

Aerosol System





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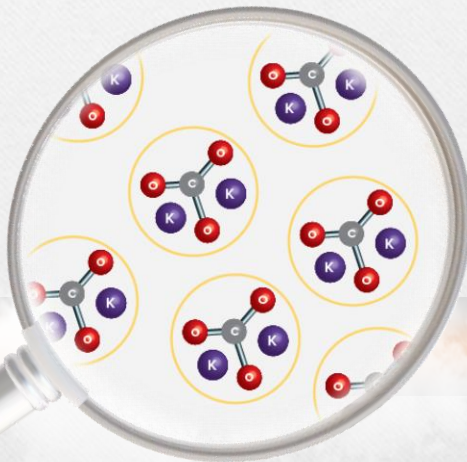
1

Introduction

What is Aerosol?

Definition:

- **Aerosol:** A colloidal suspension of particles dispersed in air or gas(es)
- **Colloids:** Particles with diameter of a few microns – nanometers



- **Aerosol systems**

- use the latest generation of our patented FPC solid compound that is the pinnacle of many years of research and development.
- When activated the **FPC** solid compound is transformed into a rapidly expanding extremely effective and efficient fire extinguishing condensed aerosol.
- The aerosol is propagated and evenly distributed in the enclosure under protection using the momentum generated during the transformation process.
- Unlike gaseous agents, the total flooding effect is achieved without increasing the pressure in the protected area/volume.

- **Goal**: Finding a Solution based on the following specification:

- No O₂ Suppression
- Environmental Friendly
- No pressure storage
- Fast extinguishing
- No pressure built up



- The FPC solid compound, developed after many years of Research & Development, utilizes environmentally friendly, naturally occurring Potassium salts with no pyrotechnic materials involved. Our dedication to sustainability is attested by the number and quality of EU and International Certificates, Listings and Approvals attained.



Aerosol according to firepro Brand



Reinventing
Fire Suppression

Advantages of Aerosol

Advantages of Aerosol



Certified 15-year Product Life



CFC-free



ODS Listed Alternative



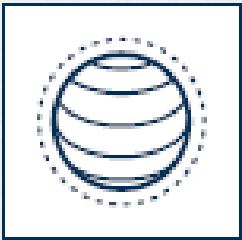
Non-Pressurized



HFC-free



Zero Ozone Depletion Potential



Zero Global Warming Potential

Health Safety and Environment

- Ozone Depletion Potential (ODP): **Zero** (EPA-SNAP Listed)
- Global Warming Potential (GWP): **Zero**
- Atmospheric Lifetime (ATL): **Negligible**
- Oxygen Depletion substances (ODS): **None**
- **Safety for humans:**

Approved by EPA for occupied spaces
safe for humans

Tested by KEMA and found

Solid Aerosol Forming Compound (FPC)

- Compact - strong solid
- Certified Lifetime – 15 years
- Transformed into Aerosol upon activation (electrical or thermal)
- Exothermic transformation process
- Self-activation Temperature + 300 °C





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General Operation

General Operation

Characteristics

- Extinguishing time < 30 Seconds
- Nb external flames or sparks
- Nb pressurized Cylinder
- Easy installation in new and/or retrofit projects



Features:

- Very Quick Suppression and extinguishing
- SNAP Listed, NO ODP and GWP
- Life Time 15 Years
- Small Foot Print



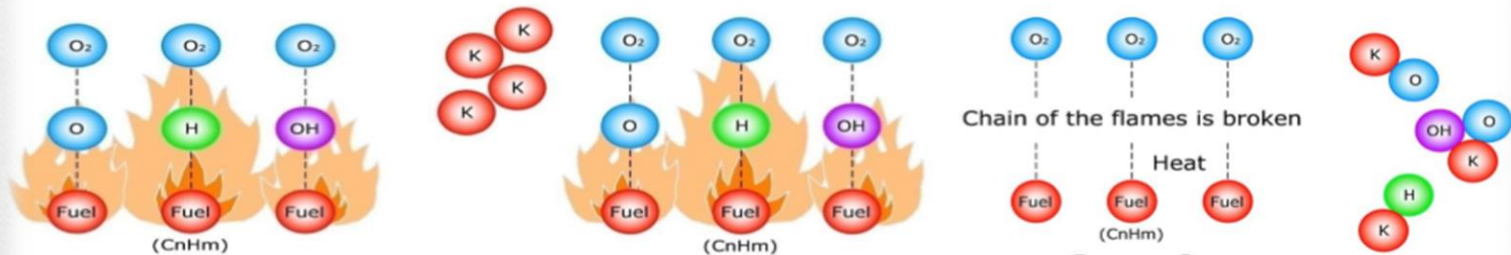


3

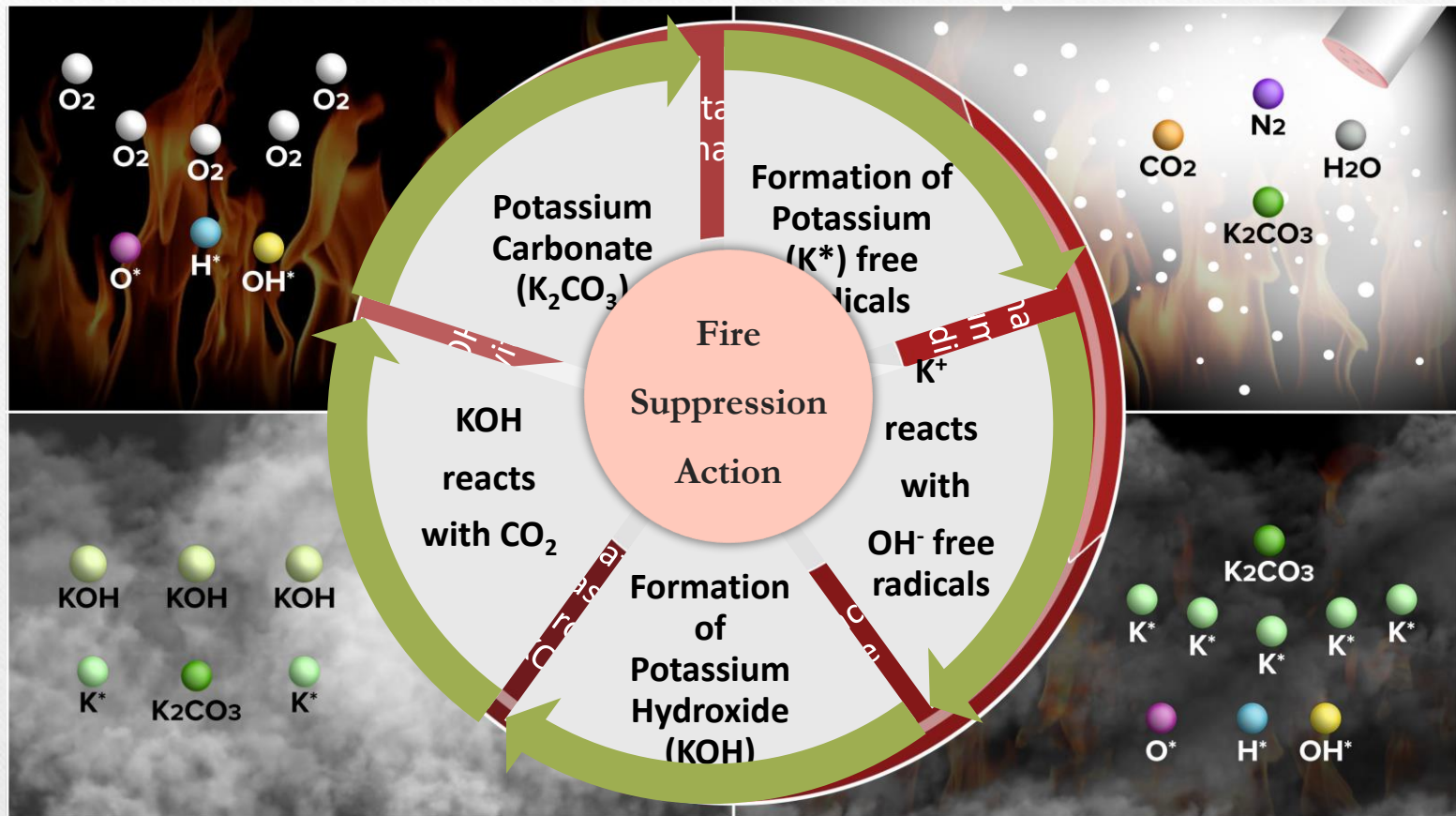
How Aerosol Works

How Aerosol Works

- The solid particles of Potassium salts, which are of a few microns in size, are suspended in an inert gas that displays an extremely high surface to reaction mass ratio - a fact that increases efficiency - which results in less quantities of fire extinguishing agent required.
- When the condensed aerosol reaches and reacts with the flame, Potassium radicals (K^*) are formed mainly from the disassociation of K_2CO_3 . The K^* s bind to other flame free radicals (hydroxyls - OH^-) forming stable products such as KOH . This action extinguishes fire without depleting the ambient oxygen content. KOH reacts further in the presence of CO_2 and forms K_2CO_3 .



Fire Suppression Action



How Aerosol Works

- In a typical fire, there is intensive inter-reaction between atoms and fragments of unstable free radicals in the presence of oxygen. This continues until the burning fuel is depleted. FirePro extinguishes fire predominantly by inhibiting on a molecular level the chemical chain reactions present in combustion.
- On activation of the FirePro unit, the FPC compound within is transformed into a rapidly expanding fire extinguishing condensed aerosol consisting mainly of Potassium salt-based K_2CO_3 , H_2O (vapor), N_2 and CO_2 .
- The gas-type, 3-D, properties of the condensed aerosol facilitate its even and fast distribution in the protected volume as well as its flow into the natural convection currents of combustion.



the chemical formula

hydroxide

potassium

potassium salts



H + O₂

Potassium
hydroxide

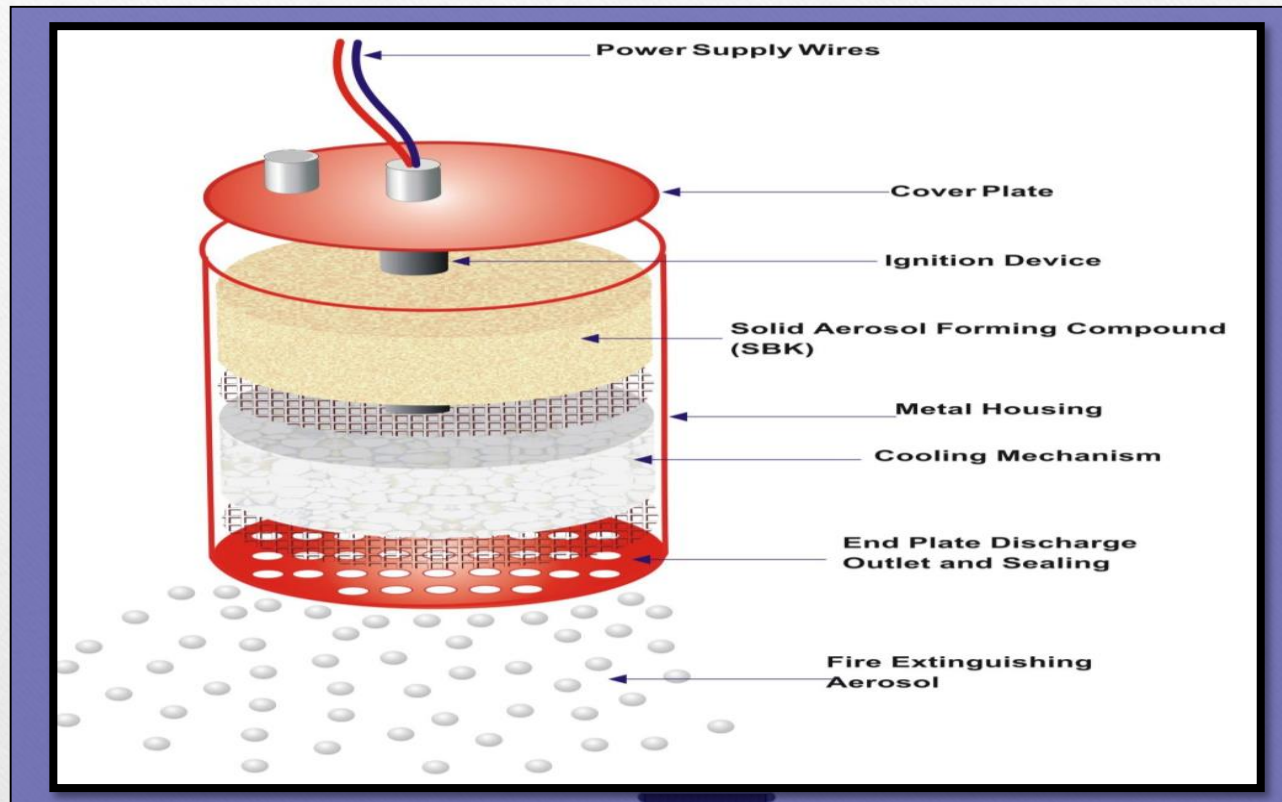
Carbon Dioxide

hydrogen gas

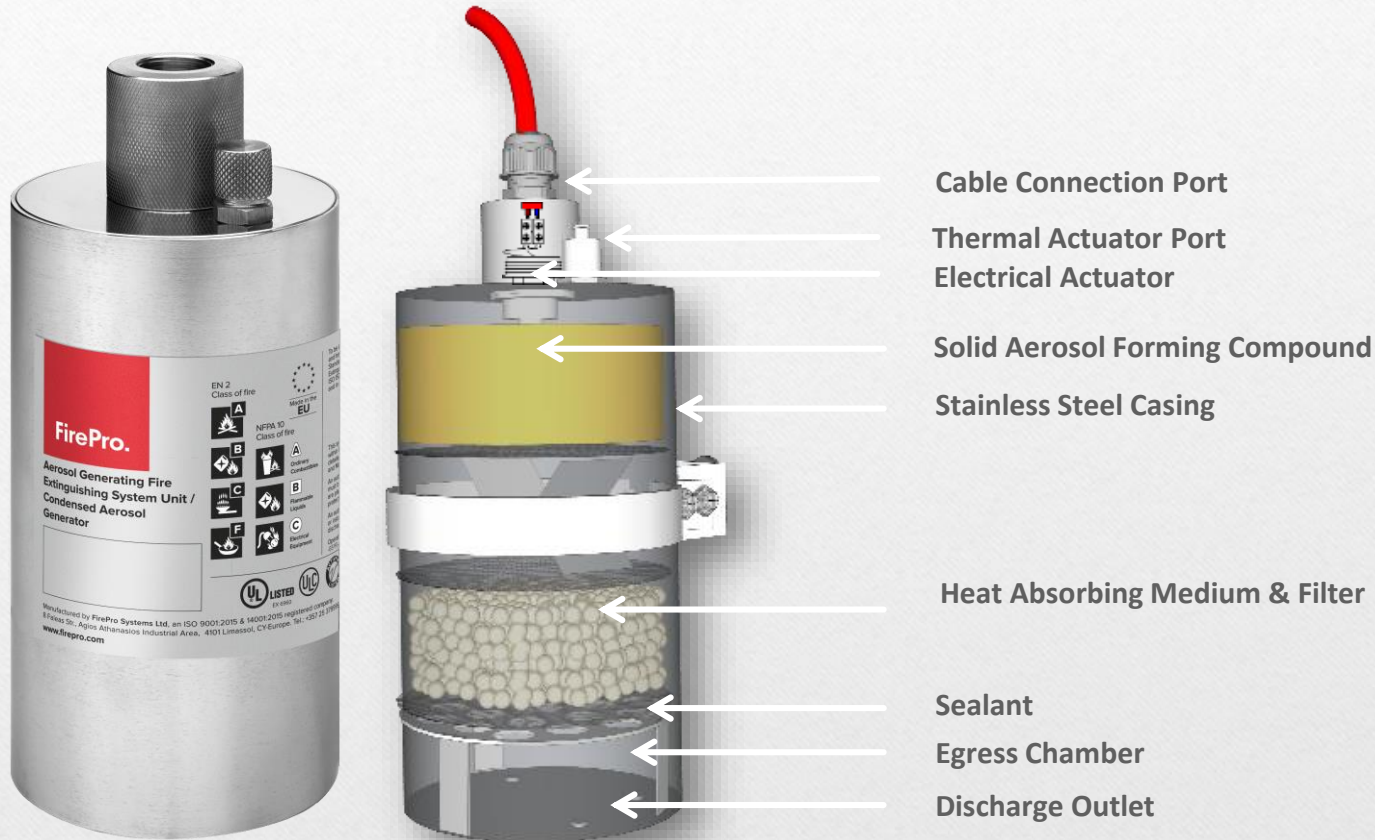
Theory of Aerosol

Theory of aerosol

- The solid particles of Potassium Carbonate (K_2CO_3) have a diameter of less than five microns and remain in suspension in the protected room/enclosure for at least 30 minutes, preventing further re-ignition of the fire.



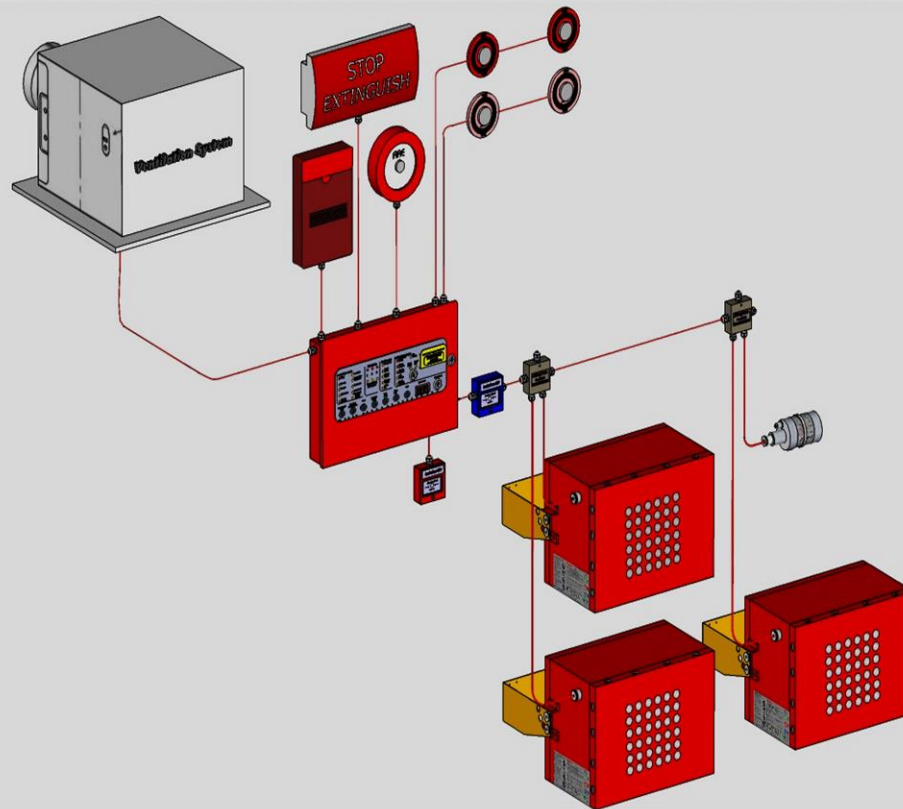
Condensed Aerosol Generator

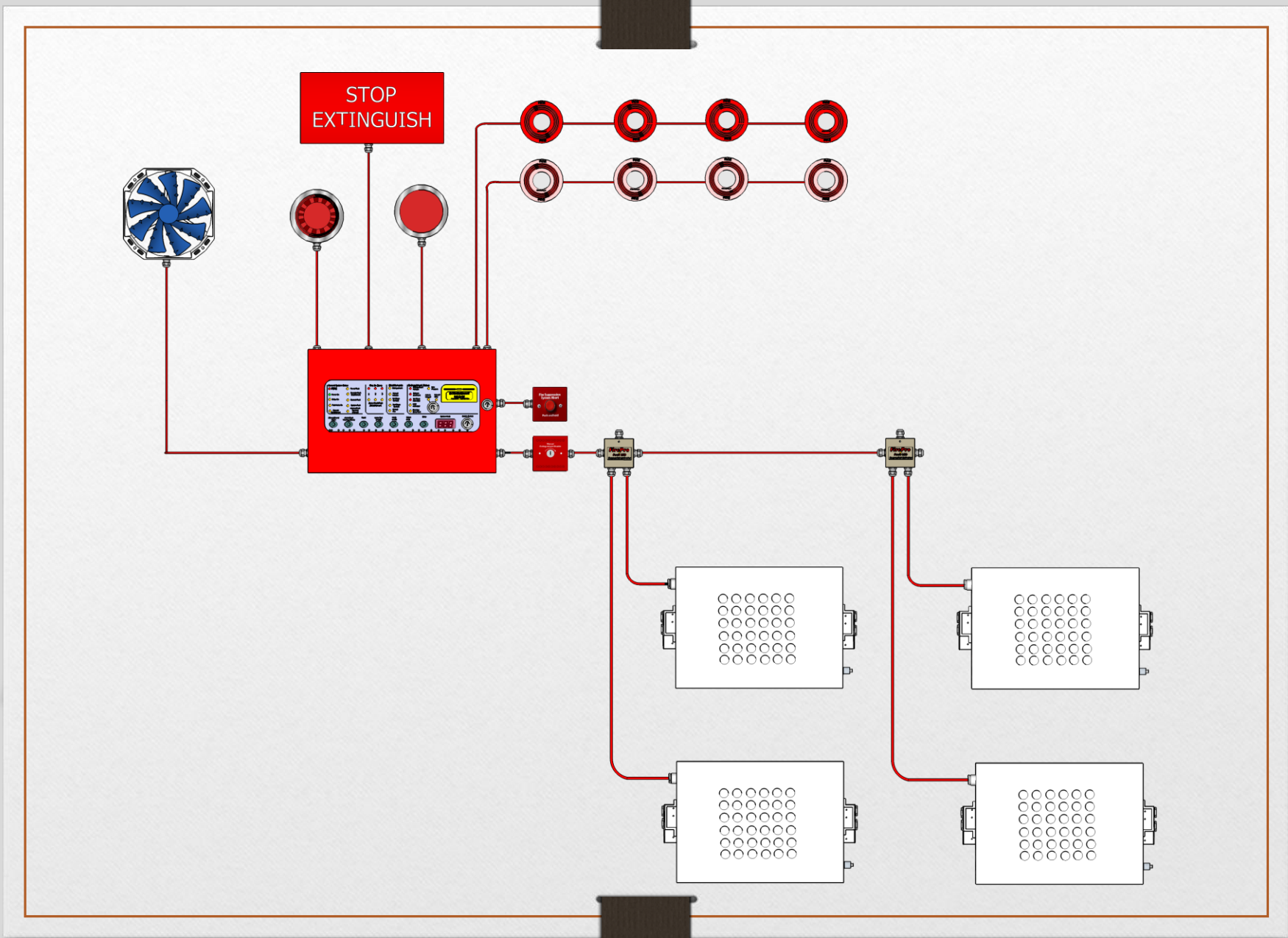


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System diagram & Operation

System diagram :

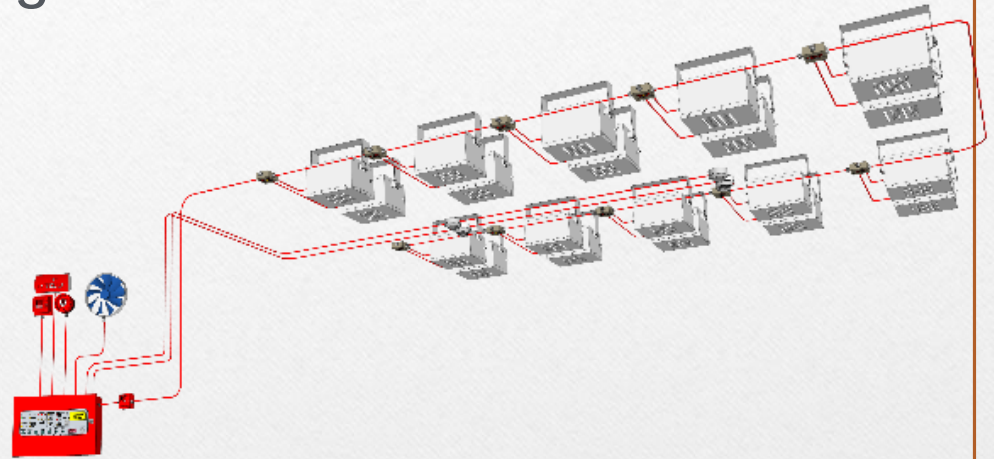




Technology Advantages

For the Designer

- Simple design
- Modular
- Can protect enclosures of any size



For the End User

- No space for agent storage needed
- Non-pressurized
- 15 years lifetime
- Safe for Humans & Environment
- Easy and cost effective maintenance

For the Installer

- No door-fan / integrity tests
- Easy & Quick installation
- No Piping

Range Of Units





FP1200

Gross Weight (g): 10900

Mass of FPC Compound (g): 1200

Dimensions (mm): 216X300X167



FP2000

Gross Weight (g): 15500

Mass of FPC Compound (g): 2000

Dimensions (mm): 300X300X185



FP3000

Gross Weight (g): 16300

Mass of FPC Compound (g): 3000

Dimensions (mm): 300X300X185



FP4200

Gross Weight (g): 25000

Mass of FPC Compound (g): 4200

Dimensions (mm): 300X300X300

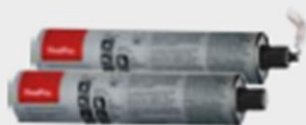


FP5700

Gross Weight (g): 26400

Mass of FPC Compound (g): 5700

Dimensions (mm): 300X300X300



FP20

Gross Weight (g): 310

Mass of FPC Compound (g): 20

Dimensions (mm):

Height: 165 / Ø: 32



FP40

Gross Weight (g): 610

Mass of FPC Compound (g): 40

Dimensions (mm):

Height: 140 / Ø: 51



FP80

Gross Weight (g): 870

Mass of FPC Compound (g): 80

Dimensions (mm):

Height: 185 / Ø: 51



FP100

Gross Weight (g): 1370

Mass of FPC Compound (g): 100

Dimensions (mm):

Height: 155 / Ø: 84



FP200

Gross Weight (g): 1630

Mass of FPC Compound (g): 200

Dimensions (mm):

Height: 185 / Ø: 84



FP500

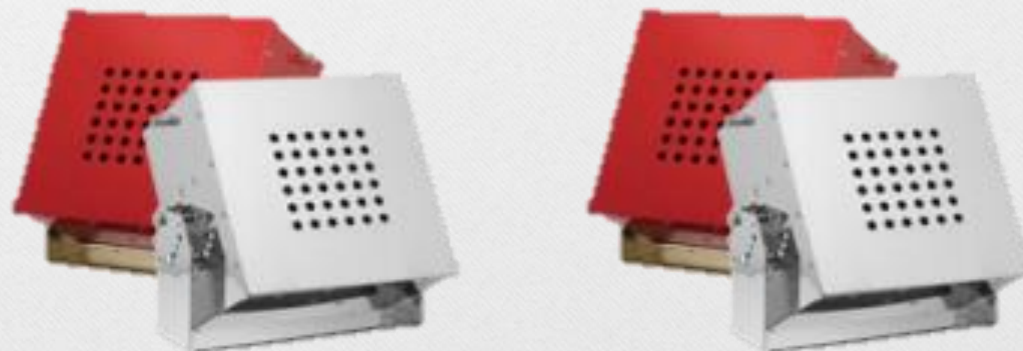
Gross Weight (g): 2850

Mass of FPC Compound (g): 500

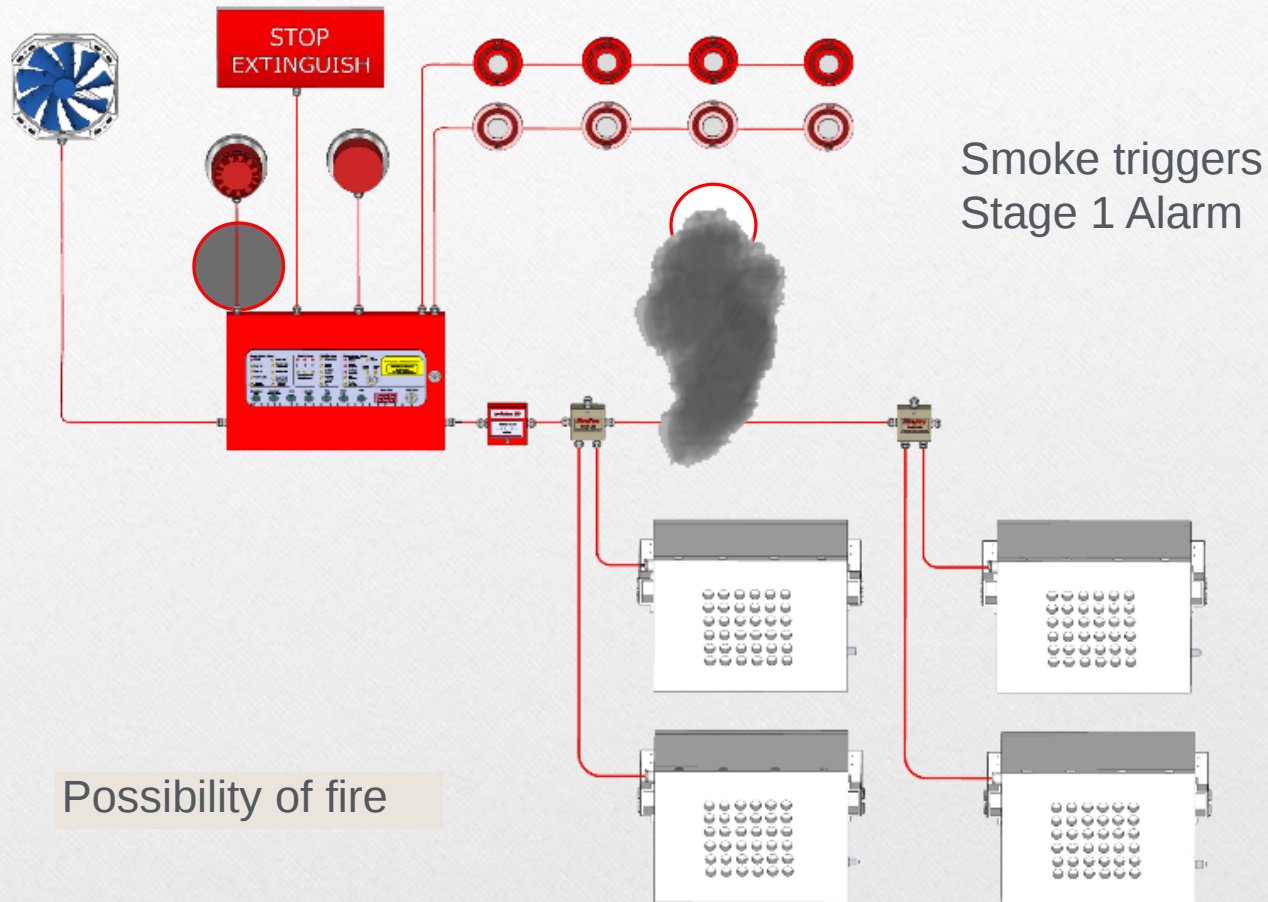
Dimensions (mm):

Height: 295 / Ø: 84

Rooms system

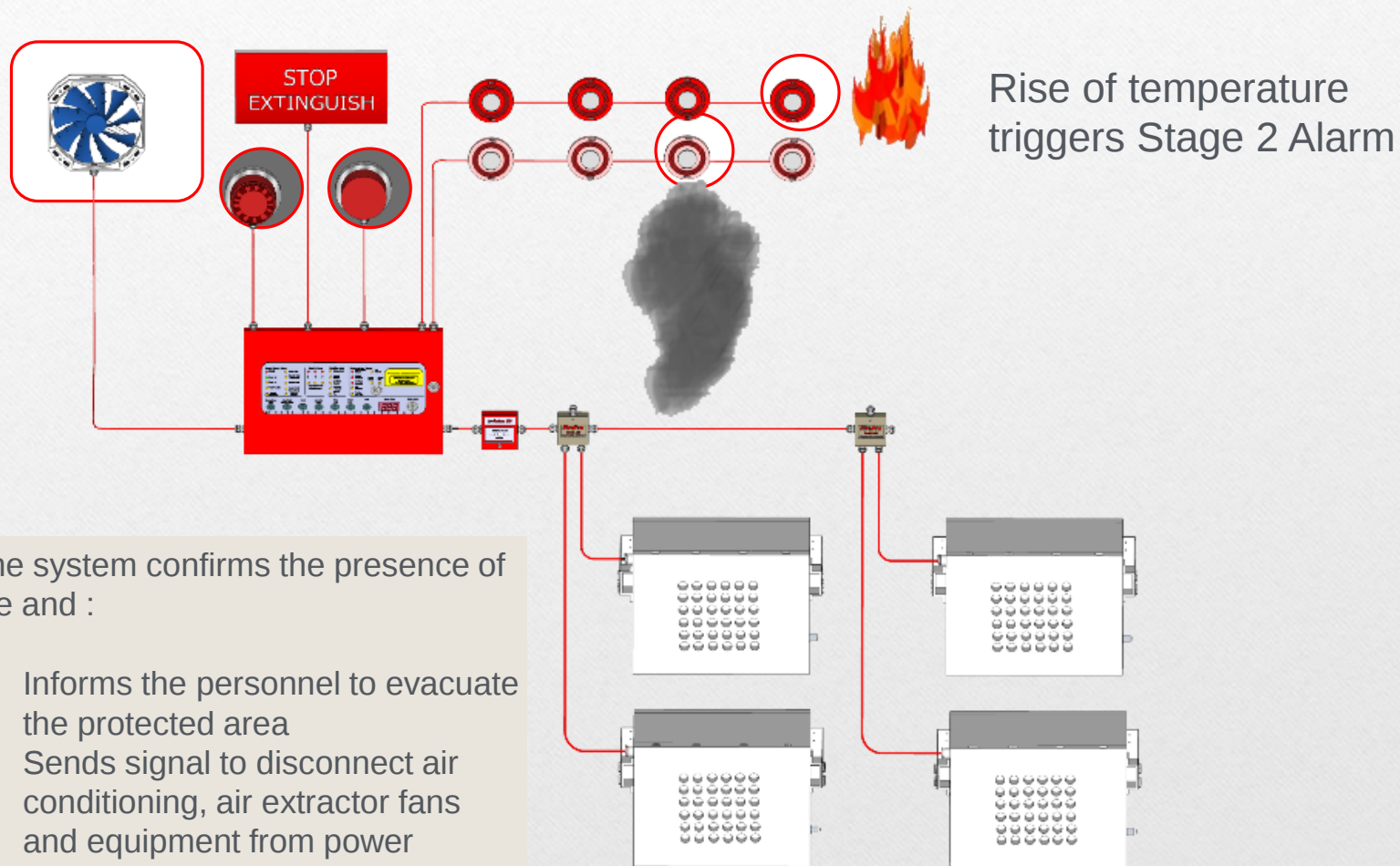


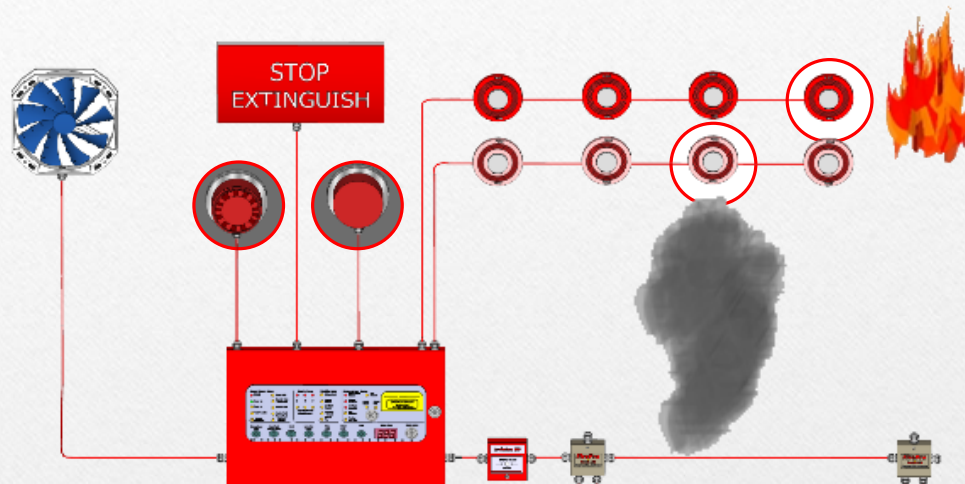




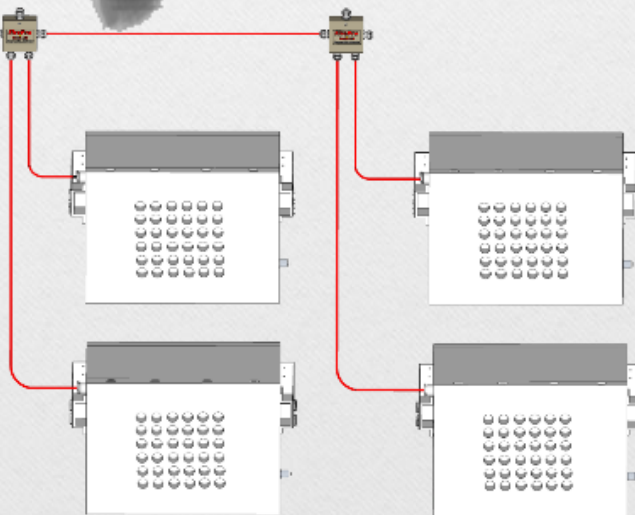
Smoke triggers
Stage 1 Alarm

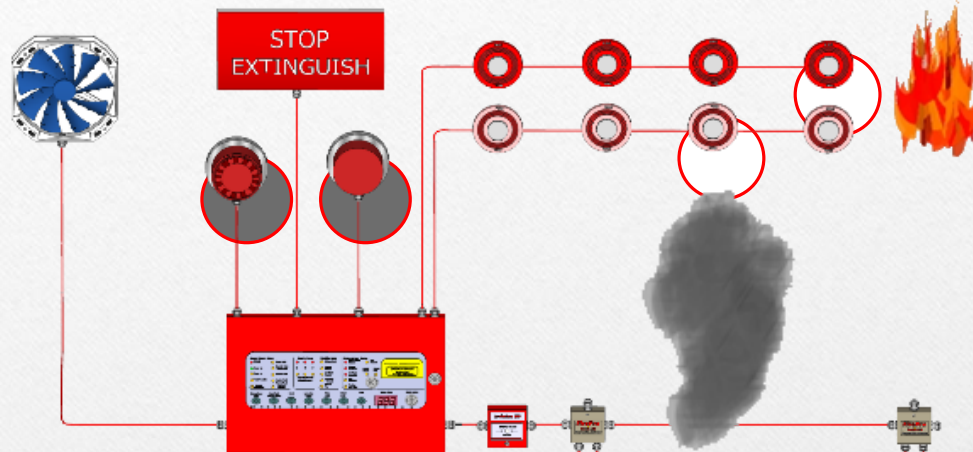
Possibility of fire



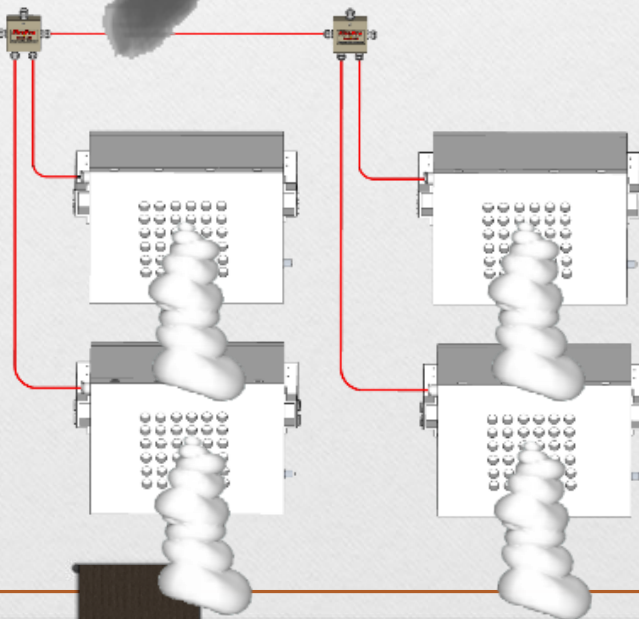


Activation
of time count-down





The FirePro generators activate after the time delay elapses

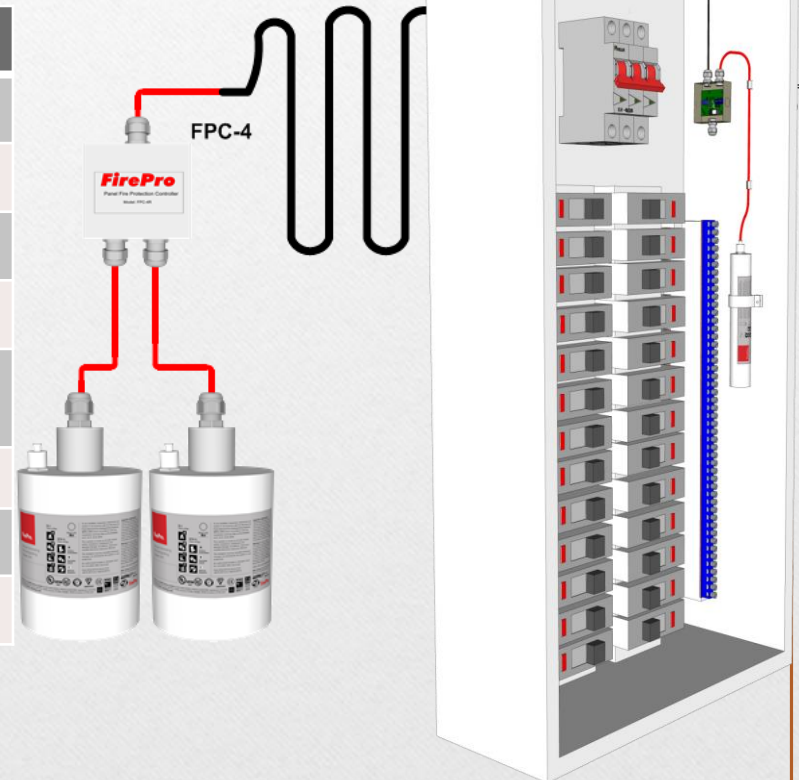


Panels system



FPC-4R In-Cabinet Protection

Model	FPC-4R
Battery	3V (internal) or 24V (external)
Detection	LHD
Installed	Internal or External
Monitoring	NO
Output Signals	YES (2)
No. of Generators	2 maximum
Re-usability	YES (if external)
Listings	None



Modular Controllers: FPC-4R

Model	FPC-4R(M)
Battery	3V (internal) or 24V (external)
Detection	LHD
Monitoring	NO
Output Signals	YES (2)
No. of Generators	2 maximum

Where it can be used?

- Electrical panels
- Engine bays

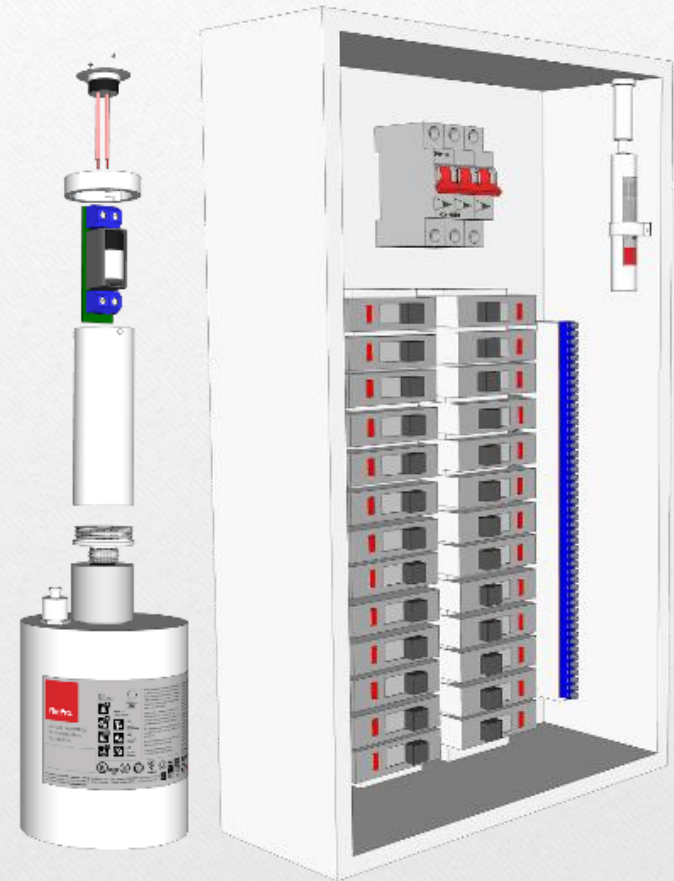


The diagram illustrates a FirePro system architecture. At the top, three **FPC-4R** units are shown, each connected to two **FirePro Generators** via red cables. Below the FPC-4R units, three **Adtran IO Modules** are connected to the FPC-4R units via red cables. Each Adtran IO Module is connected to a **Site Controller** via a blue cable labeled **Remote Alarm**. The Site Controllers are shown as racks containing various electronic components. A detailed view of the **Adtran IO Module** is shown on the left, highlighting its various ports and indicators.

FirePro Generators

FPC-5 In-Cabinet Protection

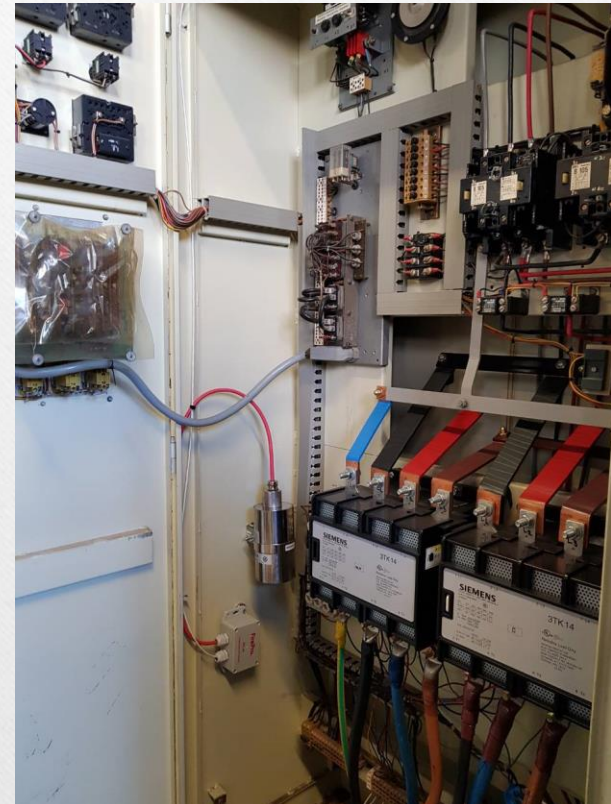
Model	FPC-5
Battery	3V (internal)
Detection	LHD or Bi-metallic (70, 80, 90 or 100 C)
Installed	On generator
Monitoring	NO
Output Signals	NO
No. of Generators	1 for each
Re-usability	Change upon discharge



Where it can be used?

- Any enclosure to be protected only by 1 generator

Electrical Cabinet Protection





Approvals

Approvals



Organization

UL - Underwriters
Laboratories

Certification Protocol

UL 2775 – Fixed
Condensed Aerosol
Extinguishing Units

Reference

FWSA.EX6960



Organization

ULC - Underwriters
Laboratories
of Canada

Certification Protocol

ULC/ORD-C2775-12
Fixed Condensed
Aerosol Extinguishing
Units

Reference

FWSAC.EX6960



Organization

LPCB – Loss
Prevention
Certification Board UK

Certification Protocol

LPS 1656 : Issue 1.0
Requirements and
test methods for the
LPCB approval of
Condensed Aerosol
Extinguishing
Generators

Reference

1417 – Red Book
Listing



Organization

BSI - British
Standards
Institution

Certification Protocol

BRL-K23001/04
Aerosol Generating
Fire Extinguishing
System Units

Reference

Kitemark License
Number KM
547633



Organization

KIWA NV

Certification Protocol

BRL-K23001/04
Aerosol Generating
Fire Extinguishing
System Units

Reference

Product Certificate
K21774/16

UL & ULC Listed



FWSAC.EX6960 Aerosol Generating Fire Extinguishing Units

CERTIFICATE OF COMPLIANCE

Certificate Number: 20160920-EX6960
Report Reference: EX6960-20110729
Issue Date: 2016-SEPTEMBER-20

Issued to: FIREPRO SYSTEMS LTD
6, KOUMANDARIAS STREET
& SPYROU ARAOUZOU
TONIA COURT NO. 2, 1ST FLOOR 3036
34080 LIMASSOL, CYPRUS

This is to certify that
representative samples of

Fixed Condensed Aerosol Extinguishing System Units
Pre-Engineered, FirePro Aerosol Generating Fire Extinguishing
System Units, Models FP-205E, FP-20T, FP-40S, FP-40T, FP-
80S, FP-80T, FP-100S, FP-200S, FP-500S, FP-1200, FP-1200S,
FP-1200T, FP-1200TS, FP-2000, FP-2000S, FP-2000T, FP-
2000TS, FP-3000, FP-3000S, FP-3000T, FP-3000TS, FP-4200T,
FP-4200TS, FP-5700, FP-5700S, FP-5700T, and FP-5700TS
with 20, 40, 80, 100, 200, 500, 1200, 2000, 3000, 4200, and
5700 grams respectively. The units have operating temperatures
of -55°F (-54°C) to 130°F (54°C). The units are designed for
total flooding protection against Class A, ordinary combustibles,
Class B flammable liquid fires, with or without Class C
involvement, occurring within an enclosure.

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 2775, Fixed Condensed Aerosol Extinguishing System Units
Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's
Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

Signature

UL Online Certifications Directory

UL 2775

Any information and documentation regarding this certificate are provided to the extent of UL's records. Please
contact UL at Customer Service Department at ULCustomerService@ul.com

Page 1 of 3



10010216

FWSAC.EX6960 - Aerosol-Generating Fire Extinguishing System Units



ONLINE DIRECTORIES

FWSAC.EX6960
Aerosol-Generating Fire Extinguishing System Units

Page Bottom

Aerosol-Generating Fire Extinguishing System Units

See General Information for Aerosol-Generating Fire Extinguishing System Units

FIREPRO SYSTEMS LTD

6, Koumandarias Street
& Spyrou Arouzou
Tonia Court No. 2, 1st Floor 3036
34080 Limassol, Cyprus

EX6960

Description	Part No.
Aerosol-generating extinguishing system unit	
FirePro condensed aerosol generator	FP-205E
FirePro condensed aerosol generator	FP-20T
FirePro condensed aerosol generator	FP-40S
FirePro condensed aerosol generator	FP-40T
FirePro condensed aerosol generator	FP-80S
FirePro condensed aerosol generator	FP-80T
FirePro condensed aerosol generator	FP-100S
FirePro condensed aerosol generator	FP-200S
FirePro condensed aerosol generator	FP-500S
FirePro condensed aerosol generator	FP-1200
FirePro condensed aerosol generator	FP-1200S
FirePro condensed aerosol generator	FP-1200T
FirePro condensed aerosol generator	FP-1200TS
FirePro condensed aerosol generator	FP-2000
FirePro condensed aerosol generator	FP-2000S
FirePro condensed aerosol generator	FP-2000T
FirePro condensed aerosol generator	FP-2000TS
FirePro condensed aerosol generator	FP-3000
FirePro condensed aerosol generator	FP-3000S
FirePro condensed aerosol generator	FP-3000T
FirePro condensed aerosol generator	FP-3000TS
FirePro condensed aerosol generator	FP-4200T
FirePro condensed aerosol generator	FP-4200TS
FirePro condensed aerosol generator	FP-5700
FirePro condensed aerosol generator	FP-5700S
FirePro condensed aerosol generator	FP-5700T
FirePro condensed aerosol generator	FP-5700TS
Mounting bracket, 20 g	C205S
Mounting brackets, 40, 80 g	C400S(S)/C400S(S)2/ C4-55S
Mounting brackets, 100, 200, 500 g	C1-2-5AS(S)/C1-2-5S(S)/ C1-2-5S(S)/ C1-2-5S(S)/C1-2-5S
Mounting brackets, 1200, 2000, 3000, 4200 g	S1200S(S)/S1200S(S)/S1200S(S)/S1200S(S)/S1200S(S)

<http://database.ul.com/cgi-bin/XYV/templateULDOC/ANAD/17/FAM/AN/coverage/ItemName=FWSAC.EX6960/construction=Aerosol-Generating/FireExtinguishing> 10

UL Online Certifications Directory

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To begin a search, please enter one or more search criteria in the parameters below.

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City

US State

US Zip Code

Country

Region

Canadian Province:

Postal Code (non-US)

UL Category Code [\(options\)](#)

UL File Number [\(help\)](#)

Keyword

TIPS FOR EFFECTIVE SEARCHES

Select a search method

- Match all words - type AND between words (i.e., display **and** nwgq)
- Match any word - type OR between words (i.e., hair dryer **or** blow dryer)
- Match phrase(s) - type exact phrase

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You can use the UL Online Certification Directory to:

- Verify a UL Listing, Classification, or Recognition
- Verify a UL Listed product use
- Verify a UL Recognized component use
- Verify a product safety standard

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Learn more with the [Quick Guide to the Online Certifications Directory](#)

SPECIFIC SEARCHES

FEATURED LINKS





LINKS OF INTEREST

[Enhanced UL Certification Mark](#)

UL Confirmation of Design Application Density

CERTIFICATE OF COMPLIANCE

Certificate Number 20160920-EX6960
Report Reference EX1690-20110729
Issue Date 2016-SEPTEMBER-20

Issued to: FIREPRO SYSTEMS LTD
8, KOUMANDARIAS STREET
& SYIROU ARAOZOU
TONA COURT NO. 2, 1ST FLOOR 3036
54010 LIMASSOL, CYPRUS

This is to certify that representative samples of Fixed Condensed Aerosol Extinguishing System Units PreEngineered, FirePro Aerosol Generating Fire Extinguishing System Units, Models FP-20SE, FP-20T, FP-40S, FP-40T, FP-80S, FP-80T, FP-100S, FP-200S, FP-500S, FP-1200, FP-1200S, FP- 200T, FP-1200TS, FP-2000, FP-2000S, FP-2000T, FP-2000TS, FP-3000, FP-3000S, FP-3000T, FP-3000TS, FP-4200T, FP-4200TS, FP-5700, FP-5700S, FP-5700T, and FP-5700TS with 20, 40, 60, 100, 200, 500, 1200, 2000, 3000, 4200, and 5700 grams respectively. The units have operating temperatures of -45(1F (-54(1C) to 130(1F (54(1C). The units are designed for total flooding protection against Class A, ordinary combustibles, Class B flammable liquid fires, with or without Class C involvement, occurring within an enclosure.

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate:

Standard(s) for Safety: UL 1775, Fixed Condensed Aerosol Extinguishing System Units
Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

Signature

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UL 1617

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the standard in safety

Underwriters
Laboratories

July 2, 2015

Mr. Ghigo Gianfilippi de Parenti
FirePro Systems
PO Box 54080,
Limassol, Cyprus - EU

Our Reference: File: EX6960

Subject: APPLICATION DENSITY OF AEROSOL SYSTEM

Dear Mr. Gianfilippi de Parenti :

This letter serves to provide verification that the FirePro aerosol generating system units discharge density, as tested, was 84 g/m³. The design density, including 30% safety factor, is 109.2 g/m³. The FirePro product manual, Version 1, Revision 3, dated June 2014, is part of the UL Listing and includes these specifications.

In no event shall UL be responsible to anyone for whatever use or non-use is made of the information contained in this Report and in no event shall UL, its employees or its agents incur any obligations or liabilities for damage, including, but not limited to, consequential damages arising out of or in connection with the use, or ability to use, the information contained in this Report. Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

If you have any questions, please do not hesitate to contact me.

Prepared by:

Signature

Eric Haberichter
Sr. Project Engineer
Fire Suppression
Tel: 269-426-2152
Eric.Haberichter@ul.com

Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook, IL 60062-2099 USA
T: 847.272.8800 / F: 847.272.6129 / W: ul.com

KEMA

[illegible]

LPCB Red Book Listing



Loss Prevention Standards

LPS 1656 : Issue 1.0 Requirements and test methods for the LPCB approval of Condensed Aerosol Extinguishing Generators

Assessment tests have been completed. LPCB Online Listing expected to be available by end of October.

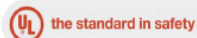
LPS 1656 - Red Book Listing

**INFO EGYPT-
FOR TRANSLATION**
37 KASR EL NIL, ST
Phone, 3931370 - 3924647
3921942- Fax, 3911581
Dr. NAHLA A. SOLIMAN

UL Certificate of 15 years lifetime

CERTIFICATE OF COMPLIANCE

Certificate Number 20150920-EX6960
Report Reference EX1990-20110729
Issue Date 2015-SEPTEMBER-20



Underwriters
Laboratories

Issued to: FIREPRO SYSTEMS LTD
6, KOUMANDARIAS STREET
& SPYROU ARAOZOU
TONIA COURT NO. 2, 1ST FLOOR 3036
54010 LIMASSOL, CYPRUS

July 2, 2015

Mr. Ghigo Gianfilippi de Parent
FirePro Systems
PO Box 54080,
Limassol, Cyprus - EU



Underwriters
Laboratories

This is to certify that
representative samples of

Fixed Condensed Aerosol Extinguish
PreEngineered, FirePro Aerosol Genen
System Units, Models FP-20SE, FP-201
80S FP-80T, FP-100S, FP-200S, FP-50
FP- 200T, FP-1200TS, FP-2000, FP-20
2000TS, FP-3000, FP-3000S, FP-3000T
FP-4200TS, FP-5700, FP-5700S, FP-57
with 20, 40, 60, 100, 200, 500, 1200, 20
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Our Reference: File: EX6960

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In no event shall UL be responsible to anyone for whatever use or non
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If you have any questions, please do not hesitate to contact me.

Prepared by:

Eric Haberichter
Sr. Project Engineer
Fire Suppression
Tel.: 252-455-2152
Eric.Haberichter@ul.com

December 5, 2016

FirePro Systems LTD
Ghigo Gianfilippi de Parent
6, Koumandarias Street & Spyrou Araouzou
Tonia Court No. 2, 1st Floor 3036
Limassol, Cyprus 54080

Our Reference: FILE EX6960, PROJECT 4787407118

Subject: STATUS UPDATE- LISTING INVESTIGATION FOR 15-YEAR LIFE OF
AEROSOL GENERATING FIRE EXTINGUISHING SYSTEM UNITS

Dear Ghigo:

This letter is to inform you that we have successfully completed UL Project 4787407118 to
conduct agent aging tests for 15-yr life. A copy of the data generated under this project has been
attached for your online records.

Also, all UL-Listed units previously manufactured under this file and volume also are certified for
the 15-yr product life, as no changes affecting the product life have been made.

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Should you have any questions or comments regarding this project, please contact me.

Prepared by:

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UL Sr. Project Engineer
Fire Suppression
Eric.Haberichter@ul.com

Standard(s) for Safety: UL :775, Fixed Condensed Aerosol Exli
Additional Information: See the UL Online Certifications Dire
www.ul.com/database for additional i

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UL 1517

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A graphic of a white certificate with a thin orange border, held by two black clips at the top and bottom. In the center is a bright green rounded rectangle with a subtle drop shadow, containing the text "EPA Certificate" in white.

EPA Certificate

FirePro (Powdered Aerosol E) approved by U.S. EPA SNAP for use in “Normally Occupied Areas”



Based on a review of additional information from the submitter to support the safe use of Powdered Aerosol E in normally occupied spaces, EPA now determines that Powdered Aerosol E is also acceptable for use in total flooding systems for normally occupied spaces, and EPA is adding Powdered Aerosol E to the list of acceptable substitutes for total flooding uses, which would include both unoccupied and occupied spaces.

<https://www.epa.gov/snap/substitutes-total-flooding-agents>

Powdered Aerosol E (Fire Pro)	0	0	September 27, 2006; October 4, 2018	Acceptable	Use of this agent should be in accordance with the safety guidelines in the latest edition of the NFPA 2010 standard for Aerosol Extinguishing Systems. For establishments manufacturing the agent or filling, installing, or servicing containers or systems to be used in total flooding applications, EPA recommends the following: adequate ventilation should be in place to reduce airborne exposure to constituents of agent; an eye wash fountain and quick drench facility should be close to the production area; training for safe handling procedures should be provided to all employees that would be likely to handle containers of the agent or extinguishing units filled with the agent; workers responsible for clean up should allow for maximum settling of all particulates before reentering area and wear appropriate protective equipment; and - all spills should be cleaned up immediately in accordance with good industrial hygiene practices. See additional comments 1, 2, 3, 4, 5.
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Normally occupied area determined by EPA

5.2.4.2* Normally Occupied Spaces. Aerosol extinguishing systems approved for normally occupied spaces shall be permitted in amounts where the aerosol particulate density does not exceed the level deemed acceptable by the U.S. EPA SNAP Program and where any aerosol agent produced does not exceed the excursion limit for the critical toxic effect.

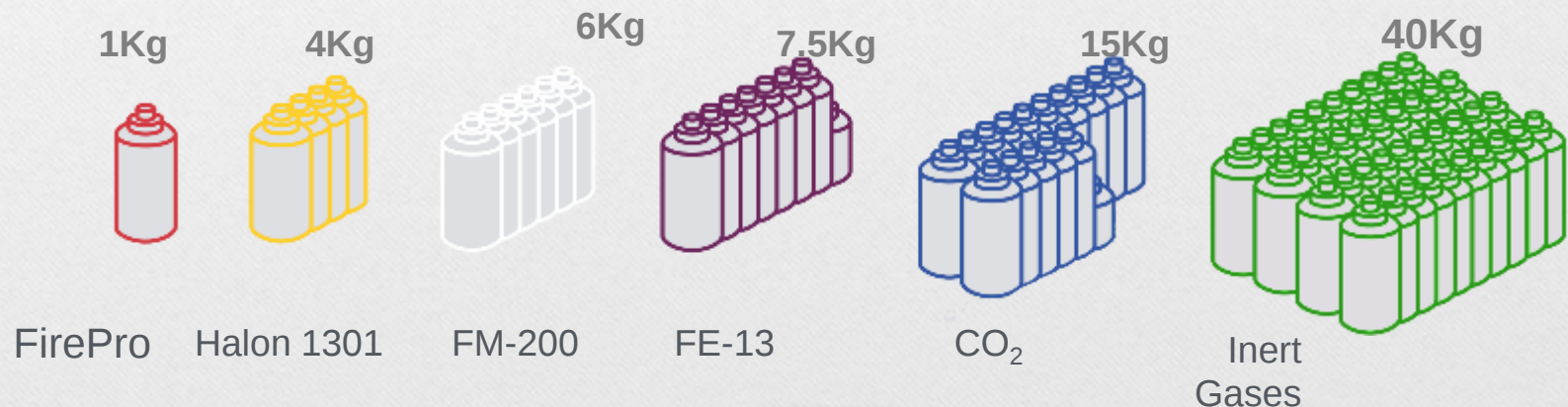
**EFFECTS AND COMPARISONS
WITH OTHERS**

	EFFECT ON HUMANS	EFFECT ON PROPERTY	EFFECT ON ENVIRONMENT
WATER	Not dangerous	Extensive damage	Harmful fumes
WATER & FOAM	In fixed systems protection for people is needed	Corrosive & harmful to electronics	Difficult residues & foam can be poisonous
CO ₂	Extremely dangerous	Condensation/ cooling is harmful to electronics	Negligible from fire fighting
INERT GASES	Displace O ₂ so may ↓ supply to brain	Not harmful	Natural gases so no threat
FM200	Safe in non pyrolyse state	Not harmful	harmful Banned
Aerosol	safe	Not harmful	Environment Friendly

- The FirePro fire extinguishing condensed aerosol technology is suitable for Fire Classes A, B, C & F (according to EN2 Classification) and A, B & C (according to NFPA10 Classification).

GENERAL Operation- Description

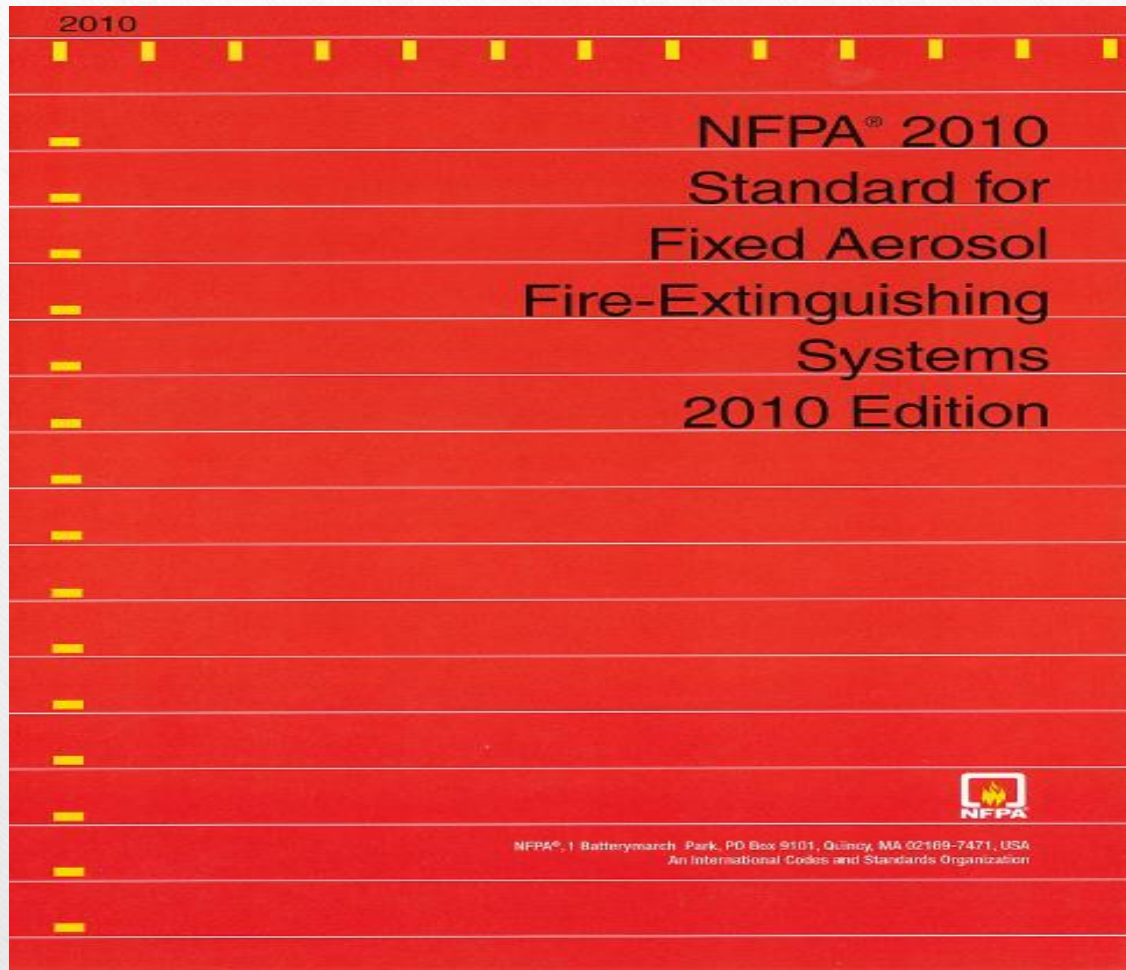
- Total Flooding
- Flows around obstacles (3-D extinguishing effect)
- Good Penetration
- Effective Volume / Weight Ratio





NFPA Reference

NFPA Reference



Normally Equation

7.5 Total Flooding Quantity.

7.5.1 Quantity Calculation. The mass of aerosol-forming compound required shall be calculated from the following formula

$$m = d_a \times f_a \times V \quad [7.5.1]$$

where:

m = total flooding quantity [g(lb)]

d_a = design application density [g/m³ (lb/ft³)]

f_a = additional design factors (see 7.5.2)

V = protected volume [m³ (ft³)]

NFPA 2010 Standard – Design Application Density

7.3.2.1.1 The minimum design application density for a Class B fuel hazard shall be the extinguishing application density, as determined in 7.3.2.1, multiplied by a safety factor of 1.3.

7.3.2.2 Class A Fuels. The extinguishing application density for Class A fuels shall be determined by test as part of a listing program.

7.3.2.2.1 The minimum design application density for a Class A surface fire hazard shall be the extinguishing application density, as determined in 7.3.2.2, multiplied by a safety factor of 1.3.

7.3.2.3 Class C Fuels. The minimum design application density for Class C hazards shall be at least that for the class of fire hazard being protected as defined in 3.3.7.1 and 3.3.7.2.

Normally occupied area brands

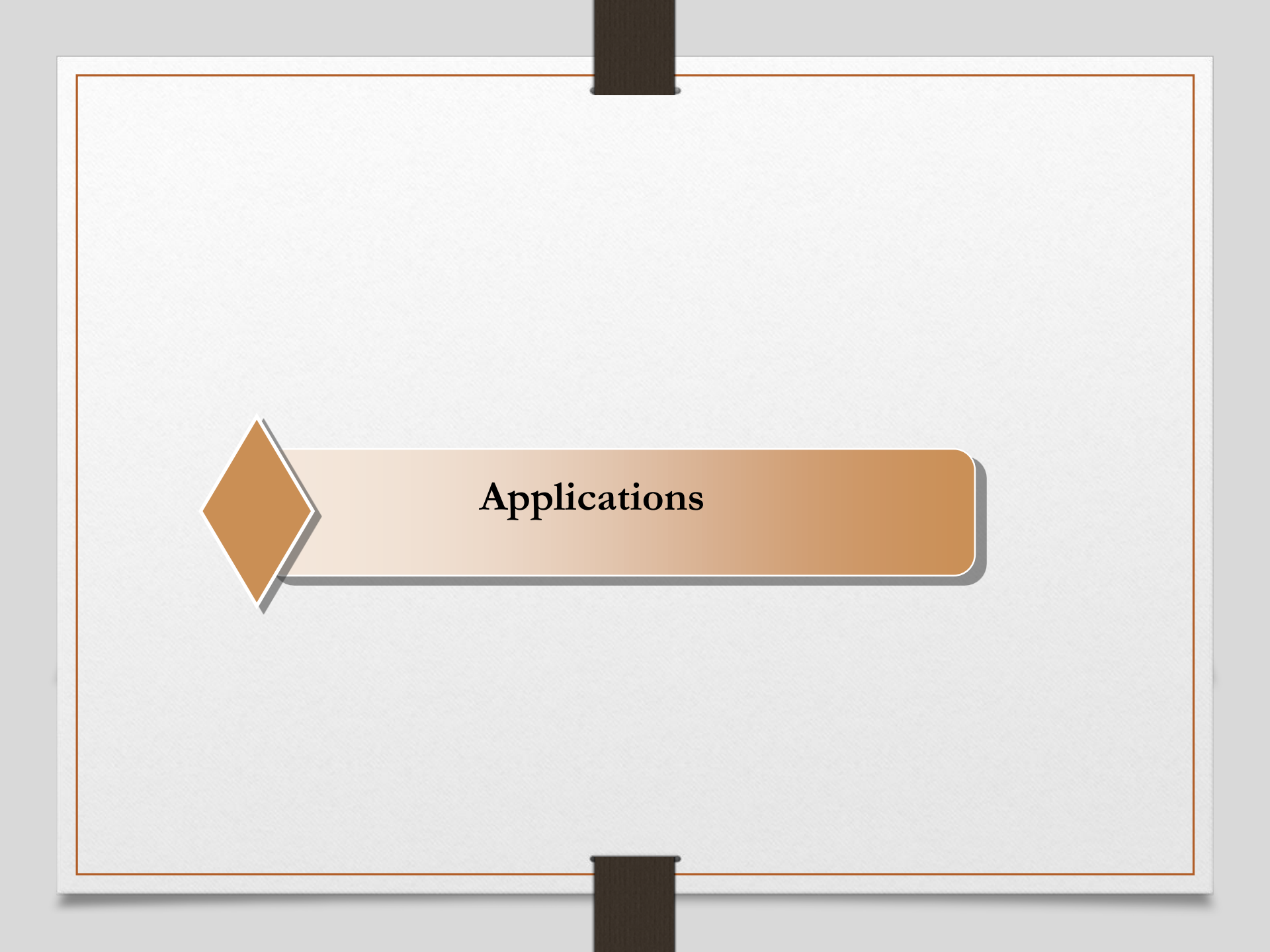
V **Table A.5.2.4 Typical Maximum Allowable Design Application Densities for Normally Occupied Spaces**

Aerosol Agent Designation	Maximum Allowable Design Application Density [g/m ³]
Inert gas/powdered aerosol blend	*
Powdered aerosol A	*
Powdered aerosol C	*
Powdered aerosol D	100
Powdered aerosol E	109.2
Powdered aerosol F	*
Powdered aerosol G	*

*A maximum allowable design application density for occupied spaces has not been determined. The aerosol agent is approved by the U.S. EPA SNAP Program for normally unoccupied areas only. If determined at a later date, a value could be added.

Normally occupied area determined by EPA

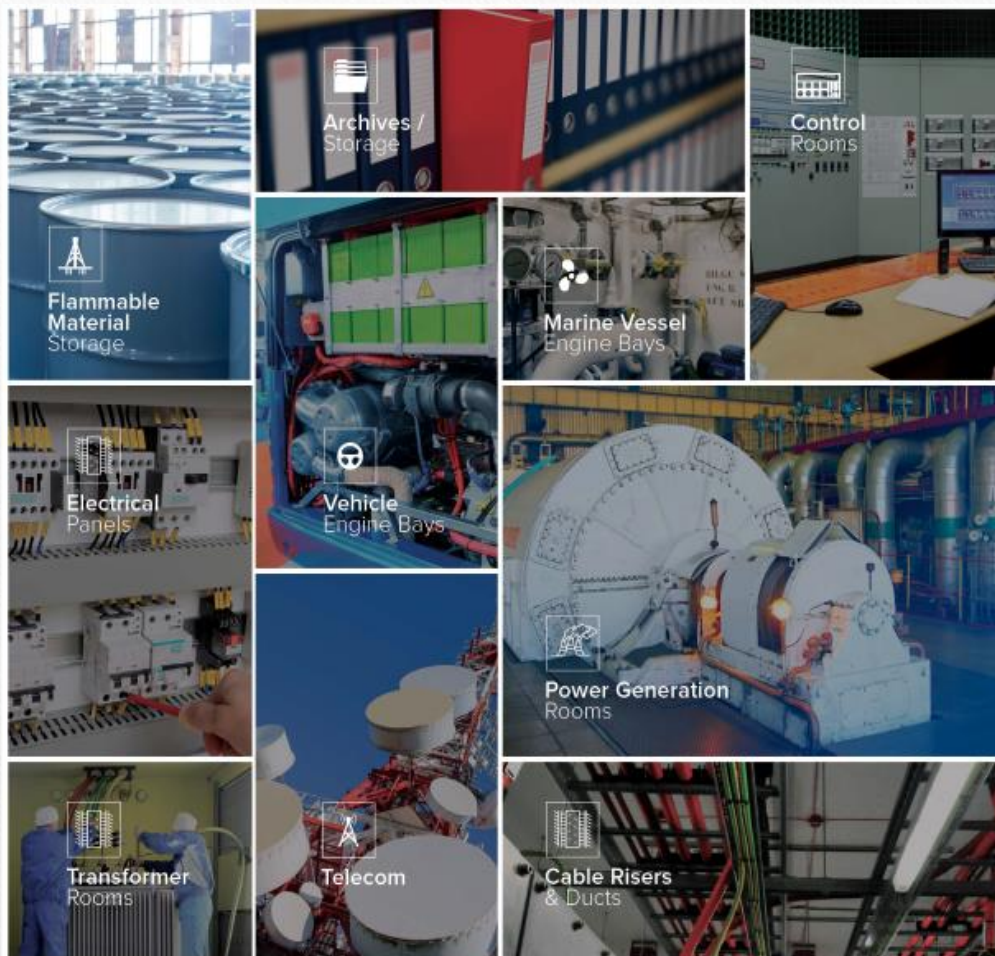
5.2.4.2* Normally Occupied Spaces. Aerosol extinguishing systems approved for normally occupied spaces shall be permitted in amounts where the aerosol particulate density does not exceed the level deemed acceptable by the U.S. EPA SNAP Program and where any aerosol agent produced does not exceed the excursion limit for the critical toxic effect.



Applications

Applications

- Archives
- Cable Tunnels
- False Ceilings
- Raised Floors
- Wind Turbines
- Inverters
- Power Packs
- Electrical Panels
- Main Distribution Boards
- Switchgear
- Power Factor Correction
- Control Rooms
- Electrical Rooms
- Transformer Rooms
- Telecom Shelters
- Diesel Generator Rooms
- Marine Engine Rooms
- Vehicle Engine Bays
- Heavy Vehicle Engines
- Railway Stations
- Rolling Stock
- Medical Equipment
- Processing Areas
- Pumps Rooms
- Boilers Rooms
- Chillers Rooms
- Burners Rooms
- Compressors Rooms
- Machine Tools
- Kitchen Hoods
- Bank Vaults
- Dangerous Goods
- First Responders
- Storage Areas
- Laboratory Rooms





Applicable Fire Classes

Applicable Fire Classes



US & European: Class A

Involve organic solid materials e.g. wood



US: Class B – European: Classes B and C

Flammable or combustible liquids or gaseous fuels



US: Class C – European: Class E

Energised electrical equipment e.g. short-circuiting machinery or overloaded electrical cables.

NFPA 2010 Standard – Classes of Fire

3.3.6 Classifications for Fires.

3.3.6.1 Class A Fires. Fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics. [10, 2013]

3.3.6.2 Class B Fires. Fires in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases. [10, 2013]

3.3.6.3 Class C Fires. Fires that involve energized electrical equipment. [10, 2013]



Aerosol calculation

Design Considerations

Classification of
Fire Risk

Volume & Height
of Protected Area

Arrangement &
Characteristics of
Room and equipment to b
e protected



Classes:
A, B, C,
Li-Ion Batteries



Select condensed aerosol
generators according to agent
capacity and stream length



Meet safety air
clearance criteria

Design Principle (NFPA 2010 - UL 2775)

Land Applications

$$M = V \times D \times S.F$$

M (g) = Mass of Aerosol forming compound

V (m³) = Protected Volume

D (g/m³) = Extinguishing Application Density (EAD)

SF = Safety Factor (30%)

Fire Class	<i>E.A.D UL (g/m³)</i>
A	84
B	84
C	84

Fire Class (NFPA)	Extinguishing Application Density (UL) (g/m ³)	Design Application Density (UL) (g/m ³)
A	84	109.2
B	84	109.2
C	84	109.2

7.5 Total Flooding Quantity.

7.5.1 Quantity Calculation. The mass of aerosol-forming compound required shall be calculated from the following formula:

$$m = d_a \times f_a \times V \quad [7.5.1]$$

where:

m = total flooding quantity [g(lb)]

d_a = design application density [g/m³ (lb/ft³)]

f_a = additional design factors (see 7.5.2)

V = protected volume [m³ (ft³)]



Case Study

Electrical Room

Dimension of room : -

$$22 * 12 * 4$$

$$1.056 * 109.2 = 115,315.2$$

$$115,315.2 / 4200 = 27.456 = 28 \text{ G}$$

Installer company

FirePro

Design Calculation Sheet

In accordance with UL Standards - UL Manual (Ex 6960, v.1, Rev.6, Nov.2016)

Spinning Factory

SELECT UNITS

VOLUME
(If not to be calculated)

ROOM NAME & No.

SPACE TYPE

ROOM SHAPE

SECTION DIMENSION m x m x m = VOLUME = m³

CLASS OF FIRE

STREAM REQUIRED

SAFETY FACTOR (SF)**

**FOR ADDITIONAL SAFETY REPLACE CURRENT SAFETY FACTOR AS APPLICABLE

TOTAL VOLUME THIS ROOM IN CUBIC METERS (m³) m³

m (g)	V (m ³)	d _a (g/m ³)	
Solid Mass of FirePro Compound (FPC) required (g)	Total Volume 1 = 1056,00 m ³ x	EAD 84 g/m ³ x	SF 1,3 = 115315,20 g

RECOMMENDED GENERATOR MODEL(S) SELECTION

Recommended Models by Stream Length:

FP-4200, FP-5700

Recommended Models by Volume:

FP-2000, FP-3000, FP-4200, FP-5700

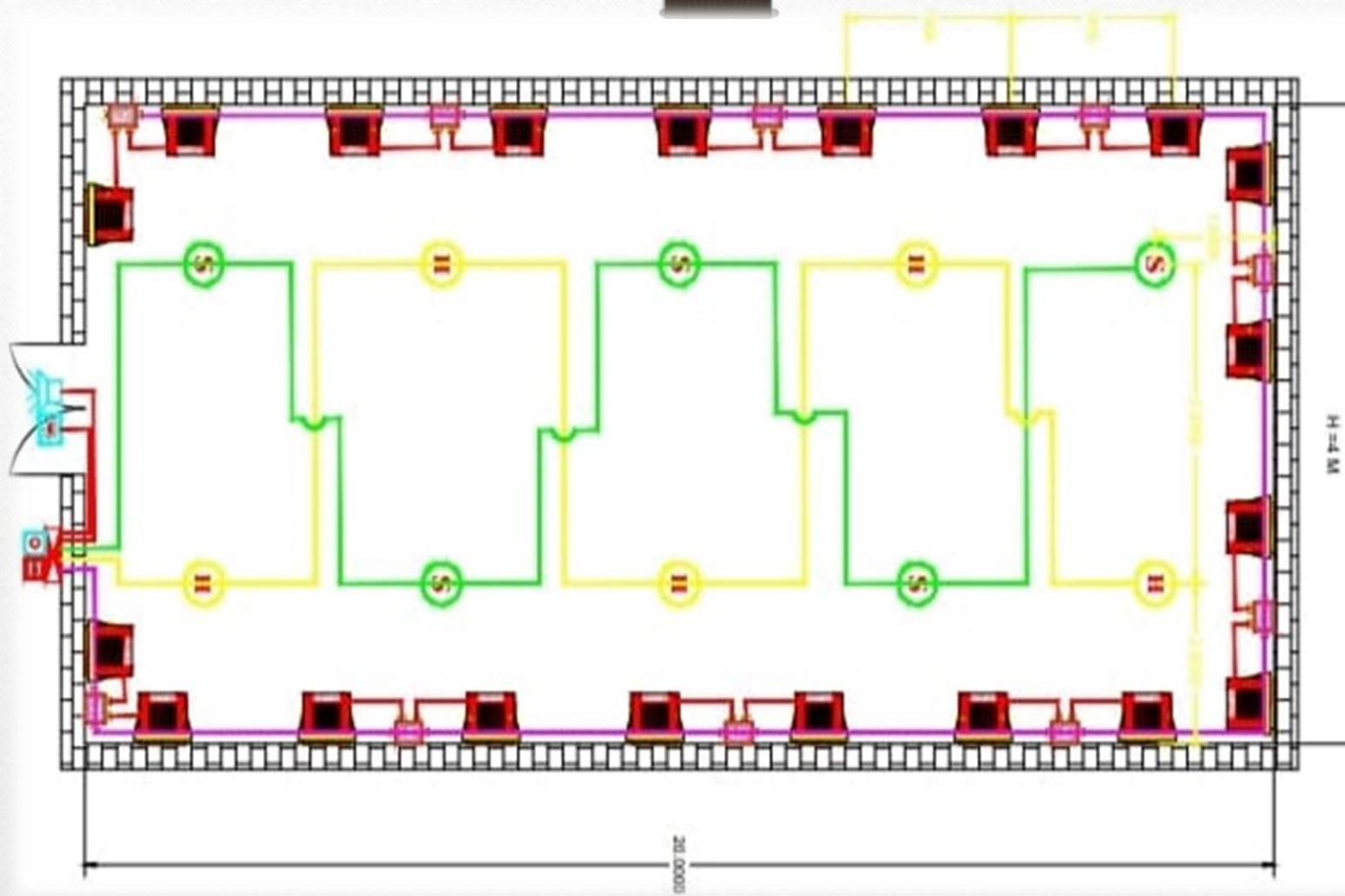
IMPORTANT REMARKS:

1. THIS SOFTWARE IS ONLY A GUIDING TOOL - SELECTION OF GENERATORS IS THE USER'S RESPONSIBILITY.
2. ABOVE SELECTION IS JUST A RECOMMENDATION. ENGINEERING JUDGMENT SHOULD BE APPLIED FOR PROPER SELECTION OF GENERATORS TAKING INTO CONSIDERATION ROOM HEIGHT(STREAM LENGTH), GENERATOR ORIENTATION IN RELATION TO THE VOLUME ARRANGEMENT, OPENINGS etc.
3. FOR PROTECTED VOLUMES EXCEEDING 4M HEIGHT GENERATORS SHOULD BE INSTALLED IN STAGGERED ARRANGEMENT TO ENABLE PROPER TOTAL FLOODING - PLEASE CONSULT MANUFACTURER.
4. ALWAYS CHECK CALCULATIONS FOR CORRECTNESS

TOTAL VOLUME THIS SECTION
TOTAL SOLID MASS OF FirePro COMPOUND REQUIRED

m³
 g

FirePro Systems Ltd all rights reserved





Projects reference

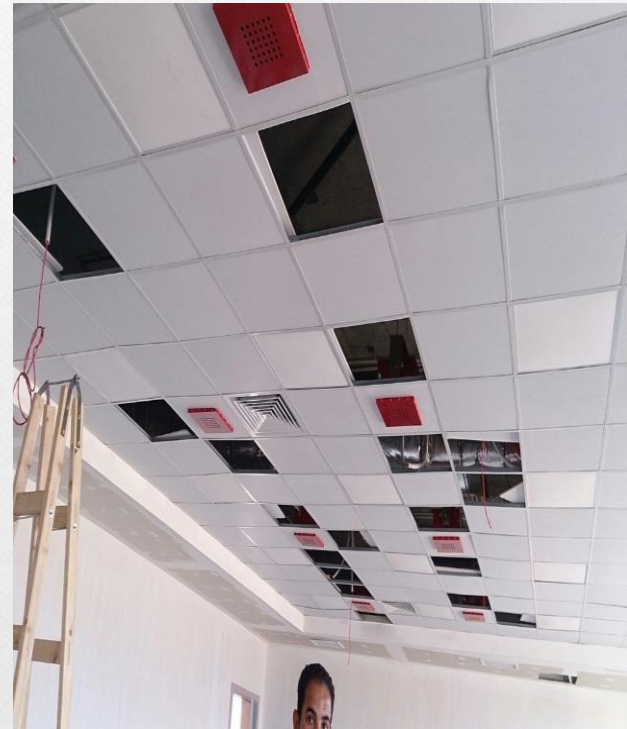
Benha University-New College of Education project



Benha University-New College of Education project



Badr University Project



Japanese University





●●○○

SHOT ON POCO X3 NFC



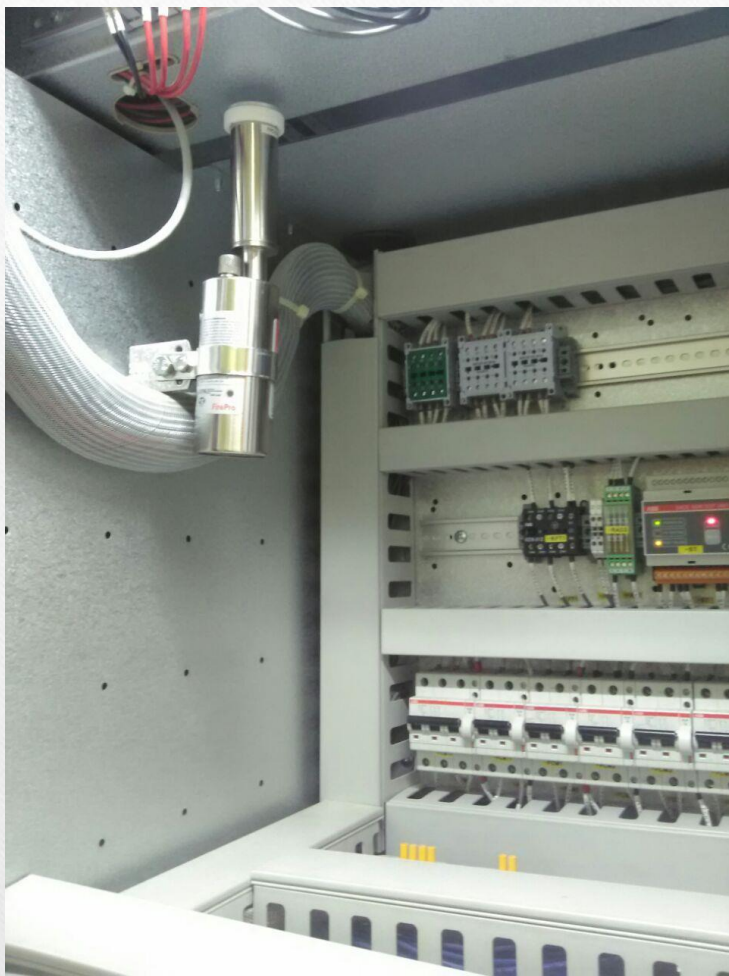
El Demerdash Hospital – Cairo



Control Rooms - Abu Kier Fertilizer Manufacturer Egypt



ERC project



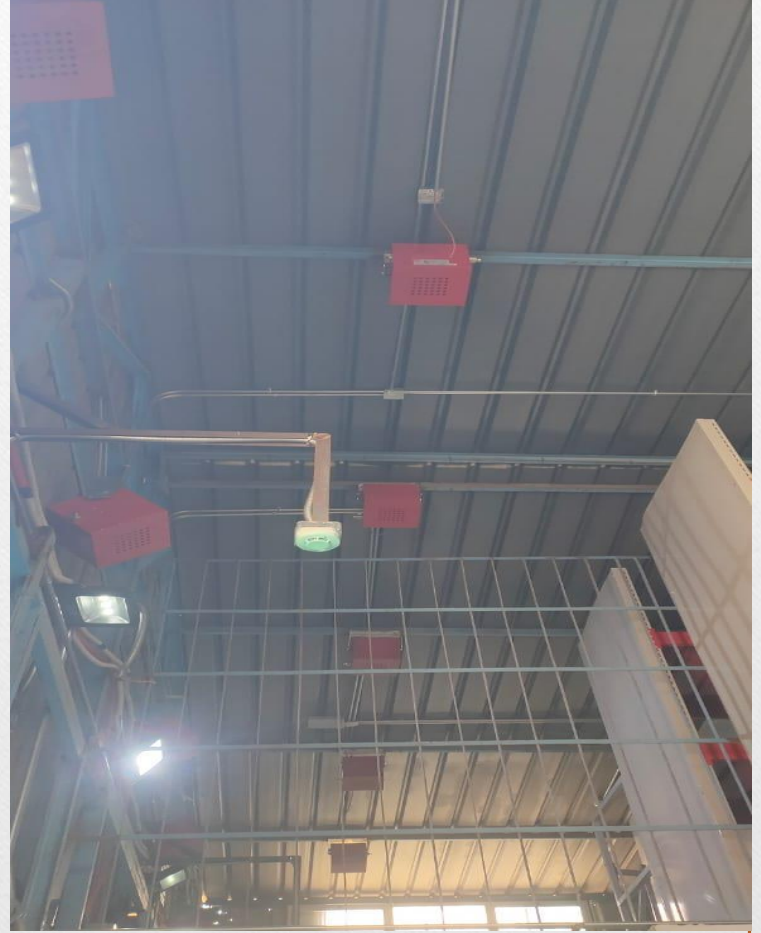
Helwan University



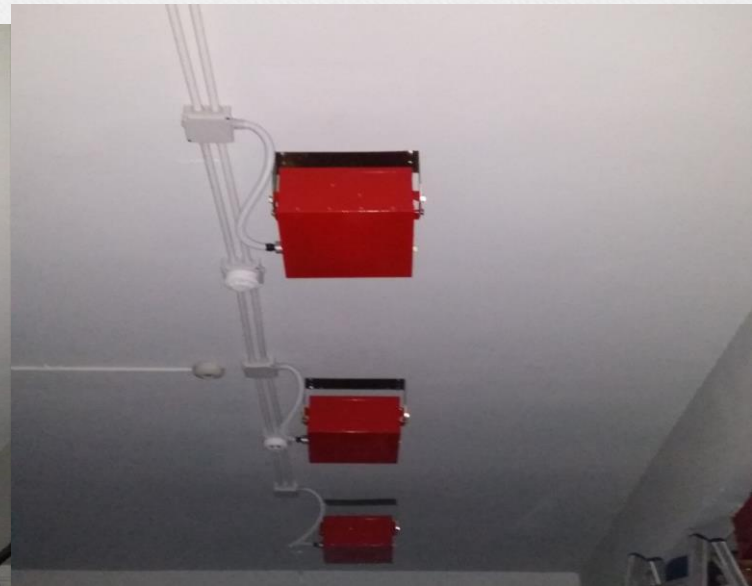
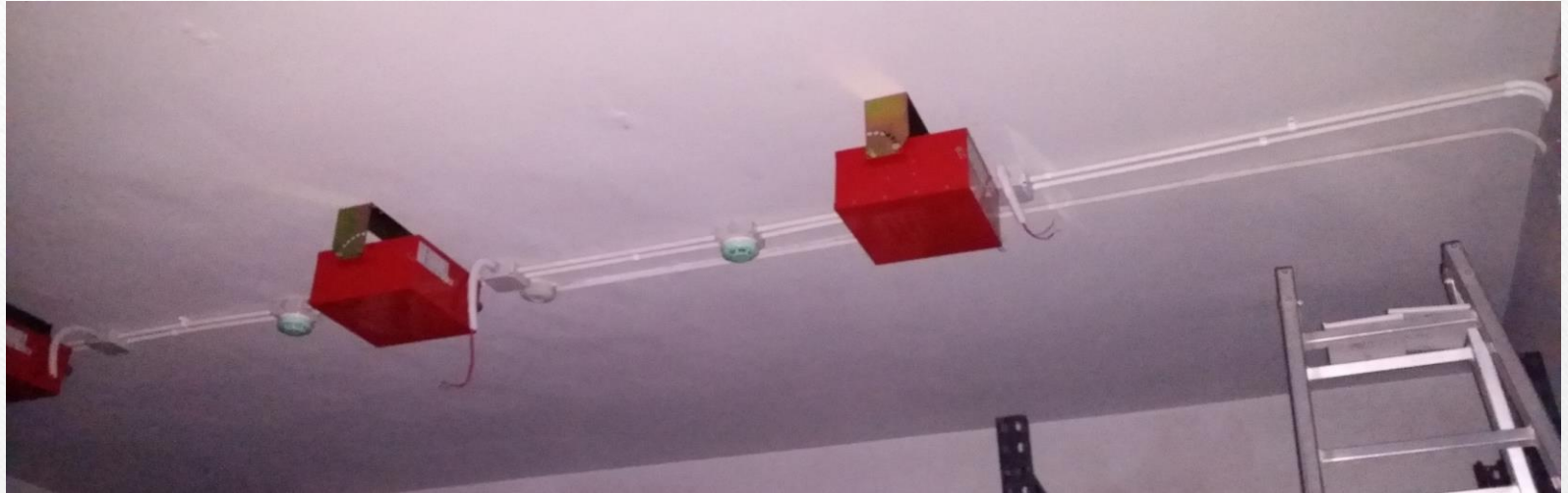


Helwan Central - Stores - Telecom Egypt





Pfizer Pharmaceutical Factory Project – Cairo



Projects Reference

- 1. Obstetrics and Gynecology Hospital (Al Demerdash)**
- 2. Egyptians cement**
- 3. Masjid Alshuhada**
- 4. Kian Club**
- 5. Damanhur Military Hospital**
- 6. Aswan Solar Power Station**
- 7. Banha University**
- 8. Elgouna Airport**
- 9. ERC "Egyptian Refining Company"**
- 10. Hehia Hospital**
- 11. Nile City Towers**
- 12. Exxon Mobil**
- 13. Paints warehouse for RG1 Ghabbour building**
- 14. Al-Hussein University Hospital**
- 15. Telecom Egypt (WE)**
- 16. Egyptian Central Bank**
- 17. Marriot Hotel Sharm Elsheikh**
- 18. Gardenia Swimming Pool**
- 19. Veterinary Vaccine Factory**

- 20. Mall Masr in Tanta**
- 21. Orange Asuit**
- 22. Stadium Borg el3arb**
- 23. Eva pharma**
- 24. Abou Kier Factory**
- 25. Military Factory 9**
- 26. Hall 4500**
- 27. National Institute for Research on Endemic and Liver Diseases**
- 28. Elite Hospital**
- 29. Passport Building**
- 30. Dar Eliftaa**
- 31. Safir hotel Cairo**
- 32. Four Seasons Hotel Cairo**
- 33. Alsalam Stadium**
- 34. Lapoire Factory**
- 35. Conrad Cairo Hotel**
- 36. Banque Du Caire Dandy Mall**
- 37. Cairo Marriott Hotel & Omar Khayyam Casino**
- 38. Marassi R01 HUB**
- 39. Marine Port – Galalah Resort**
- 40. Galalah Project Buildings D&W&**

41. Rubiky Thin Textile Factory
42. Rubiky Fabric and bush Factory
43. GLC Factory
44. Central Auditing Organization
45. Tanta University Hospital
46. El Nasr Hospital for the treatment of tumors in Port Said
47. Aswaq Fathallah
48. ITIDA
49. Ministry of Defense – The Egyptian Satellite Mohamed Nagib Military Base
50. Ministry of Defense – The Egyptian Satellite Haikstep
52. Japan University
53. Coca Cola
54. Police Academy (Ministry of interior)
55. Cargill (National Vegetables Oils Co.)
56. Pfizer Global Supply.
57. Suez Cement Factory (Italcementi Group).

58. Kattamya Cement Factory (Italcementi Group).
59. Mantrac (Caterpillar agent) Building.
60. Hilton King Ranch.
61. EgyptianLNG Control Room (EDKO, main server control room)
62. EgyptianLNG Office at British Gas Building, 5th settlement Area.
63. Grand Azur Hotel Sharm Elsheikh
64. Alex West Radisson Blue Hotel.
65. Carrefour Tanta.
66. New Al sabil For Poultry Production Factory.
67. Semouha Medical Center.
68. Badr University.
69. ABCO United for Plastic & Chemicals.

70. Hinawi Tobacco and Molasses (Americana Group).

71. End Moon Factory (Mido Painting).

72. SCIB Painting Factory.

73. Kawades Cabo feed

74. Glaxo Smiyhkleel Salam City.

75. Eldemerdash Hospital.

76. Abou Quir Fertilizer.

77. Alamria Pharmaceuticals.

78. Ministry of interior- (National Security)

79. Vodafone Depots.

80. Orange Building at Smart Village.

81. Cairo Conference Halls.

Thank You

