



TECHNICAL DATA

DRY PIPE SPRINKLER SYSTEM

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

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1. DESCRIPTION

A Dry Pipe Sprinkler System is a fire-protection system which utilizes water as an extinguishing agent. The system piping from the Dry Pipe Valve to the fusible sprinklers is filled with pressurized air or nitrogen.

An air check system is a small dry system which is directly connected to a wet pipe system. The air check system uses a dry valve and an air supply but does not have a separate alarm. The alarm is provided by the main alarm valve.

2. APPLICATIONS

A Dry Pipe System is primarily used to protect unheated structures or areas where the system is subject to freezing. Under such circumstances, it may be installed in any structure to automatically protect the structure contents and/or personnel from loss due to fire. The structure must be substantial enough to support the system piping when filled with water. One system may protect as much as 52,000 sq. ft. (4830.8m²) in a single fire area. The system should be designed by qualified fire protection engineers in conjunction with insuring bodies.

3. COMPONENTS OF THE SYSTEM

NOTE: ALTHOUGH ALL DRY PIPE SYSTEMS FUNCTION IN THE SAME MANNER, THE COMPONENTS AND ARRANGEMENTS MAY VARY DUE TO THE APPLICATION OF DIFFERENT SETS OF STANDARDS. THE STANDARDS MOST COMMONLY ENCOUNTERED ARE:

- NFPA - "INSTALLATION OF SPRINKLERS-NFPA NO. 13"
- FM - "LOSS PREVENTION DATA"
- LPC - "RULES FOR AUTOMATIC SPRINKLER INSTALLATIONS"
- IN ADDITION, THERE ARE NUMEROUS LOCAL INTERPRETATIONS AND REQUIREMENTS. THE SYSTEMS ILLUSTRATED HERE ARE OF A GENERAL NATURE.

A. WATER SUPPLY

An adequate water supply taken from a city main, an elevated storage tank, a ground storage reservoir and fire pump, or a fire pump taking suction from a well and pressure tank is required.

B. UNDERGROUND SYSTEM

1. Piping - cast iron, ductile iron or cement asbestos.
2. Control Valves - Post Indicator Valves (PIV).
3. Valve Pit - Usually required when multiple sprinkler systems are serviced from a common underground system taking supply from a city main: Two OS & Y valves, check valves or detector check, fire department connection (hose connection and check valve with ball drip). Check local codes for equipment and building requirements. A back-flow preventer, full-flow meter, or combinations of equipment may be locally required.
4. Auxiliary Equipment - Fire hydrants with two 2-1/2" (63,5mm) outlets (for hose line use), two 2-1/2" (63,5mm outlets and one 4" (101,6mm) outlet (for connection to a fire department pump truck), hose and equipment houses. Check with the fire department servicing the location for hydrant and hose-thread requirements.

C. INSIDE SYSTEM

1. A check valve must be incorporated if not already provided in the underground system.
2. Control Valve - Wall PIV or OS&Y must be incorporated if a control valve is not already provided in the underground piping for each system.
3. Dry Pipe Valve with the following:
 - a. The Dry-Pipe Valve and pipe to the underground system must be protected from freezing. An enclosure should be provided with an automatic heat source, lighting, and sprinkler protection.
 - b. Compressed air supply (automatic or manual) capable of restoring normal air pressure to a system in 30 minutes or less. A Viking Air Pressure Maintenance Device may be desired unless the compressor operates within an 8 psi (0,5624 kg/cm²) to 10 psi (0,703 kg/cm²) differential.
 - c. An accelerator is required when system capacity exceeds 500 (1892,5 liters) gallons.
 - d. A water motor alarm or electric pressure switch.
 - e. Valve trim and pressure gauges.
4. Fire Department Connection - Hose connection and check valve with a ball drip, if it is not provided in the underground system.
5. System Piping - A system of piping progressively increasing in size in proportion to the number of sprinklers from the most remote sprinkler to the source of supply. The pipe size and distribution is determined from pipe schedules or hydraulic calculations as outlined by the appropriate standard for the hazard being protected.



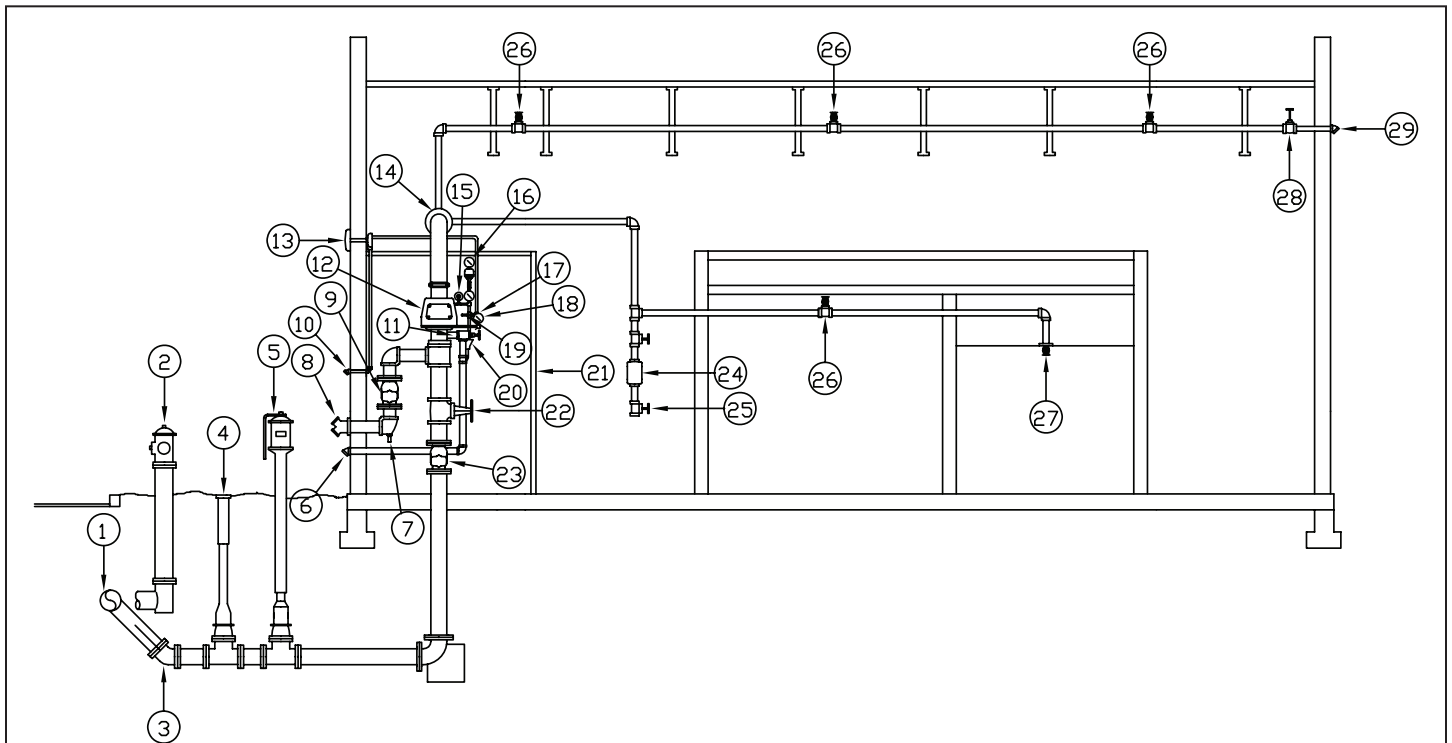
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6. Sprinklers - For types, orifice sizes, and temperature ratings, see the sprinkler section of the Engineering and Design Data Book. Sprinklers installed in the pendent position must be of the DRY PENDENT TYPE when the piping and sprinkler are not in a heated area. Sprinklers are spaced to cover a design-required floor area [from 36 to 225 square feet (3,344sq.m to 20,9025sq.m)] or as designated in the appropriate standard.
7. Inspector's Test and Drains
 - a. A test drain valve must be provided:
 - 4" (100mm) and larger system = 2" (50mm) drain,
 - 2-1/2" (65mm) to 3-1/2" (90mm) = 1-1/4" (32mm) drain,
 - 1" (25mm) to 2" (50mm) = 3/4" (20mm) drain.
 - b. All piping must be pitched toward a drain. A drain must be provided at all low points. A two-valve drum drip may be required.
 - c. An inspector's test is required on each system. The inspector's test simulates the flow of one sprinkler. It is used when testing the system to ensure that the alarm will sound and the water will reach the farthest point of the system in less than one minute.
8. Pipe Hangers - Specific type, size, and placement requirements as indicated in the appropriate standard.



ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	City Main	11	Test Drain Valve	21	Dry Pipe Valve House
2	Underground Fire Main	12	Dry Pipe Valve	22	D.S. & Y. Valve (Optional)
3	Pumper Type Fire Hydrant	13	Water Motor Alarm	23	Check Valve
4	Key Valve and Road Box	14	Cross Main	24	Drum Drip
5	Post Indicator Valve	15	Air Pressure Maintenance Device	25	Drain Valve & Plug
6	Test Drain	16	Accelerator (Optional)	26	Upright Sprinkler
7	Ball Drip	17	Pressure Switch (Hidden)	27	Pendent Sprinkler
8	Fire Department Connection	18	Alarm Line Strainer (Hidden)	28	Inspector's Test Valve
9	Check Valve	19	Alarm Test Valve	29	Inspector's Test Drain
10	Water Motor Alarm Drain	20	Drain Cup		

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4. OPERATION

When a fire occurs, the heat produced will operate a sprinkler causing the air pressure in the piping system to escape. When the pressure trip-point is reached (directly or through the ac-celerator), the dry-pipe valve opens allowing water to flow through the system piping and to the water motor alarm or electric pressure switch to sound an electric alarm. The water will continue to flow and the alarm will continue to sound until the system is manually shut off. A dry-pipe valve equipped with an accelerator will trip more rapidly and at a higher air-pressure differential. Component parts of the dry-pipe system operate in the following manner:

A. DRY VALVE OPERATION

When the air pressure in the dry system has dropped (from the fusing of an automatic sprinkler) to the tripping point of the valve, the floating valve member assembly (air plate and water clapper) is raised by the water pressure trapped under the clapper. Water then flows into the intermediate chamber, destroying the valve differential. As the member assembly rises, the hook pawl engages the operating pin which unlatches the clapper. The clapper is spring-loaded and opens to the fully opened and locked position automatically.

B. ACCELERATOR OPERATION

The accelerator operates on the principal of unbalanced pressures. When the accelerator is pressurized, air enters the inlet, goes through the screen filter into the lower chamber and through the anti-flood assembly into the middle chamber. From the middle chamber the air slowly enters the upper chamber through an orifice restriction in the cover diaphragm.

In the SET position the system air pressure is the same in all chambers. The accelerator outlet is at atmospheric pressure. When a sprinkler or release operates, the pressure in the middle and lower chambers will reduce at the same rate as the system. The orifice restriction in the cover diaphragm restricts the air flow from the upper chamber causing a relatively higher pressure in the upper chamber. The pressure differential forces the cover diaphragm down pushing the actuator rod down. This action vents the pressure from the lower chamber to the outlet allowing the inlet pressure to force the clapper diaphragm open. The pressure in the accelerator outlet forces the anti-flood assembly closed preventing water from entering the middle and upper chambers.

On a dry pipe system the air pressure from the accelerator outlet is directed to the dry pipe valve intermediate chamber. As the air pressure increases in the intermediate chamber, the dry valve pressure differential is destroyed and the dry valve trips allowing water to enter the dry pipe system.

On a pneumatic release system, the outlet pressure is vented to atmosphere, speeding the release system operation.

C. PLACING THE SYSTEM IN SERVICE

1. Shut off the supply control valve. Check the entire system to ensure all piping, sprinklers, and piping components are in serviceable condition. Replace any opened sprinklers with the same type and temperature rating. Drain all low points of the system; then, close all drain valves. (On a drum drip, the upper drain valve remains open and the lower is closed.) For air check system or auxiliary dry systems, drain the dry portion of the system only.
2. Set Dry Pipe System
 - a. If an accelerator is used, with no pressure on the system, observe the air gauge on the accelerator. The gauge must read zero. (It may be necessary to loosen the air gauge to vent the trapped air pressure in the upper chamber).
 - b. Set Dry Pipe Valve - Open the test drain valve; remove the hand-hole cover; wipe the valve seats clean; pull the clapper down into the CLOSED position (hold while inserting wrench handle through hook-pawl assembly hole), slide wrench handle through hole approximately 1 inch (25mm); apply upward force on wrench and latch the dry-valve clapper; remove the wrench; fill the dry valve with water to the bottom of hand hole; replace hand-hole cover.
 - c. Pressurize dry-pipe system with air pressure as recommended in the Dry Valve Data Section.

Water Pressure psi	Max	50	75	100	125	150
Air Pressure psi	Min	15	20	25	30	35
	Max	25	30	35	45	50

- d. Wait until the accelerator air-pressure gauge reads the same as the dry-pipe valve.
- e. Open water supply control valves slowly.
- f. Close the dry pipe valve main drain valve slowly.
- g. Make sure the Alarm Test Shut-off Valve is in the ALARM position.

D. REMOVING THE SYSTEM FROM SERVICE

WARNING: DO NOT TURN OFF THE WATER SUPPLY TO MAKE REPAIRS WITHOUT PLACING A ROVING FIRE PATROL IN THE AREA COVERED BY THE SYSTEM. THE PATROL SHOULD CONTINUE UNTIL THE SYSTEM IS BACK IN SERVICE.



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Prior to turning off any valves or activating any alarms, notify local security guards and/or central alarm station (if used) so that a false alarm will not be signaled and result in a local fire department response.

1. Close the supply control valve.
2. Place the accelerator out of service by shutting the ball valves on either side of the accelerator.
3. Shut off the air-supply system.
4. Open the test drain valve.
5. Relieve system air pressure by opening the air supply test valve.
6. System and supply pressure gauges should now read zero psi.
7. Open the dry valve, hand-hole cover. If the dry-valve clapper is in the DOWN and LATCHED position, unlatch the clapper arm by inserting the dry valve wrench through the hook-pawl assembly and apply downward pressure on the wrench handle. The clapper arm will be released and will swing to the full OPEN position.
8. Replace hand-hole cover.
9. Place a system-out-of-service sign in a visible location.
10. The system should be placed out of service only for repairs. Notify management of the system being out of service.

5. INSPECTION, TESTS AND MAINTENANCE

A. WARNING

1. DO NOT TURN OFF THE WATER SUPPLY TO MAKE REPAIRS WITHOUT PLACING A ROVING FIRE PATROL IN THE AREA COVERED BY THE SYSTEM. THE PATROL SHOULD CONTINUE UNTIL THE SYSTEM IS BACK IN SERVICE.
2. Prior to turning off any valves or activating any alarms, notify local security guards and/or central alarm station (if used) so that a false alarm will not be signaled and result in a local fire department response.
3. In any of the following inspection or testing procedures, if an abnormal condition exists, see the paragraph on difficulties for possible cause and corrective action.
4. For complete information on individual devices, see the appropriate device page.
5. See NFPA Pamphlet No. 13A, Care and Maintenance of Sprinkler Systems.

B. NORMAL CONDITIONS

1. All control valves open, locked and sealed with tamper proof seals.
2. ALARM TEST SHUT-OFF VALVE IN "ALARM" POSITION.
3. Water and air pressure gauge valves open.
4. Accelerator shut-off valves open.
5. System air-pressure and accelerator gauges indicating equal pressure.
6. The water-pressure-gauge reading equals that of the known service-line pressure.
7. Incoming power to all alarm switches on.
8. Test drain valve, auxiliary-drain valves and inspector's test valves should be tightly closed.
9. If an automatic air supply is used: the compressor should be on the air-maintenance-device; the by-pass valve should be closed; and, the system air should be maintained at a constant pressure.
10. The sprinkler head cabinet contains appropriate replacement sprinklers.
11. Dry valve house temperature should be maintained above freezing.
12. Drum drips and low points should be free of water.
13. The water level in the riser must be below the air supply drain.

C. WEEKLY TEST OF SYSTEM

1. Check the system for normal conditions.
2. Turn Alarm Test Shut-off valve to Test position; water-motor alarm should sound.
3. Close Alarm Test Shut-off valve; the alarm will silence.
4. Close accelerator shut-off valves and open air supply test valve until air flows, then close the valve quickly.
5. Drain the water from drum drips. (Close the top valve, then open the bottom valve and drain; close the bottom valve, then open the top valve.)
6. Open accelerator shut-off valves.

D. SEMI-ANNUAL TEST

1. Complete a weekly test of the system.
2. Water-flow test: Observe the water-pressure gauge, open the test drain valve fully, record the pressure drop. Check the reading against the previously recorded reading. If reading differs greatly, a supply valve may be partially closed, or there may be an obstruction in the supply line. Correct the problem immediately.
3. Close test drain valve slowly.



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E. ANNUAL TEST

1. Complete a semi-annual test.
2. Open the inspector's test valve. The dry pipe valve and accelerator should trip, and water must flow from the inspector's test. Alarms will sound and the system will fill with water.
3. Re-set the system. See Placing The System In Service.

F. TROUBLESHOOTING

1. If the alarm fails to sound on test: clean strainers in the alarm line and water motor. If the alarm still fails, call your Viking representative.
2. If there is excessive dripping from the drip check: follow those precautions in the emergency procedure and turn off water and remove hand-hole cover. Trip the valve; clean the water seat and reset. If the valve still leaks, call your Viking representative.
3. If the accelerator does not trip on test, or will not set: Call your Viking Representative.
4. If the valve trips without the sprinkler opening: remove and clean the drip check. Check for excessive water hammer in the supply by using an indicating gauge. If water hammer is indicated, increase the air pressure in accordance with the chart using the maximum pressure indicated in the water hammer. Check the dependability of the air supply; and make sure air-supply valves are open. A maintenance air compressor or a maintenance device is highly recommended for maintaining system air pressure regardless of climatic conditions.
5. If the supply pressure gauge drops on the flow test: immediately check roadway valve and post indicator or control valve. If both are open, immediately call your Viking representative, since a line obstruction is indicated.
6. If the system pressure is low: make sure proper valves are closed. Add maintenance device or maintenance air compressor.
7. If the dry valve will not latch: check to see that the water seat is clean and that there are no stones or foreign objects in the valve. If the valve still will not latch, immediately call your Viking representative.
8. If the valve trips when the alarm is tested: open and clean the check valve in the alarm line.

G. MAINTENANCE

1. Dry Valve: Conduct system tests as described and see the appropriate device page.
2. Accelerator: Trip annually and see the appropriate device page.
3. Water Motor Alarm:
 - a. Clean alarm-line strainer.
 - b. Clean water motor alarm strainer.
 - c. Check condition of alarm by operating.
 - d. Check bell for obstructions.
4. Air Maintenance Device: Inspect, replace or clean filter, and see the appropriate device page.
5. Air Compressor: See manufacturer's maintenance instructions.
6. Sprinklers:
 - a. Maintain a supply of replacement heads.
 - b. Sprinklers should be kept free of debris.
 - c. Never suspend objects from sprinkler heads.
 - d. Sprinklers must not be painted or coated except by the manufacturer or an authorized representative.
 - e. Check sprinklers for mechanical damage. If the lever mechanism is loose or the frame is damaged, replace the sprinkler.
 - f. Fused or damaged sprinklers cannot be repaired. They must be replaced.
 - g. Use the special sprinkler wrench when replacing heads to prevent damage.

H. EMERGENCY INSTRUCTIONS

1. Make sure fire is OUT! Make a complete inspection of all areas covered by the system including areas not involved in fire. Place a fire watch throughout the entire area until the system is back in service.
2. Close the water supply control valve and drain the system piping. Open dry pipe test drain valve.
3. Replace all operated and damaged sprinklers with the same type and temperature rating as were removed.
4. Set the Dry Pipe System
 - a. If an accelerator is used, reset by observing the air pressure gauge on top of the accelerator. The gauge must read zero before the accelerator will automatically reset. (It may be necessary to loosen the air gauge to vent the trapped air pressure in the upper chamber.)
 - b. Set Dry Pipe Valve - Open the test drain valve; remove hand-hole cover; wipe the valve seats clean; pull the clapper down into the CLOSED position (hold while inserting wrench handle through hook-pawl assembly hole), slide wrench

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handle through hole approximately 1 inch (25mm); apply upward force on wrench and latch the dry valve clapper; remove the wrench; fill the dry valve with water to the bottom of hand hole; replace hand-hole cover.

- c. Pressurize dry-pipe system with air pressure as recommended:

Water Pressure psi	Max	50	75	100	125	150
Air Pressure psi	Min	15	20	25	30	35
	Max	25	30	35	45	50

- d. When the accelerator air-pressure gauge reads the same as the dry pipe valve, open the supply water control valve slowly and secure all valves.
- e. Close the dry pipe valve main-drain valve slowly.
- f. Perform semi-annual test.
- g. Fire can damage piping and supports, so the system should be inspected by your local Viking representative.