Master Stream Appliances

Chapter 9

Learning Objectives

- Identify the three types of master stream appliances and their application on the fire ground, including the advantages and disadvantages of each
- Recognize the various types and sizes of nozzles used to deliver the proper flow rates and stream patterns when using a master stream appliance
- Recognize that the effectiveness of a master stream appliance depends almost completely on its receiving an adequate supply of water
- Understand how a master stream appliance can be used to the best advantage to control and extinguish a fire

Master stream appliances are large-caliber devices that are used primarily during defensive operations. Conditions on the fire ground may be deteriorating or have already reached that point when these appliances are placed in service. During this time, fire fighters must be completely aware of their surroundings on the fire ground.

Master stream appliances mean that a large volume of water is being applied on the fire ground. Fire fighters must use extreme caution working around hose lines, pumpers, and the appliance itself. Precautions must be observed around buildings or other structures in which the appliance is being directed.

Both pumpers and aerial fire apparatus should be positioned so that radiant heat, convective heat, burning embers, or structural collapse will not affect the safety of fire fighters working in those areas. Master stream appliances should be as far away from the fire as possible while still being effective. If there is any indication of structural integrity, a perimeter should be set up a safe distance from the collapse zone and all personnel and equipment kept out of this area.

Command must manage the use of master stream appliances on the fire ground. Master stream appliances should not be placed in service in a defensive mode while an offensive, interior attack is being conducted. Serious injury to fire fighters could result as fire, heat, and products of combustion are forced onto them. In addition, elevated master stream appliances should not be operated into vertical natural openings or openings created by fire fighters or the fire itself. This blunder will certainly endanger fire fighters inside the building and prevent the fire, heat, and gases from leaving the building.

Master stream appliances, also known as "heavy-stream" and "large-caliber stream" devices, deliver more water and can reach further than the largest handheld hose lines. They are placed into operation when handheld hose lines are ineffective in fire attack, for exposure protection, and for backup lines. Several types of appliances are available, with several sizes of nozzles, including both spray nozzles and smooth-bore tips.

Master stream appliances are not special equipment. They should be considered standard firefighting tools and, as such, should be part of preincident planning and training evolutions. To be effective, these appliances require water flows from 350 to 2,000 gpm, depending on the size and type of the nozzle being used and the volume of water available. Engine company personnel should be fully trained in the operation of these appliances, from the laying and charging of supply lines to the use of the appliances in fire attack and exposure protection. This chapter discusses the types of appliances and nozzles that are available, water supply for master streams, and the use of master stream appliances at the fire ground.

Key Points

Master-stream appliances are used when handheld hose lines are ineffective; they are used in fire attack, for exposure protection, and for backup lines.

Key Points

There are three types of master stream appliances: portable appliances, fixed appliances, and elevated master stream appliances.

Types of Master Stream Appliances

There are essentially three types of master stream appliances. The first two types are portable and fixed appliances, which are carried on and operated from the fire apparatus. In addition, portable appliances can be operated on the ground or from other remote positions. The third type, elevated master stream appliances, is operated from aerial fire apparatus ladders or platforms. Each has its advantages and disadvantages in a particular fire situation.

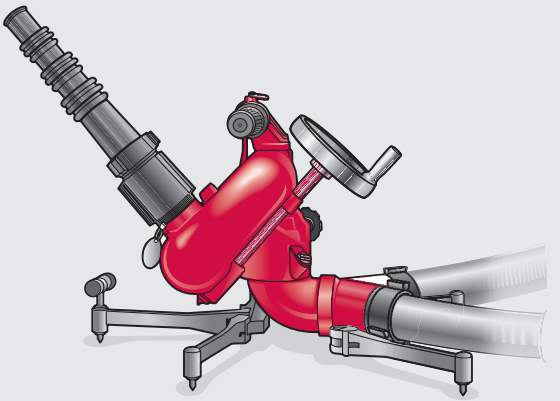
Portable Master Stream Appliance

Portable master stream appliances are often referred to as deck guns or monitors. They are carried on the apparatus and generally are operated from here, although they are designed to permit operation from either the apparatus or the ground. A number of varieties are available, but all are operated in similar fashion.

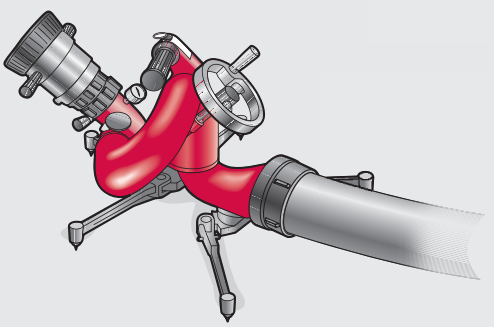
Portable master stream appliances can be operated from a fixed position on the pumper and placed into service quickly. If the pumper can be placed in a strategic location so that the appliance can be operated onto the fire or to protect an exposure, then it may be advantageous to work from that position. If the pumper cannot be located near the fire, the appliance could be removed from the pumper and operated remotely from the truck.

Portable master stream appliances are provided with points on the bottom of the stabilizing legs, as well as a chain or straps. The points dig into the ground while the chain and straps are attached to an unmovable object to prevent the appliance from shifting during operation.

When water flows through the appliance, the nozzle reaction force created can cause the device to move, or shift, from its position. This can occur if the nozzle is operating at too low an angle. A safety lock is provided so that the lock must be manually released before the nozzle can be lowered below a 35-degree angle. There are portable appliances that employ a safety shut-off valve that automatically shuts off the flow of water if the appliance moves. This feature reduces the risk of injury to fire fighters from an out-of-control appliance. Some portable master stream appliances are made to take advantage of a hose loop to prevent movement. When so equipped, this feature should be used.



(a) Smooth bore tip



(b) Spray nozzle

Figure 9-1 Portable master stream appliances can have (a) two inlets or (b) one inlet.

Figure 9-1 shows two types of portable master stream appliances with one and two inlets. These inlets are designed to be supplied by a large-diameter hose (LDH) or smaller diameter supply lines. They are capable of operating with either smooth-bore tips or spray nozzles.

Today's modern fire apparatus is usually equipped with a prepiped deck gun that can be quickly supplied from a separate discharge gate on the pump or taken off the apparatus, placed into a mounting bracket, and operated on the ground or other remote location. They may be equipped with a telescoping feature, which lowers the device for storage and raises it when operating to give greater clearance from other equipment including raised cab roofs. In addition, an appliance may also be remotely controlled from its position on the pumper. Engine company members must be familiar with the manufacturer's operating instructions for use from either the apparatus or the ground. A portable master stream appliance is placed on the ground and supplied with water from one or more hose lines.

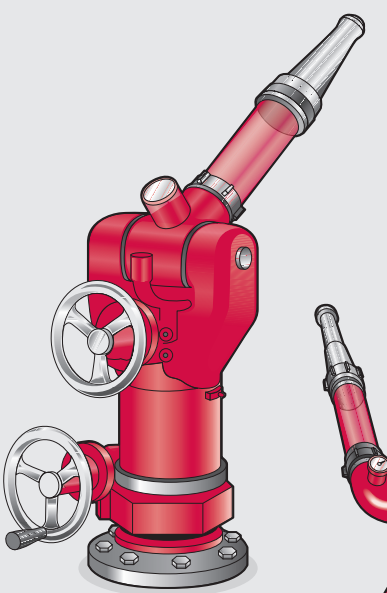
Fixed Master Stream Appliances

Master stream appliances can also be permanently mounted or fixed to pumpers **Figure 9-2**. Water is supplied to fixed appliances in one of two ways. In the first method, water is prepiped up to the appliance from a separate discharge gate on the pump. In the second method, the appliance is supplied directly by hose lines with one or more connections to the pumper's discharge outlets. Devices supplied by the second method can also be mounted on ladder trucks, special service vehicles designed to carry such appliances, and other vehicles without pumps. The apparatus on which a fixed master stream appliance is mounted must be carefully and correctly positioned at the fire scene.

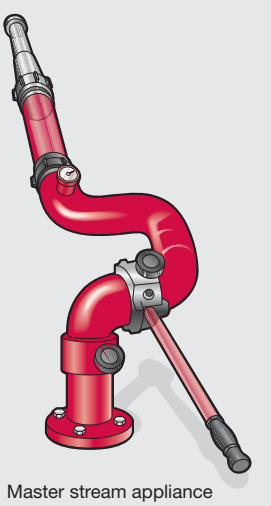
Elevated Master Stream Appliances

Elevated master stream appliances **Figure 9-3** are found on aerial ladders, elevating platforms, and water towers. Unless the aerial fire apparatus is equipped with a fire pump, an engine company will usually supply water to the appliance.

Where a prepiped waterway is provided on an aerial ladder, the waterway system must be capable of flowing 1,000 gpm



(a) Master stream appliance on a fire boat



(b) Master stream appliance on a pumper

Figure 9-2 Two types of fixed master stream appliances are (a) one from a fire boat and (b) and one from a pumper.

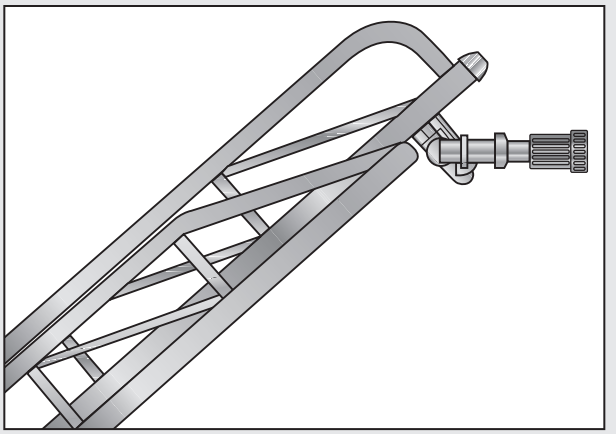


Figure 9-3 An elevated master stream appliance can be found on an aerial ladder.

at 100-psi nozzle pressure at full elevation and extension. A permanently attached monitor must be provided with a 1,000-gpm nozzle. Where a prepiped waterway is not provided, a ladder pipe with clamps to secure the appliance to the aerial ladder should be provided. In addition, appropriate tips, hose, hose straps, and halyards shall be provided to operate the appliance properly.

Elevating platforms of 110 ft or less rated vertical height must have a permanent water delivery system installed capable of delivering 1,000 gpm at 100-psi nozzle pressure with the elevating platform at its rated vertical height. One or more permanently installed monitors with nozzles capable of discharging 1,000 gpm must be provided on the platform. The permanent water system must supply the monitor. Permanent waterways on both an aerial ladder and elevating platform must be arranged so that it can be supplied at ground level through an external inlet that is a minimum of 4 inches.

Nozzles for Master Streams

Various sizes of smooth-bore tips are available for use with master stream appliances. The most common are the 1⅜-, 1½-, 1¾-, and 2-inch tips. These tips are all normally operated at a nozzle pressure of 80 psi. The 1⅜-inch tip will discharge 500 gpm, the 1½-inch tip 600 gpm, the 1¾-inch tip 800 gpm, and the 2-inch tip 1,000 gpm at 80-psi nozzle pressure. When water is delivered to any of these nozzles at a less than sufficient rate, the stream tends to break up. This decreases the reach of the stream. If water supply is a problem, a smaller tip size should be used.

A 1¼-inch tip can be used on a master stream appliance when there is not enough water volume to feed the tip sizes listed previously here. Although generally considered an attack line tip (325 gpm at 50 psi), it will develop a fairly heavy stream with a flow of 400 gpm at a nozzle pressure of 80 psi. A 1¼-inch tip is often furnished as part of a ladder pipe's assortment of smooth-bore tips. Tips of this size could also be used on other master stream appliances when necessary.

Key Points

A 1¼-inch tip can be used on a master stream appliance when there is not enough water volume to supply the common tip sizes: 1⅜-, 1½-, 1¾-, and 2-inch tips.

Spray nozzles are available in many sizes. They are designed to operate at 100 psi, with water delivery rates generally from about 300 to 1,250 gpm. There are some spray nozzles with greater flow rates available. Again, these nozzles must receive a sufficient supply of water and operate at the proper nozzle pressure in order to be effective. Some spray nozzles are constructed so that their flow rate can be varied or selectable, generally in increments of 250, 350, 500, 750, and 1,000 gpm. Allowing the volume of water to be matched to the capability of the supply system, they are recommended for use in areas where water supply delivery rates vary from location to location. Others are available with a factory ordered fixed orifice, whereas others may have an automatic pressure control.

It should be obvious from the foregoing discussion that a master stream appliance is only as good as its water supply; no device can be effective with an inadequate flow of water. A water flow rate that is inadequate for a particular size of smooth-bore tip, however, might be just right for a smaller smooth-bore tip. Moreover, a 500-gpm stream from a 500-gpm tip is much more effective in controlling a fire than an inadequate stream from a 1,000-gpm tip. For this reason, it is important that smooth bore tips of several sizes be carried on the apparatus for use as required.

Water Supply for Master Stream Appliances

Master stream appliances operate at high flow rates, which increase friction loss in supply lines and thus require higher pressures and increased water flow from pumpers. As explained earlier, the effectiveness of a master stream appliance depends almost completely on it receiving an adequate supply of water; therefore, it is important that friction losses be minimized and that pumpers be used most efficiently. For this reason, the

Key Points

A master stream appliance is only as good as its water supply.

following points are recommended to supply a master stream appliance:

- Locate a pumper at a hydrant or other water source capable of flowing a volume of water sufficient to supply a master stream appliance on the fire ground.
- Use an LDH or an adequate number of smaller supply lines laid between pumpers if engaged in relay pumping operations.
- If the master stream appliance is to be operated away from the pumper, use an LDH or an adequate number of smaller supply lines to maintain adequate volume to the appliance.
- Maintain a minimum distance between the pumper and master stream appliance if smaller supply lines are being used. The use of an LDH will usually allow distances between the pumper and master stream appliance to be increased significantly.

Before discussing these recommendations individually, consider the following three scenarios. In the first two scenarios, 2½-inch hose line is being used to supply the master stream appliance from a pumper, whereas the third scenario uses a 4-inch supply line. For these examples, the pumper and the master stream appliance are 100 ft apart Figure 9-4.

Scenario 1

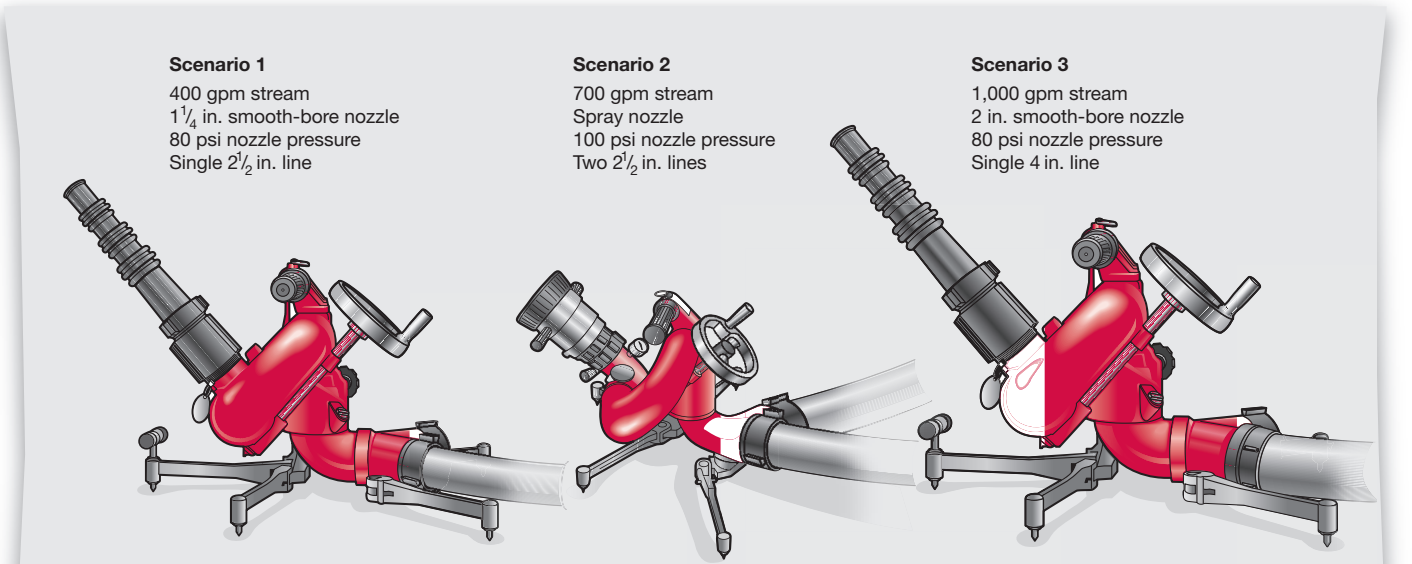
In the first scenario, a pumper is supplying a 1¼-inch smooth-bore tip, the smallest used on master stream appliances. This tip requires a nozzle pressure of 80 psi, which will develop a 400-gpm stream. This flow can just be carried by a single 2½-inch hose line. Friction loss is approximately 35 pounds per 100 ft; therefore, the pump pressure required for the 100-ft lay is 115 psi:

Nozzle pressure	80 psi
Friction	35 psi =
Engine pressure	115 psi

Scenario 2

The second scenario has a pumper supplying a 750-gpm spray nozzle on the master stream appliance. The spray nozzle requires 100 psi. Two 2½-inch supply lines, with 375 gpm flowing in each, are being used. Friction loss is approximately 30 pounds per 100 ft; therefore, the pump pressure required for the 100-ft lay is 130 psi.

Nozzle pressure	100 psi
Friction loss	30 psi =
Pump pressure	130 psi



Pounds engine pressure required:

Scenario 1		Scenario 2		Scenario 3	
80 psi	Nozzle pressure	100 psi	Nozzle pressure	80 psi	Nozzle pressure
+ 35 psi	Friction loss (hose)	+ 30 psi	Friction loss (hose)	+ 20 psi	Friction loss (hose)
115 psi	Engine pressure*	130 psi	Engine pressure*	100 psi	Engine pressure*

*20–25 lb must be added due to friction loss in the device.

Figure 9-4 Engine pressures for increased water volume to a master stream appliance will vary little if specified recommendations are followed.

Scenario 3

In the last example, a pumper is supplying a 2-inch smooth-bore tip on a master stream appliance. This tip requires a nozzle pressure of 80 psi, which will develop a 1,000-gpm stream that is being carried through a 4-inch supply line. Friction loss is approximately 20 pounds per 100 ft; therefore, the pump pressure required for a 100-ft lay is 100 psi.

Nozzle pressure	80 psi
Friction loss	20 psi =
Pump pressure	100 psi

Very little difference exists among the three calculated pump pressures, although different gpm flows were achieved using different size hose lines, nozzles, and nozzle pressures. If a single 4-inch supply line had been used for all scenarios, it would have been able to supply the master stream appliances over longer distances with negligible friction loss.

Pumper-to-Pumper Operation

As noted in Chapter 5, the most effective operation for delivering a large volume of water to a fire is to have pumpers at the hydrants or other adequate water source discharge their water to pumpers at the fire ground. This allows the use of a short lay of hose from the pumper at the fire to the master stream appliance with the friction loss minimized **Figure 9-5**. If an engine company operates a master stream appliance from the apparatus, it too should be supplied by a pumper at an adequate water source, whether or not the appliance is permanently connected to its pump. Supplying a pumper from another pumper may not be necessary if an LDH is used from an adequate water source. Many fire departments with adequate water delivery systems use 5-inch LDH to reduce friction loss further. A disadvantage of relay pumping is that two pumps are required to supply water to a master stream device.

Adequate Number of Supply Lines

In the three scenarios, the number of hose lines or their size between the pumper at the fire and the master stream appliance was increased when the required flow rate increased. This actually lowered the friction loss and kept the engine pressure fairly constant. If hose lines with less carrying capacity had been used in the last two examples, the friction loss would have increased to make the desired performance impossible.

The inlet of a master stream appliance is actually a large siamese, a device that collects water from two or more hose lines

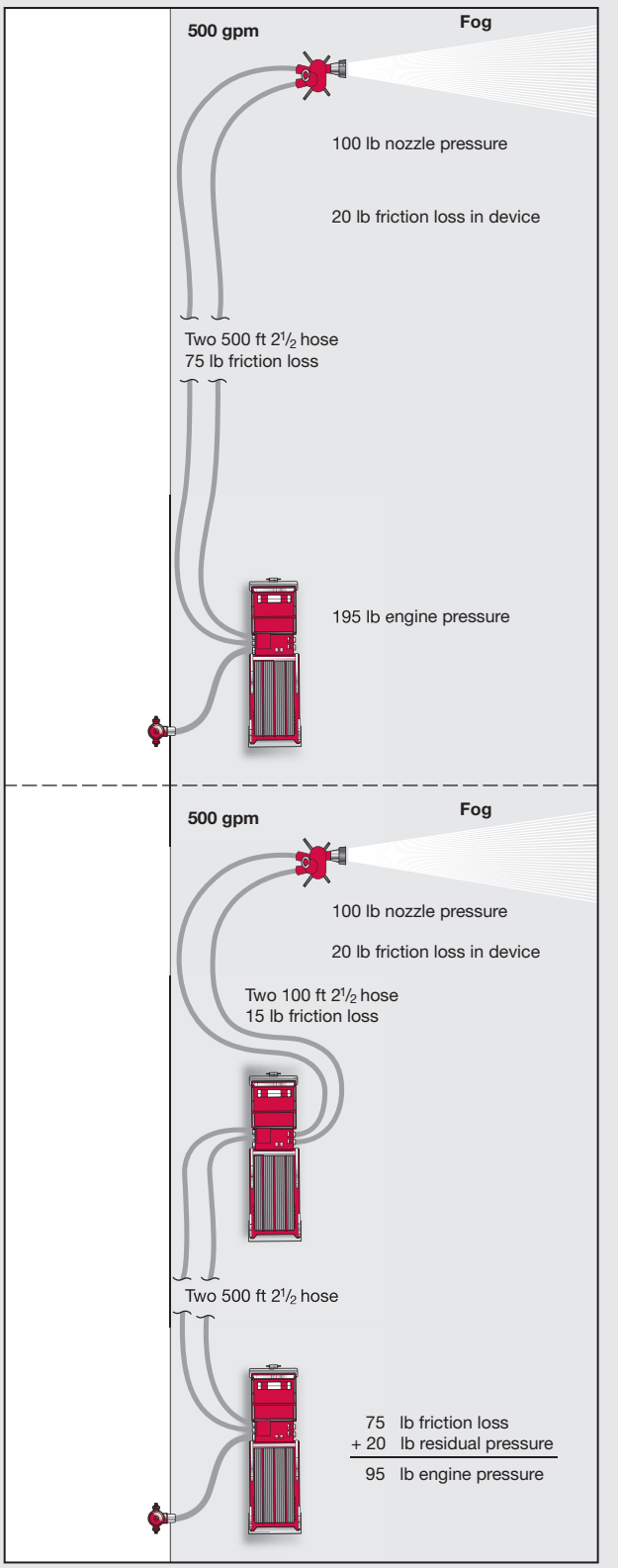


Figure 9-5 The most effective delivery of a large volume of water is a pumper at a hydrant pumping to a pumper at the fire.

Key Points

The most effective operation for delivering a large volume of water to a fire is to have the pumper at the hydrant or other adequate water source discharge his or her water to a pumper at the fire.

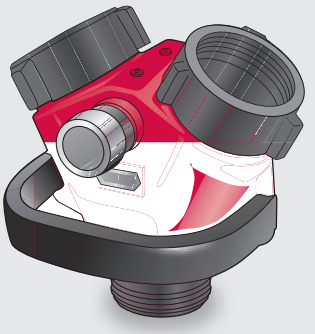


Figure 9-6 A typical siamese connection combines two hose lines into a single line.

and delivers it to a single line, which in this case is the nozzle **Figure 9-6**. The inlet can also be a single LDH connection. More water meeting less resistance flows through the multiple lines or a single LDH line to reach the appliance. Thus, less pump pressure is required and a more efficient operation is carried out.

The 2½-inch hose was used in the first two examples only because it is the smallest supply line. A larger diameter hose would give even better performance because of greater carrying capacities and lower friction loss. There are master stream appliances manufactured with a single inlet, which is designed for use with LDH. This hose is discussed in Chapter 5.

It is suggested that a maximum length of 100 ft of hose be used between the pumper and a master stream appliance when using smaller supply lines. This recommended maximum is intended to limit the friction loss in the hose lines between the pumper at the fire and the appliance. Occasionally, there will be situations in which the master stream appliance must be more than 100 ft from the pumper at the fire because the pumper cannot be brought to the position necessary for proper operation. In such cases, it is important to remember that the longer hose lines will require greater pressures. Again, the use of LDH will allow greater carrying capacities with less friction loss than smaller supply lines.

Standard Procedures

Standard operating guidelines (SOGs) differ from jurisdiction to jurisdiction. A fire department must establish an SOG that reflects its specific needs predicated on the water supply available, pumping capacities, and the water delivery system, including supply hose and appliances.

One other benefit can be derived from following the four recommendations given earlier: They are the basis of an SOG for placing master stream appliances into service. The recommendations themselves specify the size and length of hose to be used and the operation of pumping from one pumper to another. This combination is an effective one, as it minimizes pump pressures and thus maximizes water delivery capability.

The recommendations determine the discharge pressure at which the pump at the fire should be set, at least initially. The required pump pressure was close to the same in all three examples—about 115 to 130 psi. The friction loss in most master stream devices is 20 to 25 psi, which must be added to the engine pressures calculated in the examples. Each department must initiate a set of guidelines predicated on their current equipment and capabilities.

In most cases, a bit too much pressure will be no problem; there are no fire fighters trying to steady and hold a master stream appliance; however, a great deal of extra pressure will cause a solid stream to break up as soon as it leaves the nozzle, thereby making it ineffective. Its reach will be greatly reduced, and it will be as vulnerable to winds as a fog stream. In effect, too much pressure will turn a solid stream into a poor fog stream, a heavy spray of water accomplishing little if anything in extinguishing a fire or protecting an exposure. Fortunately, these results of too high of a pressure are obvious to a trained fire fighter observing the stream and a call for a reduction in engine pressure will solve the problem quickly.

Use of Master Stream Appliances

As noted earlier, several sizes of smooth-bore tips and spray nozzles should be carried on the pumper so that fire fighters can choose the correct nozzle for the fire situation and the water supply. It is just as important that both spray nozzles and smooth-bore tips are available for use as the situation demands.

A master stream appliance may be used for fire attack or exposure protection or to back up an existing hose stream. Most often, the appliance will be positioned on the outside to deliver water into the fire building through windows or doorways or to

Key Points

The use of an LDH will allow greater carrying capacities with less friction loss than smaller supply lines.

Key Points

Several sizes of smooth-bore tips and spray nozzles should be carried on the pumper so that fire fighters can choose the correct nozzle for the fire situation and the water supply. Both spray nozzles and smooth-bore tips should be available for use as the situation demands.

protect an exposure. Wind conditions and the distance to the fire or exposure will determine which type of nozzle is used and how it should be operated.

Solid-Stream Nozzles Versus Spray Nozzles

Because of the wind conditions mentioned, the strong draft created by a large fire and the usual distance from the nozzle to the building, the solid stream has proven to be most effective for fire attack, when using a master stream appliance. It will penetrate further into the building, covering more area of the fire.

For exposure protection, a spray nozzle using a fog stream may be superior to a solid stream if it is not affected by the wind or the distance from the fire building. The fog stream will cover a wider area than a solid stream and require less movement.

A spray nozzle using a straight stream, even from a master stream appliance, loses its effectiveness if it must be applied over any distance Figure 9-7. If there is any question about the ability of a straight stream to reach a fire or exposure, a solid stream should be used. For example, the intensity of a fire and/or the structural integrity of the building might prevent the positioning of master stream appliances near enough for straight streams to be effective. In such a case, solid stream nozzles with appropriate size tips would have to be used. Strong crosswinds will adversely affect both types of streams but can render a fog stream completely ineffective. Again, in a strong wind, a solid stream should be used. Smooth bore nozzles are powerful and can damage an exposure building and its appendages. Glass can be broken, making the building more vulnerable for fire extension within the building.

Key Points

The solid-stream nozzle is most effective for fire attack when using a master stream appliance. It will penetrate further into the building, covering more area of the fire.

Key Points

For exposure protection, a spray nozzle using a fog stream may be superior to a solid stream if it is not affected by the wind or the distance from the fire building.

Positioning the Master Stream Appliance

As stated earlier, to be effective, a spray nozzle using a straight stream must be positioned closer to the fire structure. Solid-

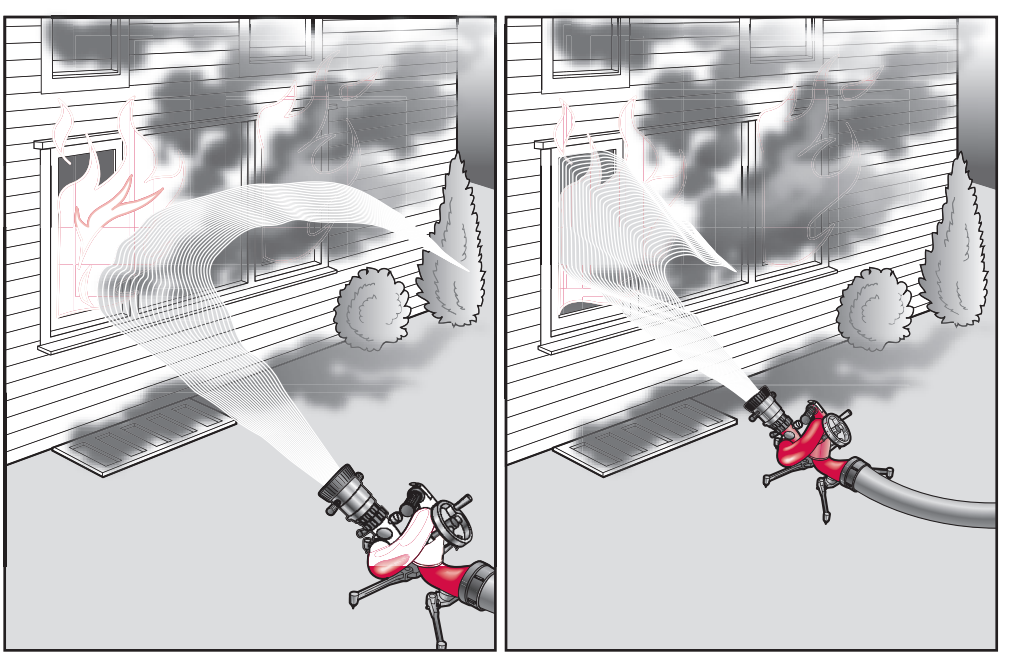


Figure 9-7 Straight stream from the mater stream appliance (*left*) is breaking up from the effects of wind. This adverse effect may be avoided by moving the appliance closer to the fire building if conditions allow (*right*).

Key Points

Spray nozzles using a straight stream must be positioned closer to the fire structure. Solid-stream nozzles perform as well or better if they are positioned some distance from the building.

stream nozzles, on the other hand, will perform as well or better if they are positioned some distance from the building. For example, a solid stream may be used to attack a fire that is three or four floors above the level of the master stream appliance. For this operation, the appliance must be placed some distance from the building to achieve the proper angle of entry. If the appliance is too close to the building, the angle will be too steep. The stream then might not reach the fire area but rather flow water needlessly into an uninvolved area.

A properly positioned solid stream will enter the building at an angle that will cause the stream to be deflected over a wide area when it strikes the ceiling or other overhead, as shown in Figure 9-8. The low angle of stream 1, just over the sill into the building, is best for maximum penetration but may be affected by obstructions. The angle of stream 2 is also effective but will not penetrate as far into the building as stream 1. Stream 3 is ineffective because of limited penetration; therefore, a stream should be repositioned up and down in a window, doorway, or other opening to achieve the best combination of effective results.

Directing a Master Stream

To be most effective in fire control, a master stream should be moved horizontally back and forth across the fire area it is covering. The stream also should be moved up and down so that it reaches to the full depth of the fire area. The amount of movement depends on the extent of the fire and existing conditions. Although nothing may burn directly under a stationary stream, the fire could spread away from it. Movement of the stream assures coverage of a good-sized area in and around the fire Figure 9-9.

Less movement might be required for exposure coverage, especially when fog streams are being used. There may be times

Key Points

To be most effective in fire control, a master stream should be moved horizontally back and forth across the fire area it is covering. The stream also should be moved up and down so that it reaches to the full depth of the fire area.

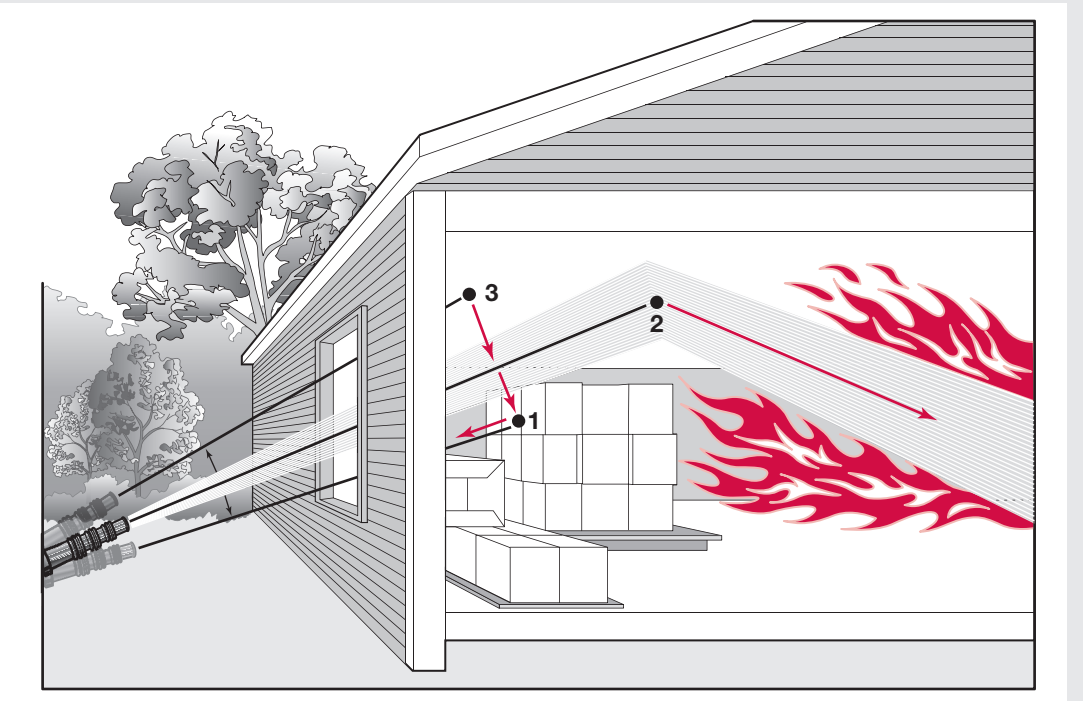


Figure 9-8 A master stream appliance must be positioned so that it hits the fire at an effective angle.

Figure 9-9 Master streams must be moved both vertically and horizontally to cover the entire area involved.

when a master stream appliance will be initially set up and left unattended. This may be due to a shortage of personnel or a situation where it may be unsafe for fire fighters, such as the possibility of a building collapse or a hazardous materials incident; however, a master stream appliance should never be set up and then left unattended indefinitely. The stream and its effect on the fire or the exposure should be carefully monitored. Command will need to be kept aware of the current conditions, as the appliance may need to be relocated to perform properly. If fire breaks out on an exposure, the exposure stream may have to be moved to control the fire immediately.

If a stream does not seem to be having any effect on a fire, it could be improperly positioned. The water must reach the base of the fire, and the master stream appliance must be positioned accordingly. Sometimes the effectiveness of the stream can be increased by moving the appliance so that the stream hits the fire at a better location. If repositioning is not the problem, the size of the stream may need to be increased, or additional streams may need to be directed onto the fire.

In heavy smoke, it can be difficult to determine whether a stream is entering the building. Fire fighters directing the stream might not be able to see the windows. If possible to do so safely, an officer should visually check the building from a safe location. If this is not feasible, he or she should listen for the sound of the stream hitting the building and should look for heavy water runoff. Both of these signs indicate that the stream is not entering the building. The stream should then be adjusted until both

Key Points

If a stream does not seem to be having any effect on a fire, it could be improperly positioned.

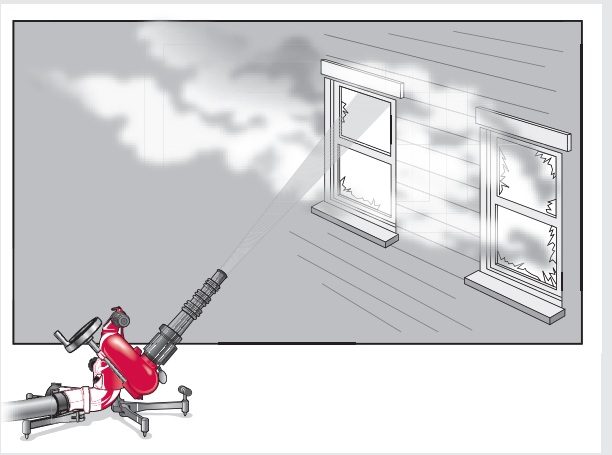


Figure 9-10 Steam and white smoke indicate that the water stream is having an effect on the fire.

indications have disappeared Figure 9-10. At that point, the stream should be operating effectively.

Shutdown

A stream from an appliance should be used only as long as fire is visible in the area covered by the stream. A check should be made for visible fire. Steam and/or white smoke is an indication that the main body of fire in that area has been knocked down. When steam and/or white smoke are no longer visible, the fire has apparently been put out. The master stream should then be shut down or moved to cover another area; its work here has been completed. Continued operation at this point would only add to the water load on the fire building and the strain on the water supply system. If necessary, handheld hose lines can be used for final extinguishment.

Elevated Master Streams

The same rules of operation discussed for portable and fixed master stream appliances apply for elevated master stream appliances. Because they are elevated above ground level, they can be used for fires on upper stories of buildings. They can be directed through windows or other openings by placing the nozzle at or near the window during defensive firefighting operations. When operating in a defensive mode, the chance of a building collapse must be considered. It is best to position the aerial apparatus at the corners of the building or at a distance away from the building that will afford protection for fire fighters and the apparatus. This should safeguard them from radiant and convective heat, burning embers, and building collapse. They are also useful in the protection of exposures, especially on upper floors. Directing water on the exposure is more effective than directing a stream between the fire and the exposure.

A solid stream is most effective for fire attack when using a master stream appliance. The stream will penetrate further into the building covering more area of the fire. For exposure protection, a spray nozzle using a fog stream may be superior to a solid stream if it is not affected by the wind or the distance from the fire building. The fog stream will cover a wider area than a solid stream and require less movement. Several sizes of smooth-bore tips and spray nozzles should be carried so that fire fighters can choose the correct nozzle for the fire situation and the water supply. It is just as important that both spray nozzles and smooth-bore tips are available for use as the situation demands.

Elevated streams must never be directed into natural openings, such as skylights, scuttles and hatches, or holes made in the roof for venting or where fire has burned through the roof. Fire fighters vent roofs to allow smoke, heat, gases, and fire to escape the building so that an interior attack can be carried out. Vertical ventilation allows fire fighters to perform a primary search, get to the seat of the fire, and apply water to extinguish the fire. During an offensive mode of operation, it is a cardinal rule in the fire service that no attack line or master stream appliance is to be directed into a ventilation opening. This will only spread the smoke, heat, gases, and fire downward throughout the building making it untenable for victims as well as fire fighters engaged in firefighting operations. If it is necessary to protect the roof from fire coming through these openings, a stream of water should be directed onto the roof adjacent to the opening so that the water will not flow into the opening. During a defensive operation when a major portion of the roof or large area is destroyed by fire, elevated master streams can be directed at visible fire inside the building without the danger of reversing ventilation.

Key Points

A master stream should be used only as long as fire is visible in the area covered by the stream.

Key Points

Elevated stream must never be directed into natural openings or holes made in the roof for venting or where fire has burned through the roof.

Wrap-Up

Chief Concepts

Master stream appliances are placed in service when the streams from handheld hose lines will not be effective in fire control or in exposure protection or as backup lines. They are primarily used during defensive operations.

- Engine company personnel should be well trained in the operation of these appliances. This includes insuring that a proper water supply is available as well as selecting the proper supply line or lines to provide a sufficient water supply to operate the appliance safely and effectively.
- The most effective methods for supplying a master stream appliance involve the use of two pumpers, one at the water supply, and one at the fire.
- Both spray nozzles and smooth-bore tips, in a range of sizes and styles, are available for use with these appliances. The size and style of the nozzle will depend on the fire situation and the available water supply.
- Effective operation of master stream appliances is mainly a matter of observing stream performance. The appliance should be positioned so the stream reaches into the fire and should be operated only as long as the stream is doing its job.
- When the fire is extinguished, the appliance should be shut down. If the stream has little effect on the fire, it should either be replaced with a larger stream or supplemented with additional streams. The basic objective is maximum use of the available water supply.

Key Terms

Master service devices: A large-capacity nozzle that can be supplied by two or ore hose lines or fixed piping and can flow in excess of 300 gallons per minute. It includes deck guns and portable ground monitors.

Firefighter in Action

1. Master stream appliances should not be placed in service in a(n) _____ mode while an offensive, interior attack is being conducted.
   - **a.** Offensive
   - **b.** Defensive
   - **c.** Marginal
   - **d.** Interior

2. Master stream appliances _____ handheld hose lines.
   - **a.** Deliver more water from a greater distance than
   - **b.** Deliver more water but must be placed closer to the target building than
   - **c.** Deliver more water than most
   - **d.** All of the above could be true depending on the size and type nozzle being used.

3. Master streams require water flows from _____ gpm.
   - **a.** 200 to 1,200
   - **b.** 500 to 1,500
   - **c.** 500 to 2,000
   - **d.** 350 to 2,000

4. A prepiped master stream appliance (deck gun) mounted on a pumper would be classified as a
   - **a.** Portable master stream appliance
   - **b.** Fixed master stream appliance
   - **c.** Elevated master stream appliance
   - **d.** Either a fixed or portable master stream appliances depending on whether it can be removed from the apparatus

5. Elevated master stream appliances on _____ apparatus must have prepiped waterways.
   - **a.** Aerial
   - **b.** Elevating platform
   - **c.** Both aerial and elevating platform
   - **d.** Neither aerial or elevating platform

6. The minimum size smooth bore tip for a master stream appliance is
   - **a.** 1 inch
   - **b.** 1¼ inch
   - **c.** 1½ inch
   - **d.** 1¾ inch

7. A portable master stream, with a 2-inch smooth bore tip attached and a nozzle pressure of 80 psi is flowing at 1,000 gpm. The pumper supplying the master stream is 500 feet away and using a 4-inch hose as a supply line. What is the required discharge pressure for the engine supplying the portable master stream?
   - **a.** 120 psi
   - **b.** 140 psi
   - **c.** 160 psi
   - **d.** 180 psi

8. The _____ stream has proven to be most effective for fire attack when using master stream appliances.
   - **a.** Solid
   - **b.** Narrow-angle fog
   - **c.** Wide-angle fog
   - **d.** All of the above are effective. The stream to be used is determined by conditions at the scene including distance, wind, and angle.

9. Strong crosswinds will adversely affect the _____ stream.
   - **a.** Solid
   - **b.** Narrow-angle fog
   - **c.** Wide-angle fog
   - **d.** All of the above

10. Master streams operating from the exterior to the interior of a building should
    - **a.** Remain in a stationary position providing the greatest penetration angle
    - **b.** Be moved from side to side horizontally
    - **c.** Be moved up and down vertically
    - **d.** Be moved both horizontally and vertically

11. When operating a master stream from the exterior into a smoke obscured window the operator can determine whether the stream is entering the window by
    - **a.** Observing windows that can be seen and estimating the distance between windows to determine the correct stream direction
    - **b.** Listening for water striking a wall
    - **c.** Observing the water runoff
    - **d.** Answer choices b and c are both correct.

12. Elevated master streams should _____
    - **a.** Never be directed into ventilation openings made in the roof
    - **b.** Only be directed into roof ventilation openings after the attack becomes defensive
    - **c.** Be directed into roof openings only when visible fire is showing at the opening
    - **d.** Be cautiously directed immediately above visible fire coming from a roof opening