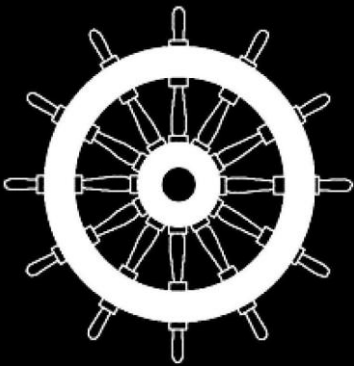


# **FirePro**

***Fire Extinguishing Aerosol Systems***

## **Marine Design Guide**



# **FirePro<sup>®</sup>**

## **ANNEX 1**

### **MARINE MANUAL**

**Version 1, 01-08-2010**

**To be read and used in conjunction with  
FirePro Information, Instruction & User Manual  
Version 4, 01-05-2010**

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ANNEX NO 1

## MARINE APPLICATIONS

### DESIGN AND INSTALLATION GUIDELINES

This Marine Application Annex contains the specific engineering guidance for the installation of the Fire Pro fire extinguishing aerosol systems, in accordance to the MSC1/Circ.1270.

**This Annex shall be read and used in conjunction with  
INFORMATION, INSTRUCTION && USER MANUAL, Version 4, 01-05-2010.**

Marine Applications Codes of Reference:

- RS Rules for the Classification and Construction of Sea-Going Ships (2010)", "Rules for the Technical Supervision During Construction of Ships and Manufacture of materials and Products for Ships" (2009)", "Chapter II-2 SOLAS-74, International Code for Fire Safety System (IMO Resolution MSC.98 (73))" and "IMO MSC.1/Circ.1270: Revised Guide Lines for the Approval of Fixed Aerosol Fire- Extinguishing Systems equivalent to Fixed gas Fire- Extinguishing Systems, as referred to in SOLAS 74, for machinery spaces".

#### SAFETY:

MSC 1/Circ. 1270, chapter 14.1.5

#### **A MINIMUM SAFE DISTANCE IS REQUIRED BETWEEN GENERATORS AND ESCAPE ROUTES AND COMBUSTIBLE MATERIALS.**

As per Information, Instruction and User Manual , version 4, 01-05-2010 , the aerosol temperatures are indicated in the table at page 36 and in Figures A,B and C at pages 38, 39 and 40, whereby the safe distances for escape routes are related to the L3 values (in meters) in the table and minimum clearance from persons (light orange color)in Figures A,B and C. Safe distances for combustible materials are related to the L2 values (in meters) in the table and minimum clearance from combustible materials (dark orange color) in Figures A, B and C.

MSC 1/Circ. 1270, chapter 14.7.3

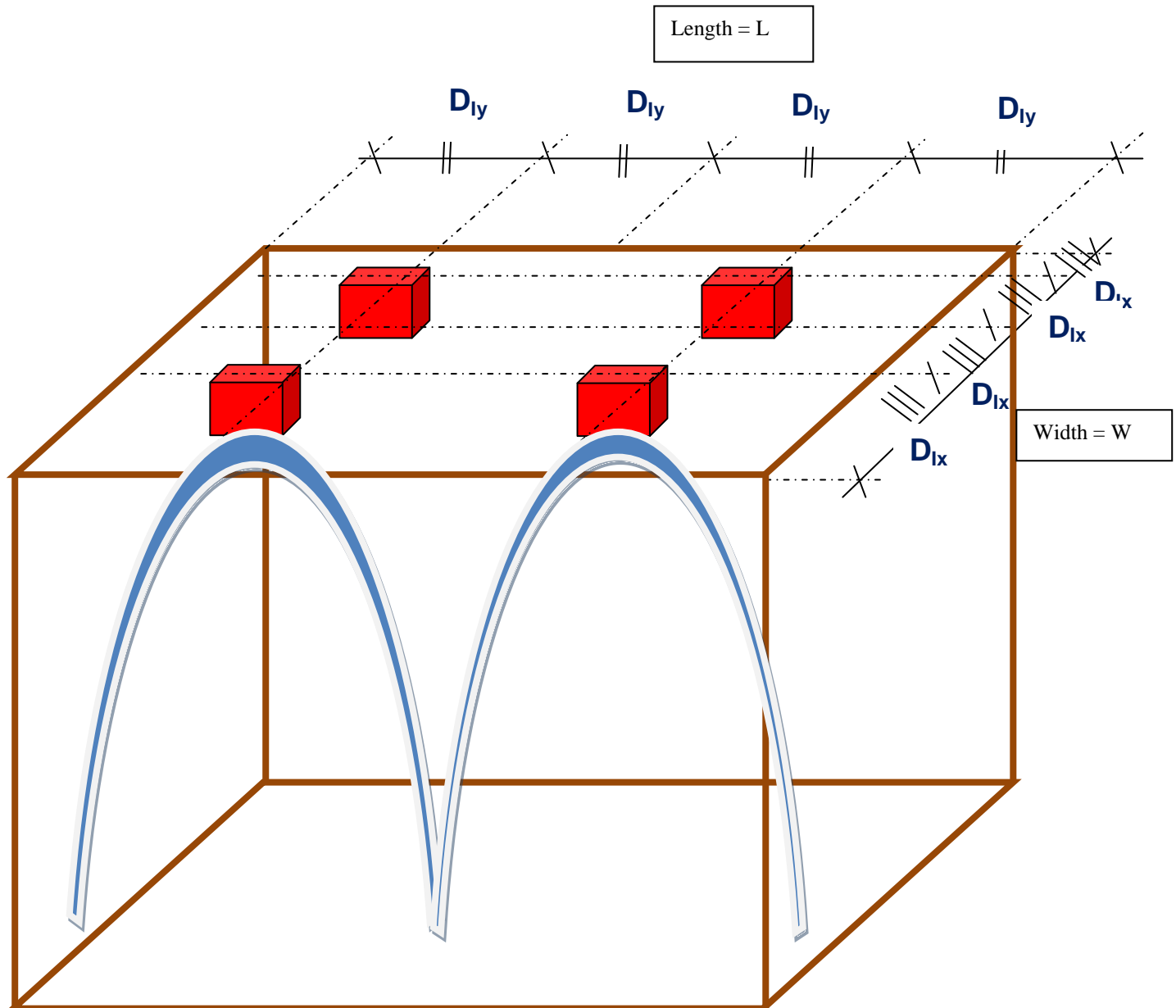
#### **MOUNTING LOCATIONS REQUIREMENTS CONSIDERING SAFE DISTANCE TO ESCAPE ROUTES AND COMBUSTIBLE MATERIALS.**

As per aerosol temperatures indicated in the table at page 36 and in Figures A,B and C at pages 38, 39 and 40, safe distances for escape routes are related to the L3 values (in meters) in the table and minimum clearance from persons (light orange color)in Figures A,B and C.

Safe distances for combustible materials are related to the L2 values (in meters) in the table and minimum clearance from combustible materials (dark orange color) in Figures A, B and C.

**The generators should be located 1 meter from the ceiling, with the use of its supporting brackets.**

## Installation Guidelines



**$D_I$ : Installation Distance**

**$D_{Ix}$  &  $D_{Iy}$ : Installation Coordinates:**

**$N_G$ : Number of Generators to be installed/spaced along the subject side**

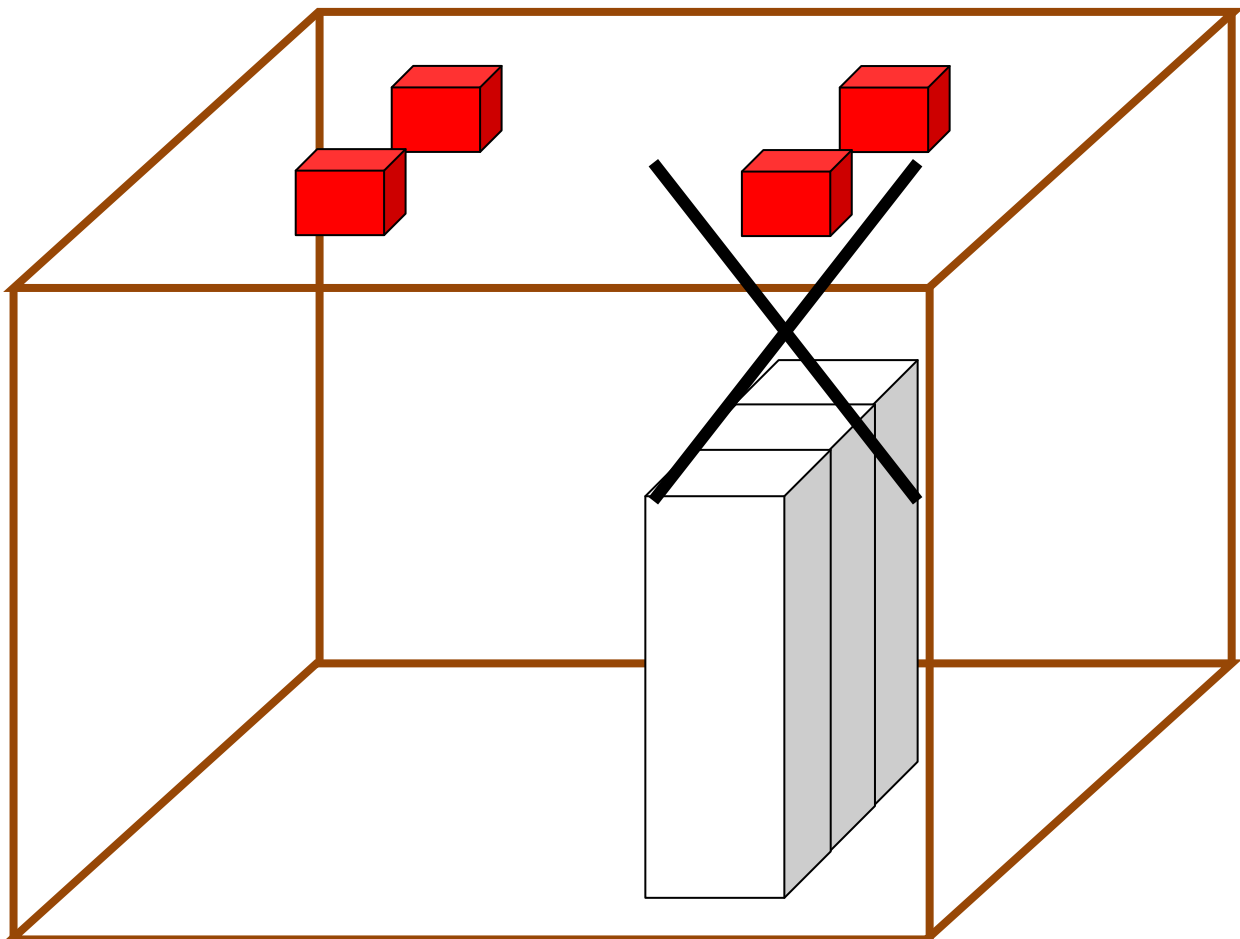
**$D_{Ix} = W/2 * N_G$  And,  $D_{Iy} = L/2 * N_G$**

**For Ex.: if  $L = 6m$  &  $W = 4m$**

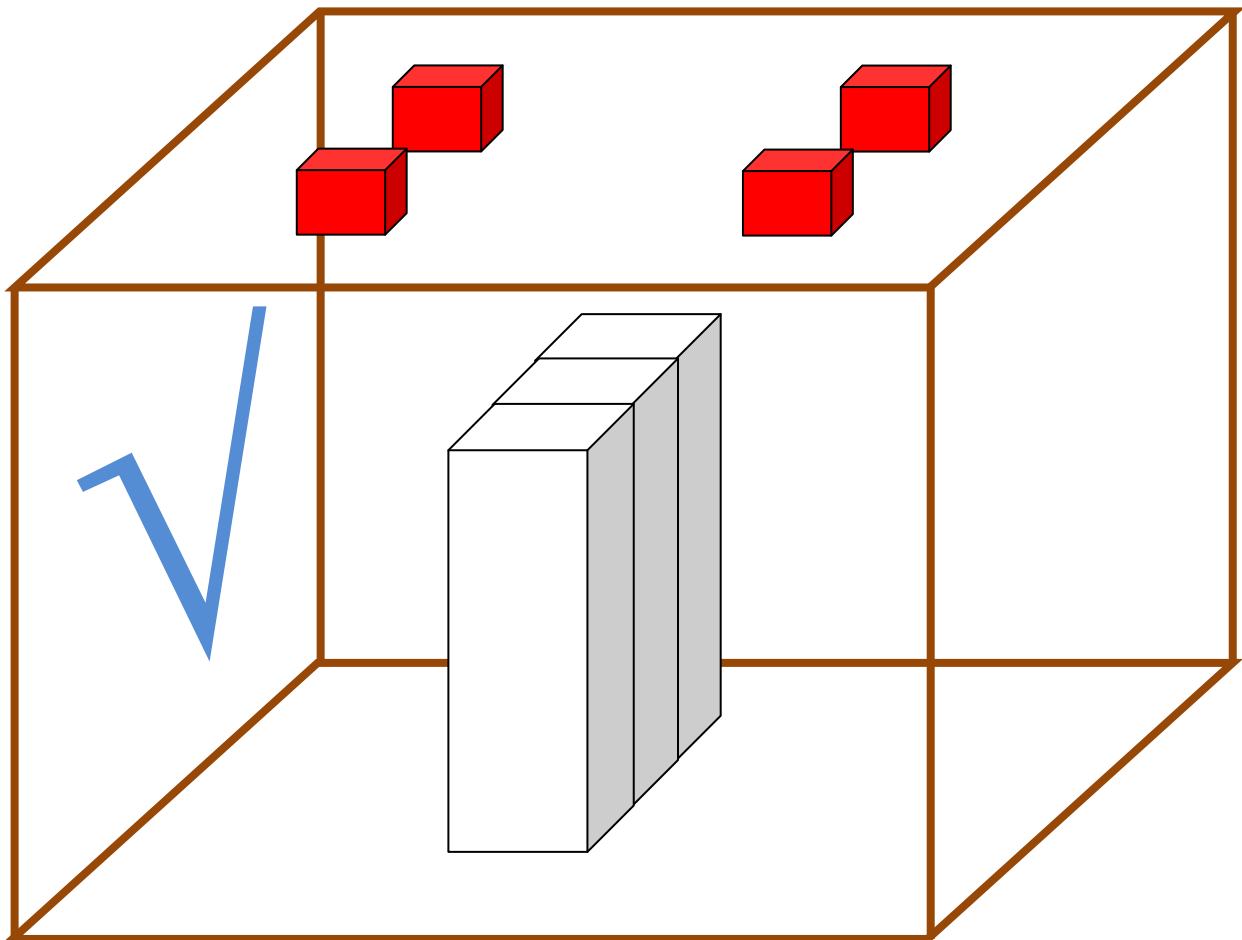
**then,  $D_{Ix} = 4 / (2 * 2) = 4/4 = 1.0m$ , &  $D_{Iy} = 6 / (2 * 2) = 1.5m$**

## Installation Clearance - the Do's & Dont's

### Wrong Installation



## Proper Installation



MSC 1/Circ. 1270, chapter 14.11.1

## **ELECTRICAL CIRCUITS FOR PYROTECHNIC GENERATORS:** **Requirements for mounting and protection of cables.**

It is covered in the FirePro Information, Instruction & User Manual, Version 4, 01-05-2010 under Section 11.1, page 53.

### **11.1 Cabling/Installation**

The cabling for the outgoing controls to the fire protection installation comes under the activities of the installer.



**Note:** the execution must conform to NEN-2535 and NEN-1010:5<sup>th</sup> edition.

Fixed cabling for main current (230 V) must have a minimum conductor cross section of 1.5 mm. The cabling must be of flame retardant construction (NEN-1010), provided that no function retention is required. All the cables that are part of the fire detection and fire alarm system and evacuation installation must be red or be marked red every five metres. Cables in a terminal box must be provided with a loop, group and cable number.

Only lay cabling in a conduit or a compartmentalised cable duct:

- In cable ducts a division plate or 50 mm spacing is required between the fire detection and fire alarm system cabling and the 230/380 V power current cabling;
- In cable ducts control current cabling may be laid with fire detection and fire alarm cabling if no disruptive mutual interference is to be expected;
- Conduit must connect to the cable duct;
- Open bends, maximum 50 x 50 mm, are only permitted above suspended ceilings and beneath raised floors;
- Protect conduits emerging from floors with impact-resistant conduit to 10 cm above the floor.

Where cabling is laid directly alongside power current cabling, for example next to motor cables of an air conditioning system, then use screened or twisted cabling, lay in separate compartments or keep a minimum of 50 mm spacing between power current cabling and fire detection and fire alarm cabling.

Where cabling is laid through fire-resistant partitions, suitable measures must be taken to ensure that the fire/smoke-resistance of the partition is not impaired.

The wiring, technology and tools used must be used according to the requirements of approved workmanship, with the aim of minimising the chance of failure. Do not include any conductors in the fire detection and fire alarm system cabling that are fed from other installations.

There may not be any joints in transmission paths, unless in consultation with the fire detection company and the local fire brigade. The joints must then be made in terminal boxes intended for the purpose. Any joints necessary must be housed in a completely sealed junction box. The conductors must be connected to the terminal strips with numbered screw terminals.

### **11.2 Function Retention Cabling**

The installation and the route of the cabling must be chosen so that the chance of damage of the cabling by fire is prevented and/or is as small as possible.

This can be achieved by:

- Laying in the ground.
- Laying in a minimum of separate 30 minutes fire-resistant ducts.
- Use of fire-resistant cabling (cabling must conform to DIN 4102 Part 12 class E 30).

The following cables are concerned:

- Between the fire detection and fire alarm control unit and signal transmitters (slow whoop and flashlight).
- Between the fire detection and fire alarm control unit and the transmission equipment.
- Between the fire detection and fire alarm control unit and the fire brigade panel and any additional panels.
- Between the fire detection and fire alarm control unit and any control that automatically resets when the BMC is reset.

The cable support of cables for which function retention is required must also remain functional for 30 minutes in the event of fire.

### **11.3 Cable Monitoring**

Cable monitoring according to NEN-2535

In addition, the following cabling must be provided with cable monitoring:

- Cabling to the transmission equipment if longer than 1.5 m.
- Cabling to the **FirePro®** unit.
- Slow whoop.

MSC 1/Circ. 1270, chapter 14.14

### **INSPECTIONS, MAINTENANCE, SERVICE AND TESTING REQUIREMENTS**

It is covered in the Information, Instruction and User Manual , version 4, 01-05-2010 1, under Section 12, at page 55.

## **12.0 Installation, Installation Tests, Delivery, Inspection and Maintenance**

### **12.1 Installation**

The Schedule of Requirements with the execution drawings and any other relevant descriptions and/or certificates of the fire detection and fire alarm system must, before the installation is installed, have been approved by the local authority. Usually this will be the local chief fire officer of the municipality in which your business is located.

The fire detection and fire alarm system can be supplied and also maintained by the authorised **FirePro®** dealer or by a fire detection company that has been certified by a member of the NCP (National Centre for Prevention) or an equivalent of this body.

The fire detection and fire alarm system must be installed by an expert and recognised installer. The installer must work in accordance with the requirements of certification under the responsibility of the authorised **FirePro®** dealer or the fire detection company (supplier of the fire detection and fire alarm system).

The authorised **FirePro®** dealer, the installer and the specialised fire detection company may depart from the provisions of this schedule of requirements, if and in so far as approval has been granted by all the required parties and the author has drafted revisions for this schedule and has been correctly informed to this effect.

Where the schedule of requirements differs from prevailing standards/directives, the schedule of requirements shall prevail. The installer must ensure that before the start of work the design and the siting of the installation has the approval of the local authorities, customer and owner.

Following acceptance of order, on the basis of perusal of the respective (definitive) text and drawing of this schedule of requirements, the authorised **FirePro®** dealer and/or the specialised fire detection company is responsible for the design and the installation of the fire detection and fire alarm system.



If and in so far as can subsequently be concluded that the actual situation differs or has become different from that on which the schedule of requirements is based, in particular where the intended use of the rooms is concerned, the owner/user of the installation and/or whoever installs the fire detection and fire alarm system must adapt the fire detection and fire alarm system to the newly arisen situation. For this purpose too advice can be obtained from FirePro Systems Ltd.

In the event of any subsequent modification (including structural) of layout having an impact on the speed and reliability of fire detection and the fire alarm, the fire risk and/or on the chance of nuisance alarm/fault, consideration must again be given to whether an adjustment of the fire detection and fire alarm system is necessary and/or required (such as detector siting and detector choice). Any adjustment, for the above reasons, must be approved by all the parties concerned and/or required. This approval must be incorporated into the schedule of requirements.



**Important:** If and in so far as the manufacturer's installation instructions differ from the schedule of requirements, for a careful implementation of the **FirePro®** products contact must first be made with FirePro Systems Ltd. Primarily the installation instructions of the manufacturers and/or fire detection and fire alarm control unit and/or detection material must be followed.

## 12.2 Installation Tests and Delivery

Following commissioning and installation an attestation (a written confirmation of approval) stating that the installation is working properly and conforms to all the technical descriptions must be issued by the installer/the fire detection company. At the time of delivery the fire detection company must supply the materials required for testing the detectors used.

## 12.3 Maintenance and Inspection

During the period that the **FirePro®** units are in use the following inspections and maintenance procedures must be carried out:

- A periodic inspection of the aerosol fire extinguishers and fire extinguishing systems to check the following parts:

1 – electrical wiring	4 – terminals of the electrical activator
2 – electrical circuit	5 – electrical contacts
3 – thermocord	6 – fixing bolts

At the time of the final inspection the following documents must be issued:

- Schedule of Requirements
- Installation attestation conforming to NEN-2535 (or any other equivalent local standard)
- Brief and concise operating instructions, approved by the fire brigade
- Logbook of the fire detection and fire alarm system
- Revision drawings in triplicate with all the relevant details
- A signed maintenance contract

The authorised **FirePro®** dealer must provide a separate quotation for inspection, management and maintenance of the **FirePro®**-based installation. The installer of the fire detection company must alert the customer to its obligation to carry out limited functional installation tests and maintenance, including a monthly functional test of the installation and transmission. This must be in accordance with NEN-2654 (or an equivalent local directive). The customer must ensure that this task is undertaken by a suitably trained officer under NEN-2654 (or an equivalent local directive).

The customer/user is obliged to conclude a maintenance contract in accordance with NEN-2654 (or an equivalent local directive) with the authorised **FirePro®** dealer. This maintenance can for example stipulate that the installation be inspected and maintained annually.

The maintenance contract must state:

- that the maintenance will be in accordance with NEN-2654 (or an equivalent local directive)
- that maintenance will be undertaken during the life of the installation

- that the service provider will start on the rectification of a fault within 24 hours of receipt of a fault report
- and urgent interventions must also be included in the maintenance contract

The suitably trained officer of the authorised **FirePro®** dealer or the customer/user must keep a logbook, recording all the relevant events concerning the installation, such as false and nuisance alarms with any cause, switching off of detectors, detector groups, maintenance, inspections and installation tests, adjustments, expansions and repairs. Other areas of attention are:

- A periodic test (see life) for type E models; electrical activation must be carried out to check that the internal electrical circuit of the activator is intact. This test must be carried out with an ohmmeter with an accuracy of at least 2.5 ohm. The control current may not exceed 5 mA (milliampère).
- All the electrical wires and connections of the **FirePro®** units to the control panel or the switch must also be tested and checked.
- A periodic inspection of the thermocord (see life) of the type TH models must be carried out to check that the thermocord and the connections to the aerosol fire extinguishers and/or fire extinguishing systems are intact. Any damaged parts must be replaced and reconnected.
- A periodic inspection of the metal casing (see life) of the solid extinguishing agent must be carried out to check whether the material is intact or has been damaged by chemically aggressive materials or corrosion. Whenever such inspection indicates that the metal casing has been damaged, the unit shall be replaced.
- All the metal brackets and connecting bolts must be inspected and tightened.
- Thanks to its chemical composition and properties the aerosol-forming extinguishing compound SBK (Solid Bound Compound) in the **FirePro®** units does not require any further maintenance throughout its life.
- Life Time: the Certified Life Time of the **FirePro®** units is 15 years.

## Logbook

The logbook contains the items required that give a picture and provide for the recording of various things during the life of the installation. In the logbook you will find the following:

### Content of logbook:

- Introduction
- General details
- Devices used
- Management and maintenance requirements
- Measures on system activation
- Measures following system activation
- General rules and regulations for the user

### In the appendices:

- Periodic checks trained person
- Periodic check by maintenance expert
- Overview of automatic fire extinguishing system statistics
- Overview of periodic checks and preventive maintenance
- Overview of real fire statistics
- Overview of nuisance fire alarms
- Overview of false fire alarms
- Overview of system availability
- Safety information sheet
- Technical data **FirePro®** units
- Certificate of delivery
- Installation drawings
- Schematic diagrams
- User instructions for BMC (fire detection and fire alarm control unit)
- Inspection reports

MSC 1/Circ. 1270, chapter 17

**WHERE THE AEROSOL GENERATORS ARE INSTALLED WITHIN THE PROTECTED SPACE, THE GENERATORS SHOULD BE EVENLY DISTRIBUTED THROUGHOUT THE SPACE AND MEET THE FOLLOWING PROVISIONS:**

(See above “Installation Guidelines” drawings)

- A manually initiated power release, located outside the protected space, should be provided. Duplicate sources of power should be provided for this release and should be located outside the protected space and be immediately available.
- MSC 1/Circ. 1270, chapter 17.1
- Electric power circuits connecting the generators should be monitored for fault condition and loss of power. Visual and audible alarms should be provided to indicate this.
- MSC 1/Circ. 1270, chapter 17.2

Electric power circuits connecting the generators should be duplicated and widely separated. Visual and audible alarms should be provided to indicate this.

MSC 1/Circ. 1270, chapter 17.3

Within the protected space, electrical circuits essential for the release of the system should be fire resistant according to standard IEC 60331 or equivalent standards.

MSC 1/Circ. 1270, chapter 17.4

The arrangement of generators and the electrical circuits essential for the release of any system should be such that in the event of damage to any one power release line or generator through mechanical damage, fire or explosion in a protected space, i.e. a single fault concept, at least the amount of agent needed to achieve the test density can still be discharged having regard to the requirement for uniform distribution of medium throughout the space.

MSC 1/Circ. 1270, chapter 17.6

**The installer shall comply with all the requirements of chapter 17.**

**The actuation system supplied shall comply with all the requirements of chapter 17.**

MSC 1/Circ. 1270, chapter 22

**The casing temperature of condensed aerosol generators should be measured in accordance with Appendix 1. This data should be used to establish the minimum safe distances away from the generator where the discharge temperatures do not exceed 75°C and 200°C.**

Temperature casings: the temperature values of the generators housing is indicated for each model in Table T1.

**Table 1: Average Generator Housing Temperatures**

<b>FIREPRO GENERATOR HOUSING TEMPERATURE</b>			
<b>MODEL</b>	<b>Average Housing Temp. °C</b>	<b>L2 (m)</b>	<b>L3 (m)</b>
FP20S	155	0.00	0.00
FP 40S	172	0.00	0.00
FP 80S	188	0.00	0.00
FP100S	220	0.01	0.10
FP 200S	276	0.03	0.30
FP 500S	290	0.05	0.50
FP1200	168	0.00	0.30
FP 2000	172	0.00	0.30
FP 3000	237	0.05	0.50
FP 5700	245	0.05	0.50

Measurements were taken approx. 3 minutes after discharge of the generator.

L2= distance in metres away from the generator where the temp. does not exceed 200 °C.

L3 = distance in metres away from the generator where the temp. does not exceed 75 °C.

MSC 1/Circ. 1270, chapter 3.4.2

## **DESIGN CALCULATION.**

### **AGENT**

Design application density

Quantity of aerosol agent.

The quantity of aerosol agent to be used should be determined as follows:

$$W = \frac{V \times q \text{ (g)}}{f}$$

where

W = agent mass (g)

V = Volume of enclosure (m<sup>3</sup>)

q = Design application density (gr/m<sup>3</sup>)

f = Efficiency coefficient of generator's model (%)

q = 113 gr/m<sup>3</sup> (tests 1,2 and 3, flammable liquid fuels)

q = 149 gr/m<sup>3</sup> (wood crib fuel)

Efficiency coefficients:

FP-20S = 65%

FP-500S = 91%

FP-40S = 78%

FP-1200 = 63%

FP-80S = 74%

FP-2000 = 64%

FP-100S = 64%

FP-3000 = 63%

FP-200S = 63%

FP-5700 = 61%

MSC 1/Circ. 1270, chapter 11.

The quantity of extinguishing agent for the protected space should be calculated at the minimum expected ambient temperature using the design density based on the net volume of the protected space, including the casing.

MSC 1/Circ. 1270, chapter 11.1.

The net volume of a protected space is that part of the gross volume of the space, which is accessible to the fire-extinguishing agent.

MSC 1/Circ. 1270, chapter 11.2.

When calculating the net volume of a protected space, the net volume should include the volume of the bilge, the volume of the casing and the volume of free air contained in air receivers that in the event of a fire may be released into the protected space.

MSC 1/Circ. 1270, chapter 11.3.

The objects that occupy volume in the protected space should be subtracted from the gross volume of the space. They include, but are not necessarily limited to:

- .1 auxiliary machinery
- .2 boilers
- .3 condensers
- .4 evaporators
- .5 main engines
- .6 reduction gears
- .7 tanks
- .8 trunks

MSC 1/Circ. 1270, chapter 11.3.

Subsequent modifications to the protected space that alter the net volume of the space should require the quantity of extinguishing agent to be adjusted to meet the requirements of this paragraph and paragraphs 10.1, 10.2, 10.3, 10.4, 12.2, 12.3, 12.4 and 12.5.