



Fire Protection Training

Procedures Handbook 4300

WATER SUPPLY SYSTEMS

TOPIC: Causes of Pressure Loss in Water Systems

TIME FRAME: 2 Hours

LEVEL OF INSTRUCTION:

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will list the causes of pressure loss in water systems.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- IFSTA, Water Supplies for Fire Protection, 4th Edition, Chapters 2 and 5

PREPARATION: Adequate water pressure is necessary to deliver an effective fire stream during fire fighting operations. Several conditions exist that may reduce the available pressure. Familiarity with the causes of these conditions may allow fire personnel to overcome pressure problems.



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CAUSES OF PRESSURE LOSS IN WATER SYSTEMS

PRESENTATION	APPLICATION
<p>I. DISTRIBUTION SYSTEMS</p> <p>A. System Design Deficiencies</p> <ol style="list-style-type: none">1. Water piping too small<ol style="list-style-type: none">a. Historically 4" and 6" pipe was used; today most cities use 8", 12" or 16" water pipesb. Care should be exercised to use a pipe of adequate size to supply sufficient water for fire protection in addition to domestic needs2. Friction loss<ol style="list-style-type: none">a. Water flowing through pipes is subject to friction loss3. Length of pipe4. Pressure at source5. Bends/turns in pipe6. Joints and valves7. Head pressure<ol style="list-style-type: none">a. Height of the water supply above the discharge orificeb. An increase or decrease in elevation will directly affect the head pressure <p>B. Line Failure</p>	<p>What factors affect the carrying capacity?</p> <p>What is head pressure?</p>



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PRESENTATION	APPLICATION
<ul style="list-style-type: none">1. Drastically reduces volume and pressure2. Natural disasters<ul style="list-style-type: none">a. Can cause failure of water pipingb. May knock out pumping stations3. Mechanical damage<ul style="list-style-type: none">a. Excavation equipment may shear valves or break pipingb. Traffic accidentsC. Pump/Failure<ul style="list-style-type: none">1. Virtually all water systems rely on pumps to move water2. Failure of one or more pumps will affect the volume and pressure3. Electrical outages to pumps during fires are commonD. Valve Failure<ul style="list-style-type: none">1. Most public water system valves are of the non-indicating type and are normally buried<ul style="list-style-type: none">a. Makes detection of problem difficult2. Valves may become corroded3. Valves must be regularly maintained and kept fully opened	<p>What affect will a line failure have on the water supply?</p>



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PRESENTATION	APPLICATION
<ul style="list-style-type: none"> (3) Leaves <ul style="list-style-type: none"> b. Caused by the build up of sediments in the bottom of the pipe 3. Foreign matter <ul style="list-style-type: none"> a. Waste, cans, bottles, paper, etc. can be placed in lines being installed b. Tools, boards, stones, even 40lb. chunks of lead have been found in lines F. Malicious damage and Vandalism 	<p>Incrustation and sedimentary deposits will cause a gradual decrease in the line's carrying capacity. May become evident during fire flow testing (decreased flow and larger pressure drops)</p> <p>What kinds of foreign matter may be found in water systems?</p> <p>Have students list potential acts of vandalism</p>
<p>II. CONSUMPTION FACTORS</p> <ul style="list-style-type: none"> A. Water System Consumption Rates <ul style="list-style-type: none"> 1. Terminology <ul style="list-style-type: none"> a. Average daily consumption (ADC)- average amount used each day during a one year period 	



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<ul style="list-style-type: none"> b. Maximum daily consumption (MDC)- maximum total amount of water used during any 24 hours in a 3 year period <ul style="list-style-type: none"> (1) 1 1/2 times the normal average daily consumption c. Peak hourly consumption (PHC) - maximum amount of water used in any given hour of a day <ul style="list-style-type: none"> (1) 2 to 4 times the average normal hourly rate 2. Rates are used to assure that the water system supplies and pressures do not reach dangerously low levels during maximum and peak consumption periods 	
<p>B. Flow Pressures</p> <ul style="list-style-type: none"> 1. Increases in the demands on a single line will adversely affect flow pressure <ul style="list-style-type: none"> a. If another outlet or hydrant is opened a pressure drop will be noticed b. If too many outlets are opened the line may become useless 	<p>Why are these consumption rates important to us as firefighters?</p> <p>Why must we be concerned about flow pressure?</p> <p>What outside factors may affect flow pressure?</p>



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PRESENTATION	APPLICATION
<ul style="list-style-type: none">(1) Not enough volume and/or pressure to operate(2) Automatic sprinkler systems and citizens with garden hoses can dramatically affect flow pressures	



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CAUSES OF PRESSURE LOSS
IN WATER SYSTEMS

SUMMARY:

Water system pressure losses are generally attributable to design flaws, component failures or excessive demands. Any of these will adversely affect firefighting operations and must be planned for.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).