

Fire streams are used to reduce the heat from a fire and provide protection to firefighters and exposures. They are one of the most important weapons in a firefighter's arsenal. Because of this it is important to understand how they work and what influences them.

A fire stream is a stream of water between the fire nozzle and the target. It is not possible to provide a more precise definition of a fire stream since different fire streams are created for specific purposes. It is important to remember that when a fire stream leaves a fire nozzle it is influenced by velocity, gravity, wind, and friction with the air.

Water is an effective extinguishing agent and can extinguish a fire in several ways:

- **Cooling:** Water absorbs the heat from the fire. When heated to its boiling point, water absorbs heat by converting to steam.
- **Smothering:** Dilutes or excludes oxygen from the fire.



The condition of the stream prior to leaving the nozzle is affected by the fire pump operating pressure, nozzle design, nozzle adjustment, agent, and hose.

Several factors affect a stream of water or extinguishing agent from a nozzle. Some of those factors are:

- Velocity of water
- Gravity
- Wind direction
- Operating pressure
- Nozzle design and adjustment

PURPOSE OF A FIRE STREAM

- Applies a water stream directly to the burning material to reduce its temperature
- Reduces high atmospheric temperature and absorbs and/or disperses hot smoke and gases from a heated area in a confined space
- Reduces the temperature over an open fire and thus permits a closer proximity with handlines to effect extinguishment
- Protects firefighters and property from heat by fire streams as a water curtain

Fire streams are described in several ways:

- Patterns formed
- Types of control valves
- Nozzles that create patterns
- Factors that limit stream

The type of nozzle used on a hose will have an effect on the fire stream:

- Size of opening and nozzle pressure – Determines quantity of flow
- Size of opening – Influences reach or distance
- Type of nozzle – Determines shape

Fire stream patterns are defined by two characteristics: 1) their size (rate of discharge, measured on a per minute basis); and, 2) their type (the pattern or shape of the stream as it leaves the nozzle).



Fire Stream Types:

- Must be compact enough for majority to reach burning material
- Must meet, exceed critical flow rate
- Must have sufficient reach to put water where needed
- Types may be any size classification

TYPES OF NOZZLES AND HOW THEY ARE USED



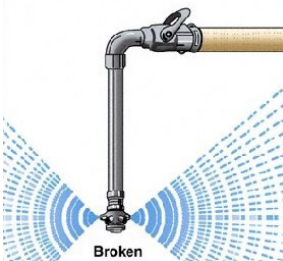
Solid Stream: Produces a compact stream with little or no shower or spray

- Operates at reduced nozzle pressure per gallon
- Stream does not lose its continuity until it reaches the point where it loses its forward velocity (i.e., break-over)
- Has greater reach and penetration than fog nozzles
- Produces less steam conversion and is less likely to disturb the thermal layer
- Does not allow for different stream patterns
- More likely to conduct electricity



Fog Stream: Produces a fine spray composed of tiny droplets

- Creates a stream of fine water droplets to expose the maximum water surface for heat absorption
- Discharge pattern and amount of water can be adjusted
- Does not have as much reach or penetrating power as a solid stream and can be affected by wind
- Can cool hot gas layer, hot surfaces
- More affected by wind, and can intensify fire by pushing fresh air into fire area if applied incorrectly



Broken Stream: Produces a stream that is broken into coarsely divided droplets

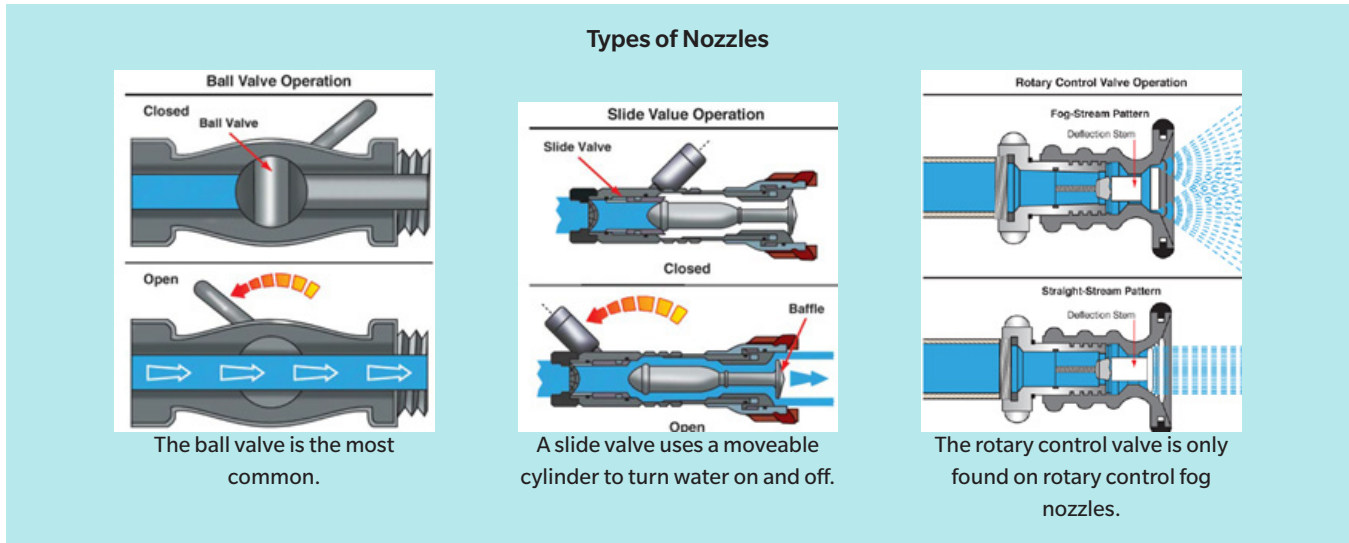
- Absorbs more heat-per-gallon than a solid stream
- Greater reach and penetration than a fog stream
- Can be effective on fires in confined spaces
- Stream may have sufficient continuity to conduct electricity
- Stream may not reach some fires

NOZZLE HANDLING CONSIDERATIONS

Nozzle control valves allow the operator to accomplish several tasks:

- Influence flow of water (start, stop, increase, and decrease)
- Open and close nozzle slowly to prevent water hammer
- Control nozzle reaction increases
- Keep nozzles closed during makeup or movement of the line
- Do not drop or drag nozzles
- Release trapped air from hoselines before moving into fire area
- In confined areas, improper use of nozzle may upset the thermal balance

- Wear protective clothing and breathing apparatus
- Always advance with a charge line



NOZZLE INSPECTION AND CARE SHOULD BE PERFORMED AFTER EVERY USE OR AT LEAST ANNUALLY

Nozzle inspection actions can be the same no matter what type of nozzle

- Inspect swivel gasket
- Look for external damage
- Look for internal damage and debris
- Check for ease of operation
- Ensure pistol grip secured to nozzle
- Ensure all parts are in place and in good condition

Nozzle cleaning and care

- Thoroughly clean after each use
- Follow manufacturer's recommendations to clean, lubricate moving parts
- Store with valve control bale in closed position
- Never drop or drag nozzle
- Use flush setting on the fog nozzle to help remove internal debris

SUMMARY

Firefighters must know the extinguishing properties of water, and the properties of the nozzles available in their departments

- They must understand the factors affecting fire streams

- They must know how to select, operate and maintain the nozzles available in their departments
- They must always advance with a charged line
- It is advised to keep nozzles closed during makeup or movement of the line
- Release trapped air from hoselines before moving into fire area
- Wear protective clothing and breathing apparatus

REFERENCES

- International Fire Training Service
- Elkhart Brass Co
- Task Force Tips Co
- Akron Brass Co
- National Association of Fire Protection (NFPA) 1963
- Fire Protection Handbook
- U.S. Fire Administration