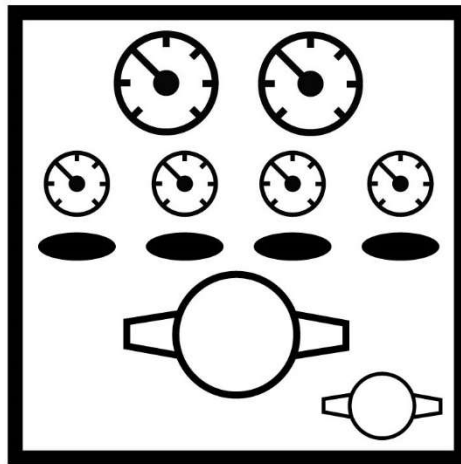




FAMA BUYER'S GUIDE

TC076

Pump Control Location



Prepared by the FAMA Technical Subcommittee

This guide does not endorse any manufacturer or product



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Introduction

Pump operator panel location is a feature that often time is used to describe the apparatus in general. One might refer to a "Top-Mount Pumper" or a "Side Mount Pumper" in general terms. But the creativity of fire departments and fire apparatus manufacturers has greatly broadened the array of pump panel locations and configurations. Before specifying a new apparatus purchase it is a good idea to consider the range of options available, and to think through what trade-offs are most important to you based on operational, logistical, and safety considerations.

Pump Control Location Considerations

TRAFFIC

Apparatus are often required at the scenes of road crashes or incidents. The apparatus may be parked in a manner that blocks the scene from on-coming traffic to reduce the risk to responders in the event of a secondary crash. Ideally the apparatus should be located so that the side of the truck where the pump operator is working is away from traffic, but this may not always be practical. A typical side-mount pumper will have the pump panel facing traffic if the apparatus is parked in-line with the traffic. The extra time required to get the apparatus turned around to face traffic will increase response time.

The importance of traffic exposure consideration will depend on the typical response scenarios for which the apparatus will be used. Give greater consideration to placing the pump controls away from the left side of the apparatus if it will see a greater percentage of responses to:

- ☐ Highway crashes
- ☐ Road scenes where traffic cannot or will not be blocked by police
- ☐ Road scenes in highly congested traffic conditions



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Pump Control Location

WEATHER

An apparatus located in cold or wet climates should consider the effect that weather conditions will have on the durability and reliability of the controls, and of the safety and comfort of the operator. Gauges, levers, wiring, and electronics exposed to road salt during winter weather are more likely to suffer corrosion related failures. Gauges and displays covered with road grime will be more difficult for the operator to see. If your apparatus will be exposed to these conditions, consider pump control locations protected from road spray. Operators exposed to cold and wet conditions will be distracted by discomfort and less likely to perform at peak alertness during the response. Consider those alternative locations or control configurations where the operator can spend as much time as possible out of the weather.

CLOSENESS TO DRIVER SEAT

Response time is always a priority. As the apparatus driver is usually also the pump operator, the time it takes to exit the driver position and begin pump operations affects the response time. It is also an activity that is visible to onlookers and is therefore important from a PR standpoint. Of course, the logistics of connecting hose are also critical, and may be of more importance, depending on the nature of the response.

VISIBILITY OF THE SCENE

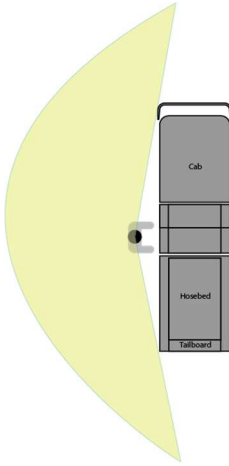
Of utmost importance to first responder is the concept of "situational awareness". The ability of the pump operator to visualize the scene is critical to their situational awareness. Aspects that impact visibility include which side of the apparatus the pump control is located on as well as whether it is located at ground level or higher on the apparatus.

A location near the middle of one of the sides of the apparatus restricts the operator visibility to 180 degrees of the scene. Moving the controls to one of the rear corners increases that range to 270 degrees. If the controls are located at the back of the truck, with just a few steps one way or the other the operator can see nearly 360 degrees around the truck. A top mount location can also improve visibility greatly by getting the operator above the scene.

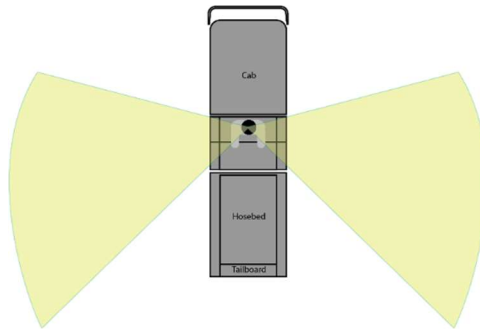


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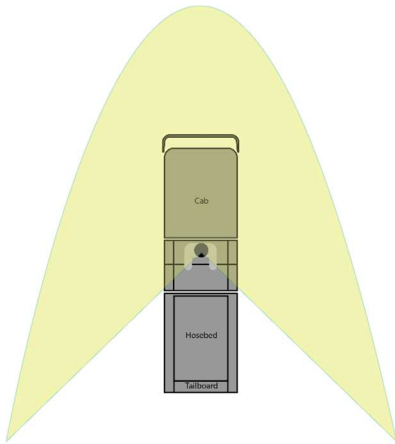
Visibility by Location



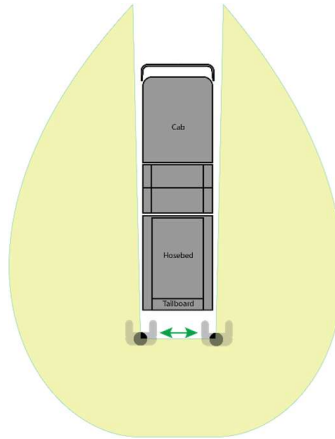
Side Mount



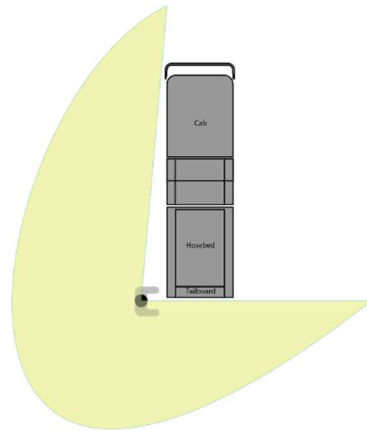
Top Mount



Top Mount Enclosed



Rear Mount – Rear



Rear Mount - Side



CONTROL ERGONOMICS

The location of the pump controls can have an impact on how easy they are to operate and how accurately the pump operator can use the controls to adjust the output. Traditional mechanical controls usually consist of linkages that work levers to open or close valves. Side control panels allow the linkages to align with most pumphouse valves to minimize friction. Top mount controls usually require a bell-crank mechanism to change the direction of the linkage to align with the valve levers. Electronic valves eliminate linkages, and the operator controls can be located anywhere.

HOSE EXPOSURE

Hose failures, particularly from large diameter hose, represent a serious safety risk. The pump operator who needs to spend a significant amount of time next to pressurized hoses has an increased risk. Moving controls away from intake and discharge connections will reduce that risk.

COST

Pump panel location price impact is determined by both the pumphouse parts cost as well as any periphery costs. The least expensive configuration is what is most popular in Europe, the rear mount pump with direct controls. The pump, pump manifold and valves are exposed, and flow is controlled by manipulating levers directly connected to the valves.

The least costly North American style pump control is the side-mount configuration. The pumphouse is simple and the valves are controlled using simple linkages. A rear control panel with a rear-mount pump has similar costs other than the fact that the panel will be built into the body rather than into a dedicated pumphouse structure.

Electric valves are inherently more expensive than mechanically operated valves, but the advantage is that the control station can be moved to anywhere on the apparatus.

Finally, certain control locations affect the structure around them. The most significant of these is probably the enclosed top mount design where the back of the crew cab seals around the top-mount controls. The more complex cab and sealing method adds cost and complexity.



Pump Control Location Examples

While the possible locations of pump controls on any apparatus are physically limited, the fire industry has tried almost all of them. In this section we will describe examples of most of the popular locations.

SIDE-MOUNT

The exposed control panel is almost always located on the left side of the truck behind the cab. Typically push-pull T-Handle manual valve controls, but could also use levers, wheels, or electronic controls.



SIDE-MOUNT INSIDE A COMPARTMENT

This configuration models the traditional side-mount location around the middle of the apparatus on the left side but improves the protection of the components by placing controls and gauges inside a compartment. Alternatively, this can be accomplished by adding a compartment door over the typical side-mount pump panel.





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REAR-MOUNT PUMP WITH SIDE CONTROLS ON LEFT

The control panel is on the left rear side of the truck. The panel could be exposed but is more commonly protected inside a compartment with a roll-up door.



REAR-MOUNT PUMP WITH SIDE CONTROLS ON RIGHT

The control panel is on the right rear side of the truck. The panel could be exposed but is more commonly protected inside a compartment with a roll-up door.





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REAR-MOUNT PUMP - EUROPEAN STYLE

This is the simple configuration very popular in European design and almost always located behind a roll-up door. The operator manipulates the levers directly connected to the valves.



REAR CONTROLS - NORTH AMERICAN STYLE

This location could be built around a rear-mount pump, or it could be a mid-ship pump with electric valves. Either way this location has the advantage of good response-scene visibility with only a few steps to the right or left.





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TOP-MOUNT

Probably the second-most popular North American configuration. The operator climbs to a walk-way behind the cab where they are up and away from passing traffic. Visibility is improved by being at height with good visibility to both sides. The body and cab can obstruct visibility over the front and back of the apparatus.



ENCLOSED TOP-MOUNT

The most comfortable of all the pump control locations, the operator can work within a climate-controlled station in any weather condition. Visibility is improved over the traditional top-mount as a view to the front of the apparatus is provided through the windshield.





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ELECTRIC VALVES WITH TRUCK-MOUNTED CONTROL DISPLAY

By accepting the increased cost of electric valves, the apparatus designer is free to place the valve controls and pump panel anywhere on the apparatus. Taking this one step further, all the controls and gauge information can be located on a single touch-screen device if desired. Multiple control pads can be located at various positions around the apparatus. By locating one inside the cab, the advantage of the enclosed top-mount is provided without the cost of the special cab.



ELECTRIC VALVES WITH REMOTE CONTROL TABLET

The ultimate in flexibility is to take the truck-mounted control tablet and make it remote. With this feature the pump operator can move to anywhere on the response scene, allowing the best situational awareness and direct communication with other firefighters working the scene.





Weighing the Pros and Cons

Every design decision is a trade-off. The key to making good choices in apparatus design is to consider the most common conditions that the apparatus will face. The answers will be different for a rural department in Texas than for an urban department in Toronto. Other factors than we have discussed here may also come into the trade-off analysis such as training, budget, service capabilities. Often departments desire their apparatus to be similar to the rest of their fleet so that every firefighter is familiar with operation regardless of the station they are assigned to. While this is a common and important consideration, it may be one of the reasons the fire industry is so slow to change. Remember that every improvement in life had to start with someone willing to take a chance at doing something different.

See the chart on the next page for a detailed summary of the attributes.



Buyers Guide Pump Control Location

	TRAFFIC	WEATHER - COMPONENTS	WEATHER - PEOPLE	RESPONSE TIME	SCENE VISIBILITY	CONTROL ERGONOMICS	HOSE EXPOSURE	COST
SIDE-MOUNT	C Operator is exposed to passing traffic at crash site if truck is parked in same direction as traffic.	C No Protection	C No Protection	A Close to the left side of cab. No doors to open.	C 180 degrees of visibility from ground level.	B Reasonably simple push-pull linkage in-line with the valve levers	C- Controls and gauges place operator near hoses	B+ Simple controls and linkages
SIDE-MOUNT INSIDE A COMPARTMENT	C Operator is exposed to passing traffic at crash site if truck is parked in same direction as traffic.	B Protected behind a compartment door except during operation	C No Protection	B+ Close to the left side of cab..	C 180 degrees of visibility from ground level.	B Reasonably simple push-pull linkage in-line with the valve levers	B Control panel location allows several feet of separation.	B+ Simple controls and linkages
REAR-MOUNT PUMP WITH SIDE CONTROLS ON LEFT	C Operator is exposed to passing traffic at crash site if truck is parked in same direction as traffic.	B Protected behind a compartment door except during operation	C No Protection	B- Same side as the driver, but all the way to the back of the truck.	B 270 degrees of visibility from ground level when standing at the rear corner.	B Reasonably simple push-pull linkage in-line with the valve levers	B+ Control panel is around the corner from hose connections.	B+ Simple controls and linkages
REAR-MOUNT PUMP WITH SIDE CONTROLS ON RIGHT	B+ Operator is protected from passing traffic at crash site if truck is parked in same direction as traffic.	B Protected behind a compartment door except during operation	C No Protection	C- Opposite side from driver door and all the way to the back of the truck.	B 270 degrees of visibility from ground level when standing at the rear corner.	B Reasonably simple push-pull linkage in-line with the valve levers	B+ Control panel is around the corner from hose connections.	B+ Simple controls and linkages
REAR-MOUNT PUMP - EUROPEAN STYLE	B- Operator is less exposed to passing traffic, but still danger from secondary traffic crashes.	B Protected behind a compartment door except during operation	C No Protection	C Driver must talk to back of truck and then open a door to gain access to controls.	C 180 degrees of visibility from ground level.	A The simplest design with levers directly on each valve.	C- Controls and gauges place operator near hoses	A Lowest cost valve controls.
REAR CONTROLS - NORTH AMERICAN STYLE	B- Operator is less exposed to passing traffic, but still danger from secondary traffic crashes.	B Protected behind a compartment door except during operation	C No Protection	C Driver must talk to back of truck and then open a door to gain access to controls.	C 180 degrees of visibility from ground level.	A The simplest design with levers directly on each valve.	C- Controls and gauges place operator near hoses	A Lowest cost valve controls.
TOP-MOUNT	A Operator is protected above traffic and within the confines of the truck perimeter.	C No Protection	C No Protection	B Close to the left side of the cab, but requires a climb to reach the walkway.	B+ Visibility off both sides and from a raised location. No direct view off the front or rear of the truck.	C 90 degree direction change required for most valve levers.	B+ Operator is above and away from hose connections	B More complex linkages because of the 90 degree direction change.
ENCLOSED TOP-MOUNT	A Operator is protected inside the crew cab	A Controls protected within the cab at all times	A Operator is totally protected.	B Close to the left side of the cab, but requires a door open and climb into crew area.	B Visibility off both sides and the front from a raised location.	C 90 degree direction change required for most valve levers.	A Operator is completely protected from hoses during operation.	C- More complex linkages because of the 90 degree direction change. More costly cab.
ELECTRIC VALVES WITH TRUCK-MOUNTED CONTROL DISPLAY	A Operator can be positioned away from traffic by using a display on the curb side of the vehicle.	C Display could be mounted inside cab, but more likely it will be out in the weather.	B Display could be mounted inside cab, but more likely it will be out in the weather.	A Could be operated directly from cab once hoses are attached.	A Option to work off either side of the truck. Visibility depends on location of display(s)	A No mechanical linkages required.	A Operator is completely protected from hoses during operation.	C- Electronic controls very costly.
ELECTRIC VALVES WITH REMOTE CONTROL TABLET	A Operator can be positioned away from traffic by using the handheld remote, or a display on the curb side of the vehicle.	C Handheld tablet may be exposed to dropping, environment, etc.. But could be used from inside cab.	B Can be used inside a cab to stay out of the weather.	A Could be operated directly from cab once hoses are attached.	A Allows operator to control from anywhere.	A No mechanical linkages required.	A Operator is completely protected from hoses during operation.	C- Electronic controls very costly.