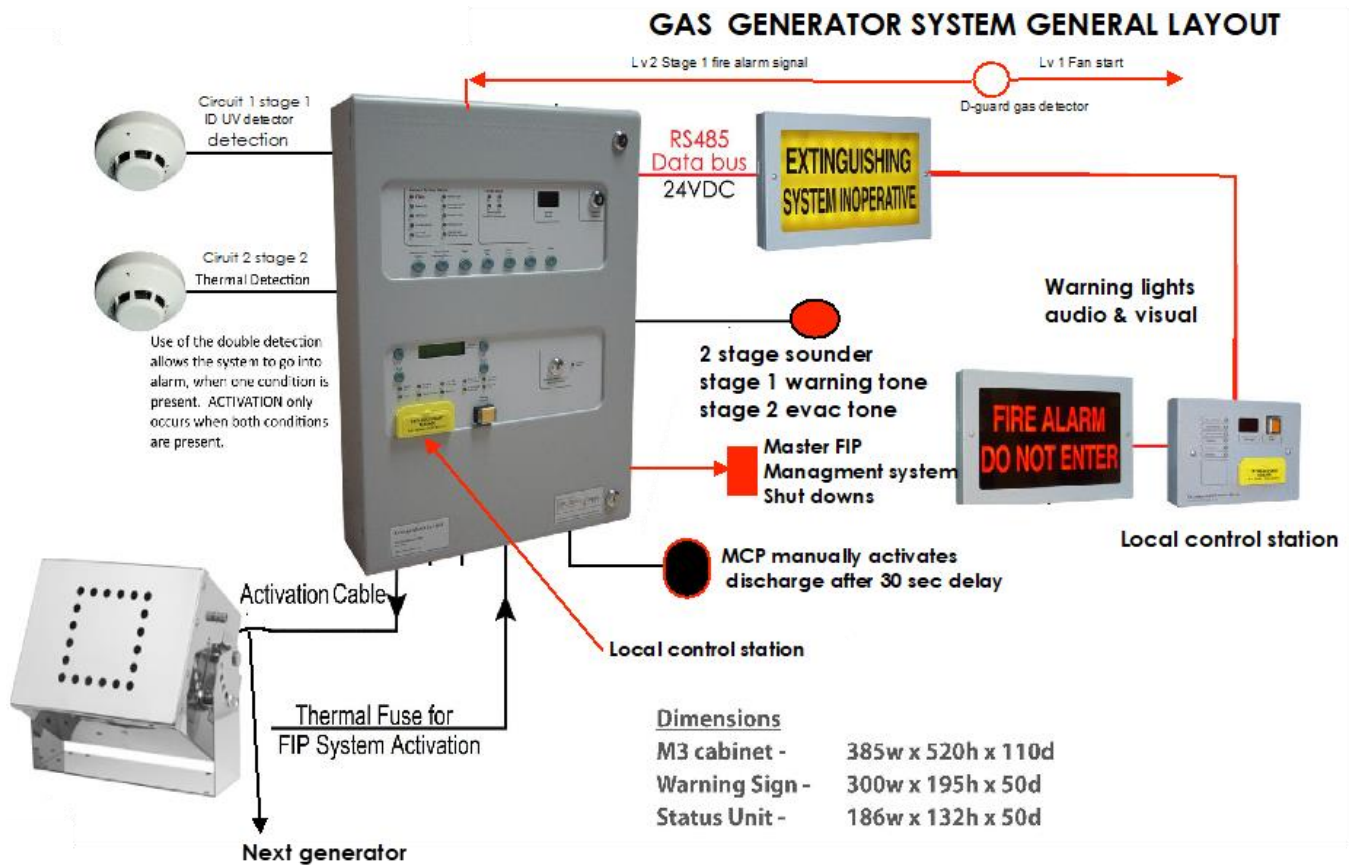


WAITSIA GAS PROJECT STAGE 2

MAINTENANCE

FIRE DETECTION & PRE-ENGINEERED FIREPRO FIRE SUPPRESSION SYSTEM



1.1. Pre-Engineered Design Calculations for FirePro Aerosol Fire Suppression System

Notes to leakage allowance

1. As per section 7.3 AS4487-2013 – the additional gas is used where leakage occurs from a non-tight enclosure, where doors being opened during discharge, excessive leakage from an enclosure.
2. Observe the original plan, volume & openings. Should additional openings have been added, container volume increased, fans & gas generator not shut down on first alarm, fan shut off louvres not close or be missing, additional partitions or compartmentation effecting stream discharge flow doors locked open then additional gas will be required if none of these changes not be able to be repaired or modified back to the original design- Refer to the manufacturer FSE to recalculate required gas levels.

Notes to system pre-engineered design during system maintenance or works.

1. Elevation & temperatures below 300deg C do not affect this calculation.
2. The generators have a safety factor that allows the generators to automatically discharge at an environmental temperature of 300degC. Note hot works should not be undertaken within the risk without isolating the FIP & removing the generators.
3. Generators have an 8mtr stream length.
4. Oxygen levels will not be affected by the discharge.
5. Internal pressure at full discharge will be approx. 1kpa discharge pressure at the generator will be approx. 20kpa.
6. The safe tolerances should be confirmed for both personnel & combustibles for both generators- refer drawing.
7. LOAEL & NOAEL are not known & not calculable. The manufacturers recommendation is to evacuate the risk as per the audio & visual alarms installed prior to discharge 30 seconds later.

8. Should personnel be in the risk at time of discharge, the gas is white by nature & is non-toxic. Refer to SDS.

Notes to After discharge clean up.

1. The FirePro[®] aerosol-forming compound is not based on halogen compounds that react with the fire. It does not produce corrosive halogen acid by-products in its reaction with the fire like some agents.
2. Potassium carbonate creates stability in neurons to help maintain equilibrium.
3. Potassium nitrate when burned with the free radicals of a fire's flame, produces potassium carbonate.
4. The residue is non-toxic and non-corrosive (see separate NRL report), it is hygroscopic in nature on discharge as a result of the aerosol process so will attract moisture. The chemical nature of the residues (potassium salts) is slightly alkaline PH is approx. 8.
5. Clean-up after a fire incident will be determined by the extent of the damage by fire involved in the event.
6. Within the risk the generators are designed that the size of the generators and positioning creates the appropriate stream length. It is this stream length that both ensures maximum fire knock down
7. Any residue left by the generators is easily cleaned away.
8. The stream created by the externally mounted generators used as a room flooding system will not affect the internal componentry and switchgear within the electrical cabinets.

Accidental or False discharge:

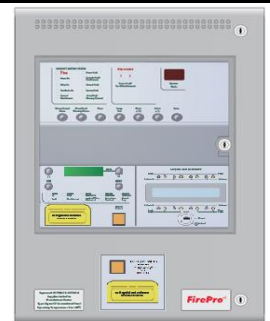
A false discharge in a land-based risk can only occur when both detection zones thermal & Photo-optical are in alarm and activation initiated from the fire indicator panel OR a manual activation Switch is used.

1. **VENTILATE** the room immediately after discharge. This reduces the aerosol concentration.
2. **CLEAN as soon as possible** all exposed surfaces using cloths, special moisture removing fluid, spray or air gun.
3. Disposal of the generators after use is send to landfill.

2. Maintenance General

FirePro systems that have been installed in accordance with AS4487: Condensed Aerosol Fire Extinguishing Systems, periodic maintenance must be performed as per the requirements of AS1851: Routine Service of Fire Protection Systems and Equipment.

AS1851 Section 7.4 sets out the requirements for routine servicing in a monthly, six monthly and yearly schedule. Servicing should be only be performed by suitably qualified personnel.



3. Testing

Must be performed as per AS1851, Sections 6.4.1 and 7.4.2 by accredited service technicians. A logbook must be kept, recording all the relevant information from the installation and servicing

Monthly Servicing should be performed as follows, with any system repairs completed as necessary:

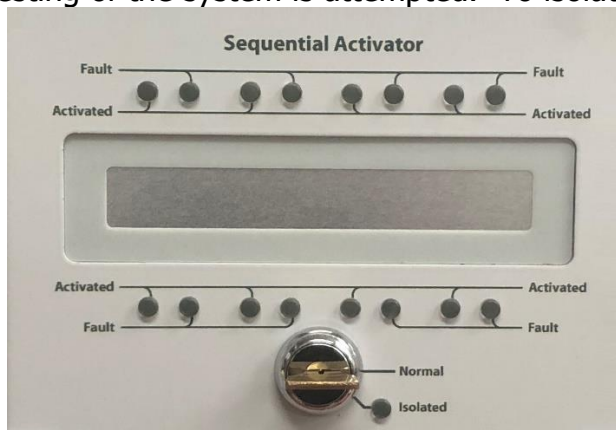
- Servicing should not be performed when the fire control panel is in an alarm/fault condition.
- No personnel should be in the risk area until the fire system is fully isolated.
- Where shutdown relays have been utilised, all personnel should be made aware equipment will not be operable until testing is completed. Shutdown Isolation Module (P/N 98510) may be used to bypass shutdown relays and allow for normal operation of connected equipment during testing.

3.1. Visual Inspection

- 3.1.1. CIE and installed components should be accessible and free from debris, rust, electrical faults, or other damage.
- 3.1.2. Inspect CIE to ensure normal functioning. When the Sigma XT/Local Control Station is functioning normally the only indicators illuminated should be "Power" (green) on the Alarm Module and the Extinguishing Module.
- 3.1.3. All anti-tamper seals and travel pins should be in place and secure.
- 3.1.4. CIE, warning signs and strobes should be clearly visible and must indicate the designated egress points for the risk area.
- 3.1.5. Ensure that all FirePro Aerosol Generators have not been discharged and seals are intact.
- 3.1.6. Inspect the risk area to ensure that the risk has not changed from the approved design.
- 3.1.7. Review base data for any changes in environment or equipment installed.
- 3.1.8. Test operation of all CIE LED indicators by pressing the "Lamp Test" button on the Alarm Module

3.2. Isolation of System

Isolate Function: it is important to isolate the activation of the suppression system before any testing of the system is attempted. To isolate:



SYSTEM – NORMAL



SYSTEM ISOLATED

- 3.2.1. The fire suppression system activation circuit **must** remain isolated until all other testing is completed.
- 3.2.2. Unlock and open the display window for the Sigma XT. The centre lock opens the display window, allowing for operation of the controls.
- 3.2.3. Insert the 003 key into the isolate switch and turn until isolate LED is lit. The FirePro units are now isolated from activation.
- 3.2.4. This will initiate a fault and operate all installed "System Inoperative" warning signs.
- 3.2.5. Inspect all installed "System Inoperative" Warning Signs to ensure operation.
- 3.2.6. Where the Sigma XT is being remotely monitored or used as a Sub-Indicator Panel, ensure that the system isolation has been reported to monitoring equipment.



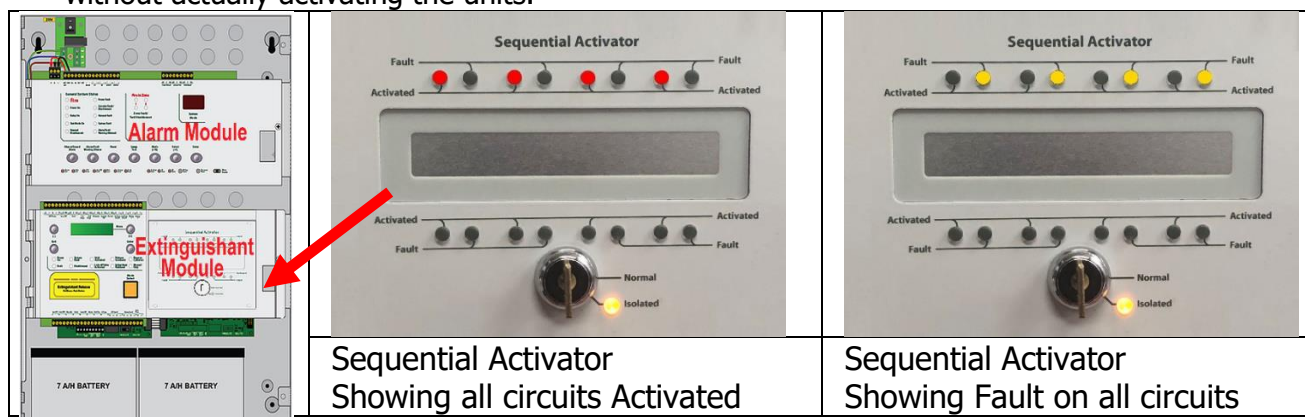
3.3. Alarm Function

The system must be placed into alarm and simple function tests observed to ensure that the system is capable of performing as designed.

- 3.3.1. Simulate a single zone alarm by appropriately testing one of the installed detectors or manual call points. Testing should be performed on a different detector for each monthly service, so that over a period each device on the detection circuits has been individually tested.
- 3.3.2. Smoke Detectors can be tested using "Canned Smoke". A spray of canned smoke should be applied to a detector and this should place the detector into alarm.
- 3.3.3. Thermal or Heat detectors can be tested with a Thermal Testing device. Applying heat to the detector should place the detector into alarm.
- 3.3.4. Flame detectors require a special simulation device which can be aimed at the flame detector to create an alarm condition.
- 3.3.5. This will operate all installed "Fire Alarm", "Evacuate Area" and "Do Not Enter" warning signs, sirens and strobes.



- 3.3.6. The FirePro panel incorporates a mimic panel located in the Extinguishant Module of the FIP. This mimic panel will show by Red LEDs as each of the FirePro units are activated, without actually activating the units.



- 3.3.7. Inspect all installed Warning Signs, sirens and strobes to ensure operation.
- 3.3.8. Ensure operation of all installed shutdown relays and connected equipment.
- 3.3.9. Where the Sigma XT is being remotely monitored or used as a Sub-Indicator Panel, ensure that the alarm condition has been reported to monitoring equipment.

3.4. Reset

The Fire Indicator Panel must be reset once the testing is complete, this will allow the system to go back to operational status.

- 3.4.1. Unlock and open the centre display window. The centre lock opens the display window, allowing for operation of the controls.
- 3.4.2. Place the 003 key in the "Enable Control" key switch located on the Alarm Module and turn to enable "ACCESS LEVEL 2".
- 3.4.3. Press the "Reset" Button on the Alarm Module to reset the Sigma XT to normal condition.

- 3.4.4. Turn back the 003 key in the "Enable Control" key switch to exit "ACCESS LEVEL 2" and allow normal operation of the CIE.
- 3.4.5. CIE should no longer be in an alarm condition. The fire suppression system must remain isolated until CIE is no longer in an alarm condition.
- 3.4.6. Place the 003 key in the "Normal-Isolate" key switch located on the Extinguishing Module and turn from "Isolate" to "Normal".
- 3.4.7. Place the 003 key in the "Shutdown Isolate Switch" key switch normally located adjacent to the FIP in a separate enclosure and turn from "Isolate Shutdowns" to "Normal".
- 3.4.8. CIE should no longer be in a fault condition.
- 3.4.9. Close and lock the central display window. System is now operational.

3.5. **Logbook**

Logbook must be updated to record the outcome of servicing and any changes or repairs to the fire system.

3.6. **Review**

Following servicing, the fire suppression system should be reviewed for fitness of purpose.

4. Maintenance for FirePro Systems AS1851 – 2012 Section 7.

This standard covers all systems so references to AS4487-2013 aerosol systems are relevant. AS ISO 14520.1 specifies requirements for the design, installation, testing, maintenance and safety of gaseous systems - It is not specifically relevant to Aerosol systems which are covered under AS4487-2013.

- 7.2.2 Prior to commencing service, take precautions to inform the responsible entity that service is to be carried out; where the system may be impaired, advise the nature and expected duration; set the detection and alarm system in test mode and ensure that ancillary facilities, systems are isolated to avoid inadvertent operation. When any function is left impaired, disabled, it shall be recorded in the logbook and the owner or agent shall be notified
- 7.2.3 System isolation - Fixed aerosol fire extinguisher system actuation means shall be isolated by means of the maintenance isolate switch prior to undertaking any tests. Where there is no maintenance isolate switch, aerosol shall be disconnected or removed prior to testing.
- 7.2.4 Baseline data shall in accordance with Clause 1.8 and shall include a systems interface diagram.
- 7.2.5 Service records of activities and results shall be kept in accordance with Clause 1.16.

1. FAN INTEGRITY TESTING, Structural Integrity & Vent Relief

Summary, the properties of aerosols have different characteristics than gaseous agents. There is no requirement for annual fan integrity test. Vent relief is not required due to the discharge pressure of FirePro aerosols being 6-8kpa; this creates no additional pressure within the risk. As per AS4487:

- 7.2.1 The designer shall provide calculations for venting requirements for each system. A calculation method or formula to estimate a minimum vent area shall be provided by the system manufacturer. The FirePro generators discharge at approx. 6-8kpa. Unlike high-pressure gases, the discharge creates no additional pressure within the risk. So even with additional design application density vent relief will not be required as determined by the manufacturer under UL 2775.
- 7.6 (Para. 2) "Due to the specific characteristics of condensed aerosols that primarily produce particulates, no method is known to evaluate the hold time in real installations. For this reason, a specific test is required for each aerosol formulation to determine the maximum leakage area to volume ratio that provides for the minimum hold time declared by the manufacturer.
It is impossible to measure accurately the resulting aerosol agent density due to the aerosol agent specific characteristics, thus cannot derive a formula of leakage compensation.
The door fan test applied for gas agents, cannot be used for Aerosol agents', as density is not measurable.

| | | | |
|-----------------------|-----------|-------------------|--|
| Date of Service | | System Identifier | |
| Service Completed by: | Name | Description | |
| | Signature | Branch / Location | |

| MONTHLY SERVICE REQUIREMENTS | | AS 1851 – 7.4.2 | |
|------------------------------|--|-----------------|--|
|------------------------------|--|-----------------|--|

| | Item | Pass/Fail | Action / Comments |
|------|--|-----------|-------------------|
| 1.1 | Electrical detection and control systems. Perform service as per Sect 6. | | |
| 1.2. | Warning signs (and labels) CHECK all signs are visible and legible. | | |
| 1.7. | INSPECT the protected area to and verify to baseline data. Any changes from the approved design (e.g. volume, fuel type, change of use). | | |
| 1.8 | Aerosol units CHECK generators have not been discharged and are secure. | | |
| 1.9 | Aerosol generator moisture seal CHECK that all moisture seals are secure. | | |

| SIX MONTHLY SERVICE REQUIREMENTS | | AS 1851 – 7.4.3 | |
|----------------------------------|--|-----------------|--|
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|------|---|--|--|
| 2.1 | COMPLETE all monthly service activities. | | |
| 2.2. | Electrical detection and control systems Perform service as per Section 6. | | |
| 2.7. | Manual release systems TEST operation of all manual release systems. | | |
| 2.9 | CHECK aerosol generators are clear and unobstructed, correctly aimed and secured. | | |

| YEARLY SERVICE REQUIREMENTS | | AS 1851 – 7.4.4 | |
|-----------------------------|--|-----------------|--|
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| | | | |
|------|--|--|--|
| 3.1 | COMPLETE all Monthly and Six monthly service activities. | | |
| 3.2 | Electrical detection and control systems Perform service as per Section 6.. | | |
| 3.10 | Dampers CLEAN dampers and remove any debris. | | |
| 3.11 | CHECK for any condition that could cause inadvertent discharge of system. | | |
| 3.12 | Type of hazard VERIFY fuel class and type match baseline data. | | |
| 3.13 | Enclosure volume (total flooding systems) VERIFY to baseline data | | |
| 3.14 | Design concentration or application density VERIFY to baseline data. | | |
| 3.15 | Dimensions of protected objects (local systems) VERIFY to baseline data. | | |
| 3.18 | INSPECT all areas adjacent to the protected area to ensure that migration of extinguishing agent does not create a hazard. | | |
| 3.19 | Test operation of automatic ventilation dampers. | | |
| 3.20 | System interfaces with HVAC systems, see Clause 1.12 and Section 10 | | |
| 3.21 | TEST the operation of the post-discharge system. | | |
| 3.23 | System interface test (see Clause 1.12.2) (a) CONDUCT system test with other interfaced fire systems (e.g. HVAC, EWS). (b) VERIFY functions in accordance with the building's systems interface diagram. | | |
| 3.24 | REPLACE any Aerosol generator that will exceed service life prior to next service. | | |

| 10 YEARLY SERVICE REQUIREMENTS | | AS 1851 – 7.4.5 | |
|--------------------------------|--|-----------------|--|
|--------------------------------|--|-----------------|--|

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|-----|--|--|--|
| 4.1 | Monthly, Six monthly and Yearly service COMPLETE all activities required | | |
|-----|--|--|--|