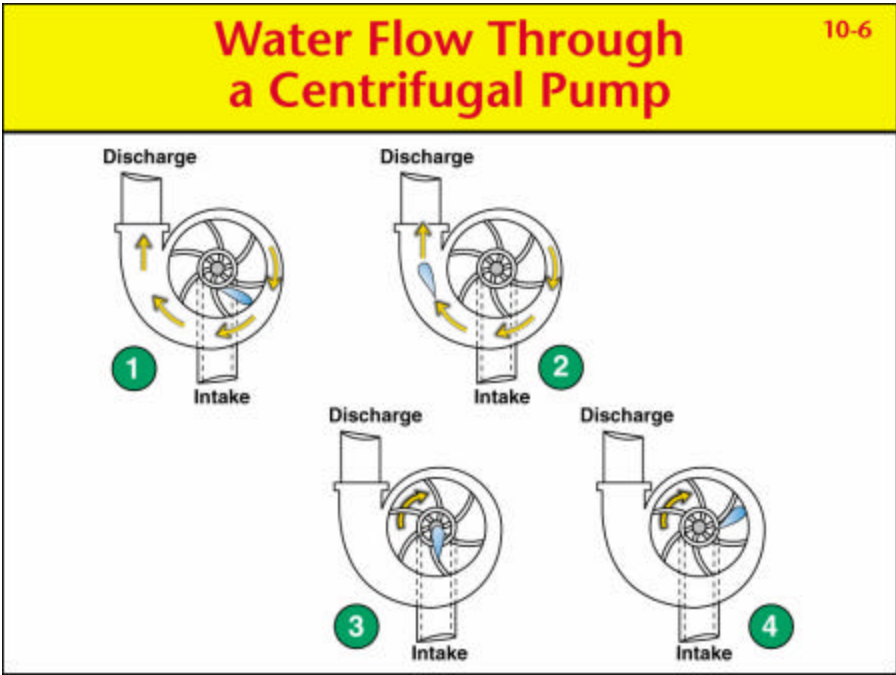
Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #4

### Fire Pump Parts



Label the parts of a centrifugal fire pump.

See IFSTA Pumping Apparatus Handbook Pages 208-209 for Information.

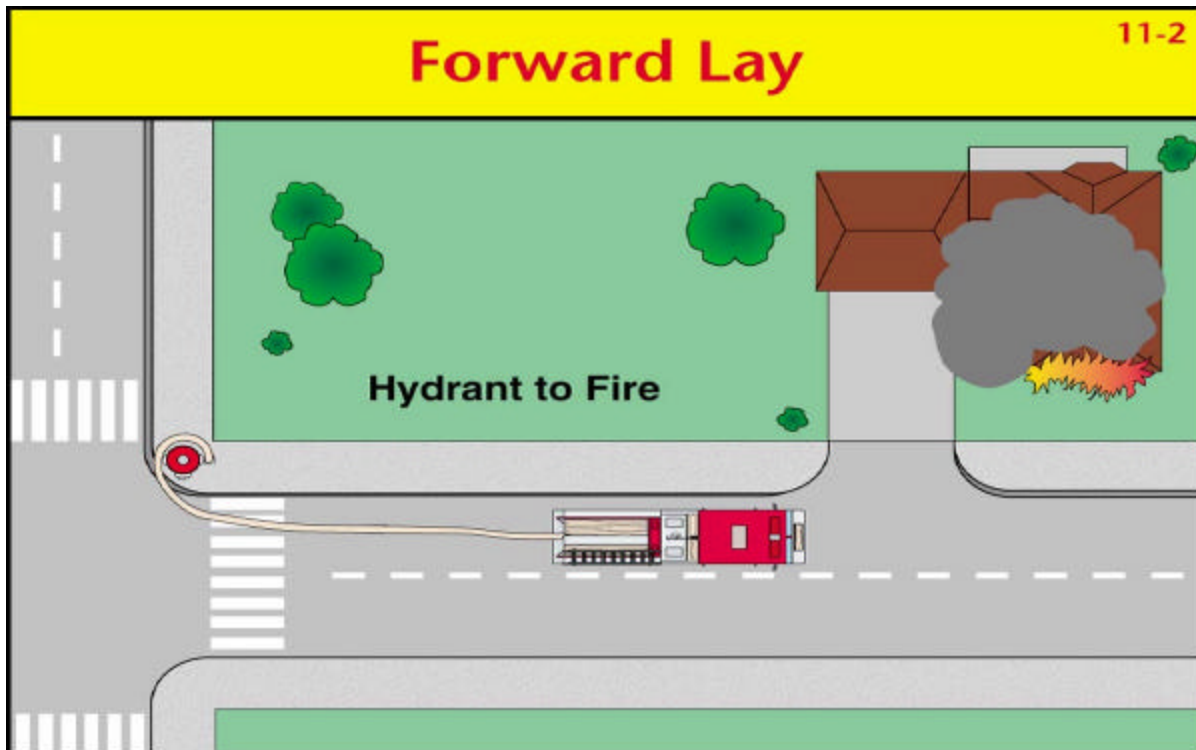


Review the flow of water through this fire pump. List step steps in the process.



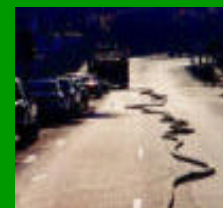
Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #5

### Forward Lead-outs



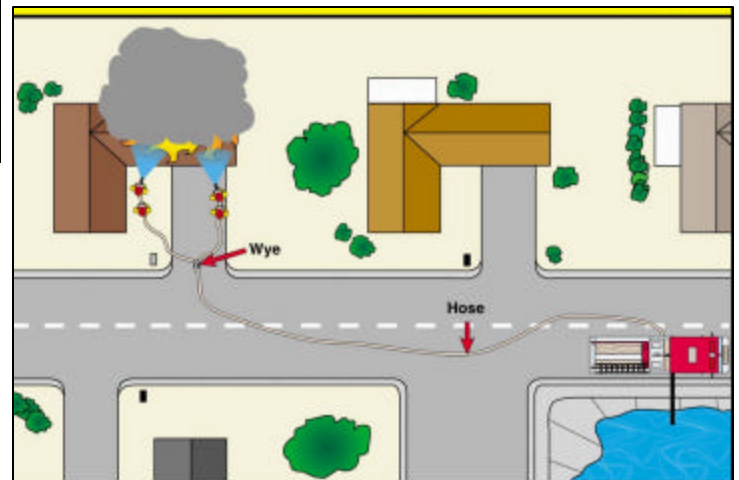
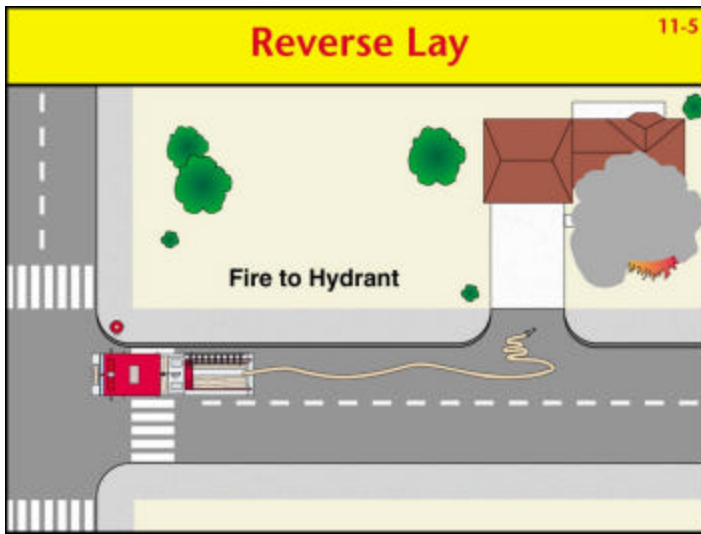
#### Discussion

1. In what circumstances would you do a forward lead-out?
2. What size supply line is laid?
3. Who completes the water supply hook-up at the hydrant?
4. Where would the engine position in the above scenario?
5. Are there any other considerations for this type of operation?
6. What hose beds on your engine are set for this operation?



Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #6

### Reverse Lead-outs



#### Discussion

1. In what circumstances would you do a reverse lead-out?
2. What is the size of supply line to the wye?
3. What attack line or lines are on the wye, what nozzle type?
4. Describe the water supply hook-up at the hydrant.
5. Are there any other considerations for this type of operation?
6. Are there other ways to complete a reverse lay from your engine besides the one you have discussed?



# Firefighter Close Calls.Com

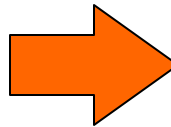
Home of *The Secret List*

Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #7

## Safe Apparatus Positioning

Don't make your apparatus part of the problem.

- Review positioning of apparatus at accident scenes
- What is considered to be a safe distance away from the accident



**What would you do if a fire went defensive and the apparatus was positioned too close? What personnel safety considerations do you have before moving the unit?**



- Discuss any SOG's on positioning apparatus
  - Remember uphill and upwind
  - Use of the apparatus as a shield from traffic
- **TAKE TIME TO SPOT CORRECTLY AND SAFELY ACCORDING TO APPARATUS FUNCTION AND CREW SAFETY**

Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #8

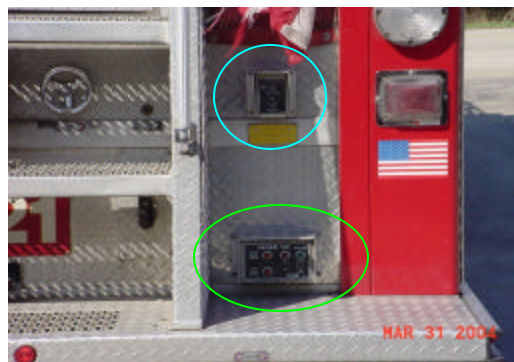
### Aerial Outrigger Set-up

Review the proper setup of outriggers on aerial apparatus.

- What is the minimum/maximum jack spread distance
- What is the procedure for setting jack pads under the outriggers?
- What are your department procedures and policy for setting up outriggers on surfaces that are not solid?
- Can your apparatus "short-jack" or not fully deploy one set of jack to accommodate parked vehicles or other obstructions? If so, what is the procedure for this and which side may be short-jacked?

**Demonstrate the various outrigger set-up procedures for your apparatus.**

*Note: If your department does not have an aerial device, review IFSTA Aerial Apparatus for information on set-up distances. Be prepared for aerial ladder usage in your community through mutual aid response!*



# Firefighter Close Calls.Com



Home of *The Secret List*

Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #9

## Backing Up Apparatus



What is the SOG for backing up apparatus?

Where are back-up spotters to be positioned?

What additional safety procedures are taken by the operator prior to backing up any apparatus?

Review hand signals used when guiding apparatus.

### The Officer's & Driver's Responsibilities

- The Officer is responsible for the operation of the vehicle and it's personnel.
- The Officer is responsible for following and enforcing policies and procedures. In this case– deploying spotters when backing up or as necessary to allow the safe movement of the vehicle.
- The driver is in control of the vehicle and therefore responsible for its movement. He/she should not move the vehicle until directed by the Officer and when spotters have been deployed in a backing up situation.
- If the driver loses sight of the spotter, he/she shall stop the vehicle until they are back in his/her sight.
- If more than one spotter is being used, the driver will need to maintain contact with both of them. This means shifting his/her attention from one spotter to another frequently so as to safely move the vehicle. This should indicate that the vehicle should be moving at a slower than normal rate to safely watch both spotters.
- If at any time the driver feels that the situation is not safe, he/she should stop the vehicle until the situation is corrected. This may mean getting out and physically walking around the vehicle and down the road to where the vehicle is headed.

### The Spotter's Responsibilities

- The spotter is there to direct the driver while backing up the vehicle.
- The spotter needs to be constantly aware of the surroundings while performing this function.
- The spotter needs to be constantly looking and listening for other vehicles and people that may enter the path of the vehicle that is backing up.
- The spotter must either stop the oncoming hazard or stop the vehicle being backed up.
- The spotter must be aware of objects and direct the driver safely around them.
- The spotter must not only look at ground level for obstructions, but also LOOK UP for overhead hazards – tree branches, wires, signs, canopies, ladders...
- The spotter shall maintain visual contact with the driver at all times.
- The spotter needs to be in the line of sight of the mirrors of the vehicle being backed up at all times.
- At night, the spotter should position one of the rear spotlights on themselves or use a flashlight to help the driver see them. DO NOT point the flashlight directly in the mirror of the driver, as it will blind him/her.
- The spotter shall use hand signals to direct the driver. These hand signals should be somewhat exaggerated so that the driver can be clear as to what the spotter is signaling in the mirror.
- Voice communication between the spotter and driver is also good, but the driver may not hear the spotter over the noise of the vehicle and other background noise.
- The use of portable radios to communicate between the spotter and driver may prove beneficial in certain circumstances.
- In congested or tight areas, more than one spotter may be necessary.
- In congested or tight areas, one spotter may be needed at the rear and one at the front of the vehicle being moved either forward or backward. We have experienced several incidents where the spotters were at the rear of the vehicle and the front of the vehicle struck an object.
- Spotters should also be used when going forward in tight areas, to avoid hitting and objects. Like during the winter when snow banks tend to push parked cars further into the already narrow streets.

# Firefighter Close Calls.Com

Home of *The Secret List*

Back To Basic Special Edition  
"Apparatus Operator"  
Apparatus Operator #10

## Pump Operator Duties



### Apparatus Operator (A/O) Responsibility

- How can an A/O keep track of the number of lines off an apparatus at an incident like this?
- What methods are available to keep track of the pump discharge pressures necessary in each of the lines off this engine?
- Review methods of calculating available water from a hydrant

### Troubleshooting Pump Operations

#### IF PUMP WILL NOT DELIVER CAPACITY:

The following may prevent the pump from delivering its rated capacity. Review the remedies for each of these occurrences.

1. **Relief Valve Improperly Set**

If a relief valve is set at a pressure below the desired operating pressure, it will pass water and lower the capacity (see manufacturer's relief valve operating instructions).

2. **Badly Worn Wear Rings**

Failure of the pump to deliver its rated capacity at a given pressure may be an indication that the impeller wear rings are badly worn, allowing excessive quantities of water to leak around them.

3. **Suction Screen and Impeller Vanes Fouled with Debris**

Backwash of water from the pump through the impellers when the pump is stopped usually cleans the impeller vanes. Debris on the pump suction screen, however, usually remains in the suction hose and is immediately caught by the screen when pumping is resumed. Therefore, suction hose should be removed and cleaned.

4. **Chassis Transmission in Wrong Gear**

See operating instructions.

5. **Suction Hose Collapsed**

On defective or old suction hoses, the inner liner often collapses when drafting water, thus restricting the flow of water to the pump. Collapse of the inner liner is often hard to detect even when the inside of the hose is examined with a light. This is due to the fact that the inner liner often goes back in place when the suction vacuum is removed. If the pump will deliver capacity with a different suction hose, it is reasonable to assume that the liner on the former hose has become loosened.

6. **Suction Hose Not Submerged Deeply Enough**

The lower end of the suction hose should be submerged at least two feet below the surface of the water to avoid taking air.

7. **Suction Hose Too Small**

When higher than normal lifts are involved or at high altitudes, larger suction hose is needed.

8. **Insufficient Engine Power**

Although the engine had sufficient power originally, there are several reasons why the power can decrease to the point at which it will not handle the pump at the rated capacity and pressure. Things to suspect are: incorrect timing, fouled spark plugs, burned distributor points, weak condenser or coil, sticking valves, worn piston rings, worn fuel pump, and poor carbonation. Also, if the engine is operated at higher than normal altitudes, the power may be too low. The power of an engine decreases about 3% to 4% for every 1000 feet of increase in altitude. Excessive engine temperatures, which frequently occur in hot weather, and during long periods of operation, reduce the power. This can be caused by clogged radiator or heat exchanger, insufficient coolant, worn water pump, loose fan belt, and deteriorated crank case oil.