

Inspection and Testing of Automatic Sprinkler Systems

For a sprinkler system to operate effectively it needs to be not only adequately designed and installed but also have an ongoing programme of inspection and testing to make sure it operates in a reliable manner when called upon.



In basic terms, this means taking measures to ensure that in the event of a fire, there will be an uninterrupted, adequate flow of water from the water supply source through to the sprinkler heads.

Sprinkler system inspection/testing: the key to ensuring your facility's sprinkler system will operate reliably when called upon

For such routines to work effectively, they should:

- Be fully supported by senior management
- Incorporate formal, recorded checks of important elements of the system as outlined below
- Be undertaken by personnel who are well trained, fully motivated and appreciative of importance of the routines
- Incorporate a comparison of the test data captured, with previous records (or original test data) to help identify any abnormal conditions and hence prompt further investigation
- Be subject to regular management audit to confirm they continue to be undertaken diligently.

What are the key elements of a sprinkler system that need to be regularly inspected/tested?

Sprinkler Control Valves

These valves are used to control the flow of water throughout the system and to isolate elements for maintenance or system modification. Should a valve that is normally maintained in the open position be closed, then the area in question would effectively be unprotected. Reasons for a valve being left in the closed position could include forgetting to reopen it following maintenance / modification / repair works, being closed in error, or with malicious intent. Unless the valve is fitted with a tamper switch (a device that gives an alarm if the valve is turned), there would be nothing to alert personnel to the situation – and without regular checks that would pick this up, the valve could remain improperly closed indefinitely.

- On a weekly basis, all valves that control the flow of water to various parts of the sprinkler system should be inspected to ensure that they remain secured in the fully open position by metal chains or leather straps. If there is a history of improperly closed valves, sturdy metal chains should be used. The checks should include valves on/at:
 - System risers
 - Distribution mains (divisional valves)
 - "Tail end" systems
 - The suction and discharge side of fire pumps
 - Suction lines from storage tanks
 - Infill lines to tanks / reservoirs
 - Connections to town's main or other central water supplies.

The QBE Sprinkler System and Water Supply test record cards can be used to prompt and document these checks.

On a six monthly basis, the valves should be fully exercised to verify they are operable. On the same frequency, any valve tamper switches should be tested.

System Alarms

Sprinkler system alarms alert personnel that water is flowing through a part of the system. These generally comprise a local water motor driven gong and an electronic pressure / flow switch which transmits a signal to a remote location.

- On a weekly basis, as prompted by the QBE sprinkler system test card, the water flow alarms should be tested by flowing water through the test line at the system riser or remote test point of the system. The time taken the alarm to sound should be recorded as should the system pressure at the 'C' gauge, before and after the test
- In addition, the functionality of remote signalling should be confirmed.

Water Supplies

On a well arranged sprinkler system, the water supply delivers water at the required flow and pressure to achieve fire control. Testing of the supply is needed both to verify that it will be available (and activate) when called upon, and also to check that the strength of the supply remains at the required level.

There are a number of different water supplies that commonly feed sprinkler systems - these include:

- Connection to town's mains
- Connections to town's mains in conjunction with a booster pump
- Fire pump(s) taking suction from suction tank(s) or other stored water supplies (eg. reservoir, river, canal etc)
- Connection to gravity tank (rare in UK).

Important tests associated with water supplies include the following:

Town's Main Supply

- Each week the static pressure on the incoming supply should be recorded

- The town's mains supply should be subject to a pressure and flow test on a quarterly basis to verify the maximum system demands continue to be met and to identify any deterioration in the supply.

Fire Pumps

Fire pump sets typically comprise a pump, either an electric motor or diesel engine driver, and a controller. In the event of a pressure drop in the sprinkler system (as would occur in the event of a sprinkler head activating), this would be picked up by the controller, which would then start the pump driver. If this fails to happen, then there will be no water supply to the system.

- This functionality should be verified for each pump on a weekly basis (ie each pump set should be started automatically upon pressure drop)
- Manual starting functionality should also be checked weekly
- To verify the satisfactory condition of the pumpset on an on-going basis, each week electric fire pumps should be run for a minimum of 10 minutes and diesel pump sets for not less than 20 minutes. As part of this test, the pump start pressures and running pressure should be recorded
- On electric pump sets, the ammeter reading should be recorded
- On diesel pumps, weekly checks need to be made to verify the engine cooling system is operating satisfactorily, the fuel supply is topped up, the engine oil level is okay and the battery sets are in good condition
- Other weekly checks associated with pump sets include verification that the pump house is secure and that its temperature is maintained above 10 deg C. Also, that the alarms associated with the pump(s) are functional. (eg. supply healthy, pump on demand, fire in pumphouse).

The above checks are prompted by QBE's water supply test record card, and can be recorded on the same document.

In addition, on a six monthly basis....

- The performance of each fire pump should be verified by flow testing. Any signs of deterioration in performance should be investigated and necessary repairs instigated
- When pumps are arranged to take suction under lift, low water level switches on the priming arrangement should be checked for functionality (these should be arranged to start the pump upon activation).

And on an annual basis.....

- Pumps and drivers should be serviced by a specialist contractor
- The "fail to start" alarm should be tested.

Every three years.....

- Foot valves associated with pump sets taking suction under lift should be serviced.

Suction Tank(s)

- Each week, as part of the water supply checks, it should be verified that all tanks are full
- On an annual frequency, the float valve on the infill to the tank should be checked for functionality
- The frequency of inspection of suction tanks for signs of corrosion etc is dependent upon the design life of the tank in question. Refer to LPCB Technical Bulletin 203 for further information.

Open Water Sources

- Each week, visually inspect the suction screens on the suction intake to make sure they are clear of obstructions / debris. Also verify the level of the supply
- Once a year, the screens should be removed and inspected and cleaned as required. The frequency should be increased as necessary, with particular attention given around the autumn to winter period. Additional checks should be made following periods of stormy weather. Intake chambers/ jackwells etc should be inspected on a similar frequency and cleaned out as required.

Additional Considerations

Dry / Alternate valves and systems

Where sprinklers are arranged on “dry” pipework, there is an obvious reliance that in the event of a fire, the valve separating the water supply from the dry pipework, “trips” in a prompt and reliable manner when called upon. Lengthy delays in operation of the valve could allow a fire to grow unchecked in its early stages. Worst still, if the valve fails to “trip”, the affected area would effectively be unsprinklered. Because of the “wet/dry” environment they operate in, over time, equipment is more prone to internal corrosion, which can compromise the system’s functionality and effectiveness.

- On an annual basis, each dry pipe valve should be trip tested. Trip tests can be either “full” (preferred) or “partial”
 - Partial trip testing involves firstly recording air and water pressure. Then, with the water control valve nearly fully closed, open the inspectors test connection to exhaust the air. Record the time and air pressure at which the system trips and compare to previous tests. If the time has increased, investigate and fix the deficiency
 - Full flow trip testing is undertaken in the same manner as the annual partial flow trip test, but with the water control valve fully open. Compare the results with previous full flow trip times. Ensure that the valve trips and water arrives at the inspectors test connection within 60 seconds. Observe condition of the water. Conduct a flushing investigation if scale or debris sufficient to clog a sprinkler is evident.

In addition, on a weekly basis:

- Checks should be made to verify that sections of pipework intended to be “dry”, are in fact “dry”. Also that accelerator / exhauster arrangements are “active”
- System air and water pressures should be checked and recorded
- Check also, that there is no water column above the dry pipe valve set(s).

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Trace Heating

- Verify that any pipework trace heating system is functional on a weekly basis.

General

Impairment handling

On occasions, it will be necessary to impair sprinkler protection to allow for maintenance or system modification works.

When an impairment is planned, or if it occurs accidentally, precautions must be taken to provide temporary protection, reduce hazards and ensure prompt reinstatement. The QBE Fire Control Impairment Notification should be utilised to manage fire protection impairments.

Scope

The scope of this document essentially covers inspection and testing routines associated with sprinkler systems. Maintenance of specific elements of the system and longer term inspection / test recommendations should be in accordance with manufacturer’s / suppliers recommendations and meet the general requirements outlined in BS EN 12845 and relevant Technical Bulletins.

Guidance and useful information

- BS EN 12845
- LPCB TB203 Care and Maintenance of automatic sprinkler systems
- QBE Sprinkler System test record card
- QBE Water Supply Test Record Card
- QBE Fire Control Impairment Toolkit.

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