TOPIC: Nozzles; Types, Uses and Safety Precautions

TIME FRAME: 2 Hours

LEVEL OF INSTRUCTION:

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will list and describe the types of nozzles necessary to provide sufficient water to extinguish different types of fires.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Variety of nozzles for demonstration
- Chalkboard
- Audio-visual equipment
- Appropriate visual aids

REFERENCES:

- IFSTA, Essentials of Fire Fighting, 2nd Edition, Chapter 9 & 14
- IFSTA, Fire Stream Practices, 6th Edition
- IFSTA, Hose Practice, 7th Edition, Chapter
- 3 Information Sheets

PREPARATION: The purpose of a nozzle is to give a fire stream forward velocity and pattern. The stream begins to take shape at the point where the nozzle is attached and the shape of the stream is formed in the nozzle. Your life may depend upon your ability to recognize and use the proper nozzle for the type of fire encountered.

PRESENTATION	APPLICATION

I. TYPES OF NOZZLES

A. Divided According to

1. Type of stream delivered

2. Purpose for which used

B. Types

1. Solid stream

2. Fog stream

3. Broken stream

4. Master stream

5. Special stream

II. SOLID STREAM NOZZLES

A. Delivers Fire Stream with Solid Water Stream Core

B. Delivered by Smooth Bore/Orifice Nozzle

C. Operational Guidelines

1. On hand held lines, 50 PSI nozzle pressure recommended

2. On master stream devices, 80 - 100 PSI nozzle pressure recommended

D. Advantages

1. Excellent distance

2. Excellent penetration

3. Large volume of water delivered

4. Small diameter pattern

PRESENTATION	APPLICATION
E. Disadvantages	
1. Less heat absorption	
2. Potentially more water damage	
a. Breakage due to impact on contents	
b. Potential to collapse ceilings with weight of water	
c. Water logging of contents	
3. Less easily handled	
a. Water stream is relatively straight out of the nozzle, therefore, an equal and opposite force is transmitted back along the hoseline	
III. FOG STREAM NOZZLES	
A. Delivers Water Stream Characterized by	
1. A hollow core	
2. Patterned stream composed of fine water droplets	
B. Operate Best at 100 PSI Nozzle Pressure	
C. Fog Nozzle Design	
1. Impinging stream nozzle	What are the major grouping of fog nozzles?
a. Water jets driven together	
(1) At set angle	
(2) To provide fog pattern	

PRESENTATION	APPLICATION
b. Usually short reach	
2. Periphery - deflected stream nozzle	
a. Water deflected against inside, circular stem	
b. bbarrel	
(1) Space between stem and barrel determines shape of pattern	
(2) Patterns usually adjust by turning exterior barrel	
c. May have spinning teeth-like protrusions on exterior barrel	
(1) Breaks water into finer droplets	
D. Types of Fog Nozzles	
1. Variable - gallonage nozzles	
	Show example
a. Also known as non-constant gallonage nozzles	
b. Change in pattern also causes change in gallonage	
c. As pattern is narrowed, gallonage decreases	
	What is the purpose of this?
2. Constant gallonage nozzle	
	Show example
a. Also known as constant flow nozzle	

PRESENTATION	APPLICATION
b. As pattern is changed, orifice remains the same	
c. Flow will remain constant	
3. Adjustable gallonage nozzle	
	Show example
a. Firefighter can adjust gallonage regardless of pattern	
	What are some of the advantages?
b. Firefighter can compensate for change in nozzle pressure	
c. Firefighter can adjust flow to meet demands of fire situation	
4. Automatic nozzle	
	Show example
a. Maintains constant nozzle pressure	
b. Variable GPM	
(1) Flow rate controlled by nozzle bale position	
c. Engine pressure set to manufacturer's recommendation without regard to actual flow rate	
d. Advantages	
(1) Easy to change GPM without affecting nozzle pressure	
(2) Gives nozzle operator maximum flexibility	

PRESENTATION	APPLICATION
(3) As other lines are added or shut down, no effect on automatic nozzle	
e. Disadvantages	
(1) Requires experience nozzle operator to use effectively	
(2) Increases potential for water damage	
(a) Regardless of gallonage	
f. Serves as pressure regulator	
(1) When other lines are added or shut down no affect	
E. Advantages of Fog Stream Nozzles	
	What are some of the advantages of a fog stream?
1. Greater heat absorption-more surface area of water exposed	
2. Protection from radiant heat	
3. Less nozzle reaction than solid stream. Force distributed in wider pattern.	
4. Excellent steam production	
5. Less electrical conduction	
F. Disadvantages of Fog Stream Nozzles	
	What are some of the disadvantages of a fog stream?

PRESENTATION	APPLICATION
1. Less reach 2. Less penetration 3. Greater chance of nozzle becoming clogged 4. Steam produced may create untenable environment 5. Disturbs thermal balance in confined spaces	
	What are some different types of fog nozzles?
IV. BROKEN STREAM NOZZLES (SPECIAL USE NOZZLES)	
A. Distributor and Cellar Nozzle	
1. Series of orifices positioned around a rotating sphere 2. Nozzle rotates on a ball bearing mounted just above the female inlet	
	What causes head of cellar nozzle to rotate?
3. Rotation is caused by hydraulic pressure 4. Used to extinguish fire when more conventional methods will not work a. Basements b. Cellars c. Shipboard fire d. Attic fires from above 5. Openings into area must be made prior to use	

PRESENTATION	APPLICATION
B. Water Curtain Nozzle	
	What are some special purpose nozzles?
1. Forms a fan like pattern	
2. Used for exposure protection	
3. Can be placed unstaffed between fire and exposure	
	How should a water curtain stream be applied?
4. 25% effective against radiated heat if directed to space between burning building and the exposure	
5. Water curtain is most effective when applied directly to the surface of the exposure being protected	
V. MASTER STREAM NOZZLES	
A. A Master Stream is Any Fire Stream that is Too Large to be Controlled Without Mechanical Aid Including:	
	What is a master stream?
1. Turret pipes	
2. Deluge sets	
3. Monitors	
4. Ladder pipes	
B. Turret Pipe - Mounted on a Deck on a Fire Apparatus and Connected Directly to the Pump	

PRESENTATION	APPLICATION
	What is a turret pipe?
1. Deck gun	
	What are some other names for a turret pipe?
2. Deck pipe	
C. Deluge Set - Composed of a Short Length of Large Diameter Hose with a Large Nozzle	
	What is a deluge set?
1. Angle and direction of stream can not be changed while flowing water	
D. Monitor - A Master Stream Device whose Stream Direction can be Changed while Water is being Discharged	
	What is a monitor?
1. May be permanently or temporarily mounted to pump plumbing	
E. Ladder Pipe - A Master Stream Device Attached to an Aerial Ladder	
	Can someone describe a ladder pipe?
1. Water supplied by large diameter hose or pump plumbing	
F. Master Streams Are Used When Handline Streams Are Ineffective	
1. Because of magnitude of fire, i.e., total involvement	

PRESENTATION	APPLICATION
2. Heat is so intense that firefighters cannot approach	
3. Situation is too dangerous for firefighters to approach	
a. Pressurized vessel (LPG, etc.)	
b. Hazardous materials	
c. Structural collapse possible	
4. For greater reach	
5. For greater fire flows	
VI. SPECIAL STREAM NOZZLES ARE DESIGNED FOR A SPECIFIC PURPOSE	
A. Low Expansion Foam Nozzles	
B. High Expansion Foam Nozzles	
C. Piercing Nozzles	
1. Designed with a hardened tip that can be driven through a wall or partition	
2. Has detachable hard steel driving head that is used when driving tip through barrier	
3. Used to reach inaccessible areas	
a. Attics	
b. Through brick walls	What are some of the applications a piercing nozzle can be used for?
c. Through wall of inaccessible areas	

PRESENTATION	APPLICATION
D. Through skins of trucks, vans, or railroad cars	
VII. SAFETY PRECAUTIONS	
	The students should cite some of the numerous precautions while using a nozzle. The instructor should list them on the board or flip chart.
A. To Avoid Injury, Firefighters Must Remain Alert and Follow Safety Guidelines When Using Nozzles	
1. Always wear full protective clothing	
2. Open and close the nozzle slowly	
3. Keep a hand close to the bale so it can be closed if control is being lost	
4. Position feet to maintain a firm stance	
a. Feet apart	
b. The foot away from the nozzle ahead one step	
5. Lean forward slightly to counter nozzle reaction	
6. Avoid uneven surfaces	
7. Avoid slippery surfaces	
8. Keep hose straight behind the nozzle	
9. Pull hose and absorb its weight with legs, not the back	
10. Maintain proper grip on hose and nozzle	
a. If available use a hose strap	

PRESENTATION	APPLICATION
11. Look before moving	
12. Shutdown nozzle to reposition if possible	
13. Watch for nighttime obstructions	
14. Have a second firefighter as a backup	
15. Avoid charged electrical equipment and lines	
16. Identify burning material prior to applying water	
a. Reactive	

SUMMARY:

There are a variety of nozzles available for use in the fire service. Some are used on a daily basis and others have very limited uses and are seldom used. As a firefighter, it is your job to determine which nozzle is appropriate for the type of fire encountered. Your safety may be affected by the choices made.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).