TOPIC: Methods For Determining Fire Hydrant Discharge Capacity

TIME FRAME: 2 Hours

LEVEL OF INSTRUCTION:

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will describe methods of determining the discharge capacity of fire hydrants.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Appropriate visual aids and supplies

REFERENCES:

- IFSTA, Essentials of Fire Fighting, 2nd Edition, Chapter 9
- IFSTA, Water Supplies for Fire Protection, 4th Edition, Chapter 2

PREPARATION: When connecting an engine to a fire hydrant at a fire scene, it is vital to know if that hydrant is going to be capable of supplying enough water. The amount of water available from the hydrant must be determined before the emergency. This lesson will familiarize the student with the methods used to determine the amount of water available and how the hydrants are marked to display that information.

PRESENTATION	APPLICATION

I. TYPES OF PRESSURE

A. Static Pressure

1. Stored potential energy that is available to force water through pipes, fittings, firehose, and adapters.

2. When water is not moving the pressure exerted is static.

3. Pressure determined at non flowing "test" hydrant.

B. Normal Operating Pressure

1. That pressure which is found on a water distribution system during normal consumption demands.

2. The flow of water changes throughout the day as consumers use water from the distribution system for domestic or industrial purposes.

3. Pressure determined at non-flowing "test" hydrant.

C. Residual Pressure

1. That part of the total available pressure that is not used to overcome friction or gravity while forcing water through pipe, fittings, fire hose, and adapters.

2. The pressure which is left in a distribution system, at a specific location when a quantity of water is flowing.

3. Pressure determined at non-flowing "test" hydrant

a. Pressure should not drop below 20 PSI

PRESENTATION	APPLICATION

D. Flow Pressure

1. That forward velocity pressure at a discharge opening while water is flowing

2. Pressure determined at a "flowing" hydrant with a pitot tube/gauge.

II. FLOW TEST PROCEDURES

A. Test Interval

1. After water main improvements

2. After water main extensions

3. When problem is suspected

a. Damage

b. Tampering

c. Reduced flow perceived

4. At least every five years

B. More Hydrants Should Be Tested on a Weak Main and Fewer on Strong Water Mains.

C. Comparison of Test Results Over Time May Expose Water System Problem.

III. COMPUTING HYDRANT FLOWS

A. Three Methods

1. Simplified Hazen-Williams formula

a. Available water =

$$Q / \frac{D2-}{D1}$$

b. Q = Total gpm during the flow

PRESENTATION	APPLICATION
c. D2 = Normal operating pressure minus 20 psi	
d. D1 = Normal operating pressure minus residual during flow	
2. Logarithmic scale methods	
a. Values are entered into the logarithmic scale	
b. Information is interpreted on logarithmic scale	
	Instructor Note: Demonstrate how to use the three methods of computing hydrant flows
3. Hazen-Williams method	
a. $QR = QF \times \frac{hR\ 0.54}{HF\ 0.54}$	
b. Qr = Flow available at desired residual pressure	
c. Qf = Flow during test	
d. hR = Pressure drop to desired residual pressure	
e. hF = Pressure drop during test	
IV. COLOR CODING OF FIRE HYDRANTS	
A. Color Codes Allow the Engine Operator to Identify the Available Flow from a Hydrant	
B. Three Classes	
1. Class A	

PRESENTATION	APPLICATION

a. Green

b. 1,000 gpm or greater

2. Class B

a. Orange or yellow

b. 500 gpm to 999 gpm

3. Class C

a. Red

b. Less than 500 gpm

C. Color Code Should be Painted on All Tops and Caps of Hydrants

SUMMARY:

A familiarity with water system pressures, flow testing, and hydrant markings will enable an engine operator to make rapid determinations of the adequacy of fire flows at the fire scene.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).