General Description of a Fire Suppression System and Room Integrity Testing

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1. Standards and Requirements

According to British Standards and NFPA regulations relating to enclosures housing gaseous suppression systems:

1) *All mechanical items* should be inspected *twice a year*.

2) The *integrity test* should be conducted *once a year* (unless alterations have occurred which bring into doubt the integrity; this is often observed via obvious leaks).

3) *All detection devices* need to be inspected *once a year* and this should take the form of *4 visits*. On each visit 25% of devices should be inspected, so that 100% are over the course of the year.

This is the normal method as stated in the standards.

2. Extinguishant Cylinders

Cylinders are utilised to contain/store the extinguishant and to do this they are filled with an extinguishing agent. This could be Halon if it is an old system, or Inergen, Argonite or Argon if it is one of the newer *inert systems,* but there are others including FM-200 (HFC 227 ea) and Novec 1230.

In order for gaseous suppression systems to operate effectively the extinguishant needs to be driven from the associated cylinder within the allotted time period (ranging from 10 seconds to approximately one minute in the case of inerting agents.

To do this the cylinders are pressurised; inerting agents are generally pressurised to between 150 & 200 bar although newer systems are now adopting a 300 bar capability. In the case of FM-200 and Novec 1230 the required pressure is approximately 25 Bar.

3. Routine Cylinder Maintenance

As part of a routine maintenance programme each cylinder must be checked to ensure the correct pressure is sustained; any drop in pressure must be noted and reported as this could affect the discharge capabilities for effective agent dispersal into the enclosure.

The operating pressure mustn't drop more than 10% below the originally intended pressure; if it does, the cylinders should be taken away, checked and refilled.

All cylinders should be cleaned to remove dust build-up and checked to ensure that they are securely attached, both to the manifold if fitted and to a solid structure. This will prevent movement should a discharge occur. The nozzles should be checked to ensure a clear discharge path, without obstructions, as this could affect dispersal of the agent.

If concerns arise relating to the pressure of any particular cylinder, the pressures should be noted and then checked on a weekly basis check to see if they remain the same (a small allowance for temperature fluctuations is acceptable). After two weeks it should be possible to detect whether the cylinders are leaking. If they are, remedial action should be taken to resolve this as soon as possible.

4. VESDA Systems

A VESDA system is a **V**ery **E**arly **S**moke **D**etection & **A**larm. It is used to detect very small, barely visible amounts of smoke and provide a very early fire warning. The VESDA normally operates as a standalone system, not usually connected into a suppression or fire extinguishing system, as it is extremely sensitive. The VESDA system should be checked on a regular basis.

5. How Fire Suppression Systems Work

5.1 Fire Detection

Smoke detectors should be connected in two separate zones within a risk area. These smoke detectors ensure that the suppression system will *not* be activated and extinguishant discharged under a false alarm.

The extinguishant discharge is only activated if *both zones* detect a fire. There is a small time delay (built into the control panel) before discharge commences to allow people to safely vacate the area. This time delay is usually variable and can be adjusted to suit the clients' requirements; the normal delay period is about 30 seconds.

A detector in one of the zones detects a signal, usually smoke, indicating a possible fire. One of the alarms sounds (usually the Bell in the first instance). If the alarm continues and the source of smoke worsens a detector in the other zone detects the signal and a second alarm sounds (usually the electronic Banshee sounder). At this point both alarms are sounding and a visual alarm may be incorporated to safeguard deaf operatives. At this point (if not before) the area should be completely vacated.

Fire suppression systems are sometimes interconnected to the house alarm system. If so, the alarm devices should be clearly designated and different alarm tones are advisable so that each type of alarm is easily identifiable.

5.2 Fire Suppression

Once the area is vacated the system should be set to automatic mode. Then, after a short time delay normally of around 30 seconds, the extinguishing agent will discharge into the room thereby extinguishing any source of fire.

There is a manual override system (usually a yellow pull-down flap) on the panel or

sometimes close to every entrance, which operates the system without the time delay, providing an immediate response to a possible fire condition. The manual override facility should only be used once the area is fully vacated.

5.3 After the Fire is Extinguished

Any area into which extinguishant has been discharged should be well ventilated *before* it is re-entered. A low-level extract system is usually fitted; *all fire suppression extinguishants* collect at low-level over the required hold time, as they are heavier than air. An extract system that draws from high level would have little to no affect on agent/extinguishant removal.

The activation of appropriate fire dampers also ensures effective operation. Under normal operation an extract system should be fitted with some form of shut off device, usually a fire damper. The fire damper is normally closed – it opens only in the event of the extract system being operated, normally as a manual operation, after a discharge has occurred. The effectiveness of fire damper operation is verified by the Integrity Test.

Fresh air supply ducts or air extract ducts that operate in a risk area should also be fitted with a fire shut off damper. These fire dampers are normally open to allow effective system operation, and they would only shut down or close in the event of a fire condition being notified. They close to prevent the loss of extinguishant in the event of a system discharge, and to prevent the possibility of air ingress, which could “feed” a fire source.

All of these operations need to be checked to ensure that the dampers do what is required of them before a system discharges. *All dampers should be in the closed position prior to the operation of a suppression system*.

Again, the integrity test verifies the effectiveness of the damper closure. It won’t, however, ensure that the operation is effective; this needs to be verified separately.

The current state of the system is monitored continuously; indicator lights on the control panel state whether the system is about to discharge, is set in manual or automatic mode or has already discharged. The indicator lights take the form of a traffic light system

System Manual
System Automatic Discharge Imminent (manual release is still available if required)
System Discharged
Isolated (not always available)

Sometimes dampers are provided with an indicator panel to allow their status to be monitored (open or closed), but only when large numbers of dampers are present.

Normally the Vesda system (if fitted) will operate before any of the above, providing

an early warning of possible fire conditions. Although the VESDA usually sounds a warning alarm only, this must be confirmed as some systems may be integrated with the suppression system and activate the initial stages of a discharge.

6. Room Integrity

The enclosure's *integrity* is its ability to adequately hold or retain an extinguishant. The room integrity should be regularly checked to ensure the enclosure will adequately retain the extinguishant in the event of a discharge. An effectively sealed room retains the extinguishant long enough to enable a fire to be suitably extinguished and to maintain an inert atmosphere which avoids the possibility of re-ignition.

Every suppression system should have a minimum retention time of 10 minutes (20 minutes minimum in the case of Carbon Dioxide CO_2).

An integrity test is required to confirm that the enclosure isn't leaking excessively. As an enclosure's integrity tends to depreciate over time (due to installation of new cables, services, new equipment and general deterioration) current British Standards and NFPA regulations state that the integrity should be tested once a year to ensure it meets the required standard.

If the integrity is questionable in any way, or if modifications have taken place that involve possible structural alterations, a re-test should be conducted to ensure that it remains within acceptable limits.

The enclosure's integrity may even be affected by the addition of new equipment which is taller than the equipment present when the room's integrity was originally tested. In this case the room integrity may need to be re-tested.

6.1 Routine Integrity Maintenance

All systems need to be checked to confirm they are operating as intended. Pressure Test checks these systems for all clients with an annual maintenance contract, which is essential for the effective ongoing operation of *any* fire suppression installation.

Make a booking for any fire suppression or fire stopping service, including integrity testing, remedial work, pressure relief or annual maintenance.

We also offer **consultancy advice,** pre- or post-installation, to ensure your fire suppression system is effective, reliable and compliant.

Call Pressure Test's Booking Team and Advice Line on

0118 973 7555

or visit www.pressure-test-limited.co.uk