EDMS 30-313-1

SPECIFICATION

FOR

AEROSOL-BASED

FIRE SUPPRESSION SYSTEM

Issue: JULY.-2022/ Rev- 1

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1. SCOPE

This specification describes the minimum technical requirements for design, engineering, installation, testing, inspection, and performance of Aerosol-based system for fire suppression. The required system is intended to be installed to protect indoor network components of the Egyptian Electricity Distribution Companies (EDCs) against fire propagation.

2. APPLICABLE CODES and STANDARDS

Unless otherwise specified in this specification, the offered system should be designed, manufactured and tested according to the latest editions of the relevant applicable codes and standards given in Table (1).

Table (1)

Standard No.	Description
NFPA 2010	Standard for fixed For Aerosol Fire -Extinguishing Systems.
NFPA 70	National Electrical Code.
NFPA 72E	National Fire Alarm.
ISO 15779	Condensed aerosol fire extinguishing system – requirements and test method for component and system design, installation, and maintenance.
ISO 14520	Gaseous – extinguishing systems-physical properties and system design – part 5-1-12 extinguishing.
ASME Publications American Society of Mechanical Engineering.	
IEEE Publication	
UL Publication Under Laboratories INC.	
The Egyptian Code for Design Basic and Implementation --Requirements to protect Facilities from Fire (Part three: Fire detection and Alarm system).	
Aerosol shall be replacement according to DOT (Department of Transportation) or similar requirements acceptable to the authority having jurisdiction.	

3. DEFINITIONS

- The Aerosol extinguished medium consisting of finely divided solid particles of a diameter 5 microns and gaseous matter formed by combustion process of aerosol forming compound.
- **Electrically operation units:**

  The system that attached to the room and it is connected to an alarm network.
- **Thermal activation head:**

  The system contains brass or aluminum thermal head by a temperature setting not less than70 C^{o}.
- **Manual aerosol generator:**

  These manually operated generators are currently adopted by national and private fire and rescue services worldwide as vital part of modern firefighting strategy. This is deployed in enclosed space where other suppression system may not be present to suppress or even extinguish a fire.

4. ENVERONMENTAL CONDITIONS

The performance of the offered aerosol system should be guaranteed under the environmental and operational conditions given in Table (2). Any differences in the guaranteed performance should be clearly set out in the offer.

Table (2)

Minimum ambient temperature	-15^{o}C or less
Maximum ambient temperature	54^{o}C or high
Maximum relative humidity	98%
Maximum wind pressure	150 kg/mm
Storage temperature	-40 to 54^{o}C
System Lifetime	15 years
Battery Lifetime	3 years

5. LIMITATION OF USE

- Aerosol system agent shall not be used on fire involving the flowing materials unless the agents have been tested the satisfaction of authority having jurisdiction:
- Deep-seated fires in class A materials (fire burning bellows the surface in duff mulch peat or other combustible as contrasted with a surface fire. a fire that has gained heed way and built-up heat in a structure to require greater cooling for extinguishment)
- Aerosol generators shall not be used to protect classified hazards or similar spaces containing flaming liquid unless the generators are specifically listed for use in those environments.
- The aerosol generators shall not be employed at less than the minimum.

6. TECHNICAL REQUIREMENTS

6.1 Electrical Operation Units:

- **Actuating Mechanism:**

  A mechanism whose automatic or manual operating leads to the discharge of extinguished agent.

- **Abort Switch:**

  A system control that, when operated during the releasing panels release delay count down, extends the delay in accordance with predetermined effect, provided that has UL Approval, and work includes the accessories necessary to install the switch and connect to the panel this and the work includes the accessories necessary to install the switch and connect to the panel.

- **Manual Release:**

  A means of manual release of the system shall be provided.

- **Control panel:**

It is a control equipment that should be specifically for the number utilized, and their compatibility listed. Normal type Conventional consisted of 2 fire zones, provided that (must has UL/FM Approval), and the work includes all fires resistance wires and EMT pipes necessary to connect the panel to all its component, to work efficiently.

- **Automatic detector:**

  It is a listed method or device capable of detecting and indicating heat, smoke, or any abnormal condition in the hazard such as process trouble that is likely to produce fire. UL Approval certificated or satisfaction of authority having jurisdiction for any other approved. Conventional smoke and heat detectors provide that it is UL Approval or satisfaction of authority having jurisdiction for any other approved.

- **Generator (Vessel):**

  Stainless steel aerosol generator with a capacity (determine from hydraulic calculations) of potassium carbonite or any potassium salt, UL Approval certificated and the world Environment Organization EPA.

- **Conventional Alarm Bell:**

  Installation bell operating on voltages of 24 volts and has UL Approval. The work includes the accessories necessary to install the switch and connect to the panel.

- **Congenital strobe / flasher buzzer:**

  It should has UL Approval. The work includes the accessories necessary to install the switch and connect to the panel.

6.2 Thermal Activation Head:

- **Fire Resistance Cable:**

  Cable can send a signal from electrical module to aerosol generators.

- **Thermal actuation head:**

  Automatic units which are thermally activated. They self-activate when they reach a preselected temperature which is determined by the thermal head temperature

chosen.

6.3 Manual Aerosol Generator:

- Manuals activate with an 8-second delay –have two product case and cylindrical.

7. SAFETY REQUIREMENTS

7.1 Hazard to personal:

- The flowing potential hazards shall be considered individual systems: noise, turbulence, reduced visibility, potential toxicity, thermal hazard.
- No fire suppression shall be used that is carcinogenic or teratogenic at application densities expecting during use.
- Aerosol extinguished systems approved for normally occupied spaces shall be permitted in amount where the aerosol particles density doesn't exceed the level deemed acceptable by the us EPA SNAP PROGRAM where any aerosol agent doesn't exceed the excursion limit for critical toxic effect (design density does not exceed 100 or 109.2 g/m^3) in table A5.2.4 at NFPA2010.

7.2 Thermal Hazard:

- Aerosol generator shall not be employed at less than the minimum safe distance from personal and combustible materials as specified in the listing of the product.

7.3 Electrical Hazard:

Aerosol generator shall not be employed at less than the minimum safe distance from any live electrical part.

8. SYSTEM DESIGN and INSTALLATION

- Specification for total flooding aerosol fire-extinguishing systems shall be prepared under supervision of person fully experienced and qualified in the design of such systems and authority having jurisdiction.
- Working plane Calculation shall be submitted for approval to the authority having jurisdiction before system installation or remodeling begins.
- This document shall be prepared by persons experience and qualified in the design

of aerosol extinguishing systems.

8.1 Enclosable Opening:

- In design for total flooding system, the integrity of protected enclosure shall be considered.
- To prevent loss of agent through opening to adjacent hazards or work area agent shall be permanently sealed or equipped with automatic closures.

8.2 Forced Air Ventilation System:

- Forced Air ventilating system shall be shut down or closed automatically where their continued operation would adversely affect the performance of the fire extinguishing system or result in propagation of the fire.
- Completely self -contained recirculating ventilation system shall not be required to be shut down.
- The volume of the ventilation system and associated duct work shall be considered part of the total hazard volume when determine the quantity of agent.
- The minimum design application density for a class B fuel hazard shall be determine multiplied by a safety factor of 1.3.
- The minimum design application density for a class A fuel hazard shall be determine multiplied by a safety factor of 1.3.
- The minimum design application density for a class C hazard shall be at least for the class of fire hazard being protected as class A, B.
- Fuel combination of class A and B, the design application density shall be the value for the fuel requiring the greater design application density.

8.3 Total Flooding Quantity:

- The mass of Aerosol -forming compound required from the flowing formula:

$$M = d^{o} \times f \times V$$

Where:

M: total folding quantity (g).

d^o: design application density (g/m^3).

f: product of all-additional factors=1.3

V: protected volume (m^3).

9. TESTING, INSPECTION and MAINTENANCE

- At least annually, all systems shall be subjected to the manufacturers test procedures by qualified personal.

9.1 Functional Testing:

- **Preliminary Functional Test:**

The following preliminary functional test shall be provided:

1. If the system is connected to an alarm-receiving office notify the alarm - receiving office that the fire system test is to be conducted that an emergency response by the fire department or alarm station personal is not desired.
2. Notify all concerned personal at the end users' facility that a test is to be conducted and instruct personnel as to the sequence of operation.
3. Each generator so that activation of the release circuit will not release agent.
4. Re connect the release circuit with a functional device in lieu of each generator.
5. Check each detector for response.
6. Check that polarity has been observed on all polarized alarm devices and auxiliary relays.
7. Chick that all end-of-line resistors have been installed across the detection and alarm bell circuits where required.
8. Chick all supervised circuit for trouble response.

- **System Functional Operation Test:**

The following system functional operational tests shall be performed:

1. Operate detection initiating circuits.
2. Verify that all alarm functions occur according to design specification.

3. Operate the necessary circuit to initiate a second alarm circuited if present.
4. Verify that all second alarm functions occur according to design specifications.
5. Operate manual release.
6. Verify that manual release functions occur according to design specification.
7. Operate abort switch circuit if supplied.
8. Verify that abort functions occur according to design specifications.
9. Confirm that visual and audible supervisory signals are received at the control panel.
10. Check pneumatic equipment, where required, for integrity.

– All flexible connection shall be tested every 5 years at 150 percent of the maximum container pressure at 55° C (130°F). The testing procedure shall be as follows:

1. The flexible connector is removed from any attachment.
2. The flexible connector is then placed in a protective enclosure designed to permit visual observation of the test.
3. The flexible connector is filled with water before testing.
4. Pressure then is applied at a rate-of-pressure rise to reach the test pressure within a minimum of 1 minute.
5. The test pressure is maintained for 1 full minute.
6. Observations are made to note any distortion or leakage.
7. If the test pressure has not dropped or if the couplings has not moved, the pressure is released.
8. The flexible connector is considered to have passed the hydrostatic test if no permanent distortion has taken place.
9. The flexible connectors passing the test must be completely dried internally.
10. Flexible connectors failing a hydrostatic test must be marked, and then replaced with new flexible connectors.
11. Each flexible connector passing the hydrostatic test is marked to show the date

of test.

9.3 Inspection:

- At least semiannually, visual inspection shall be conducted to assess the aerosol the systems operation condition.
- Where external visual inspection indicate that the generator has been damaged, it shall be replaced.
- At least every 12 months, the enclosure protected by the aerosol system shall be thoroughly inspected to determine if penetration other changes have occurred that could adversely affect agent leakage or change volume of hazard or both.
- At least annually, all systems shall be thoroughly inspected for proper operation by qualified person.
- At least semiannually, the pressure or weight of pilot containers shall be inspected.
- All flexible connectors shall be inspected annually for damage.

9.4 Maintenance:

- Systems shall be always maintained in full operating condition.
- All shall be subject to the manufacturer's maintenance procedures by qualified personnel.

9.5 Record Keeping:

- A complete copy of the inspection, testing, and maintenance reports performed on these systems in accordance with this standard shall be furnished to the owner of the system or authorized representative , and the records shall be retained for the life of the system.

10. NAMEPLATE

- Each aerosol generator shall have a permanent nameplate that indicate the mass of aerosol of aerosol – forming compound contained with manufacturer date, and date of mandatory replacement of generator based on useful life limit established in the listing. Certificate obtained such as:

- UL- listed.
- EPA- SNAP listed (ozone Depletion Potential).
- Approved by EPA for norm occupied spaces.
- 30% safety factor.
- Any other certificate.

11. AEROSOL PROCEDURE AFTER DISCHARGE

1. After discharge allow a minimum hold time or 10 minutes.
2. Do not enter the enclosure. Secure enclosure for unauthorized personal.
3. Switch off electronic apparatus.
4. Keep windows and doors closed.
5. Contact Salvage Company.
6. If the enclosure is safe, you may enter enclosure.
7. Dispose of used generators according to local regulation.

12. CLEANING PROCEDURE AFTER DISCHARGE

1. Clean residues shortly after discharge (within a few hours maximum).
2. Wipe off dry residues on floor and metal surfaces using a wet cloth brush.
3. Dust away the residues on electrical components using a fan / blower or dry compressed air.
4. Use special sprays suitable to clean the residues that have seated on electronic component.
5. If the condensed aerosol particles are removed before they can absorb moisture and mix with the combustion residues present affect electronic. metals. etc.
6. The condensed aerosol particles (dust) remain for a longer period. They will absorb moisture. The moisture will react with metals (especially uncoated metals) casing oxidation to occur.

13. GENERAL REQUIREMENTS

- The system is valid to be installed in any facility or warehouse whether the components of the facility or warehouse are of type A, type B or electrical fire.
- Installation is done in all low voltage panels and ring link units.
- For installation in distributors, the system should covers the cell hall, battery room, and service transformer room.
- In case of installing the system inside the distributor's cells, approval letter from the distributor's manufacturer must be attach.
- The supplier guarantee the supplied system, materials and all accessories against any defects or malfunctions for a period of one year at least from the date of final delivery. The system should be monitored and maintained periodically during the warranty period.

Alarm Bell

Abort switch

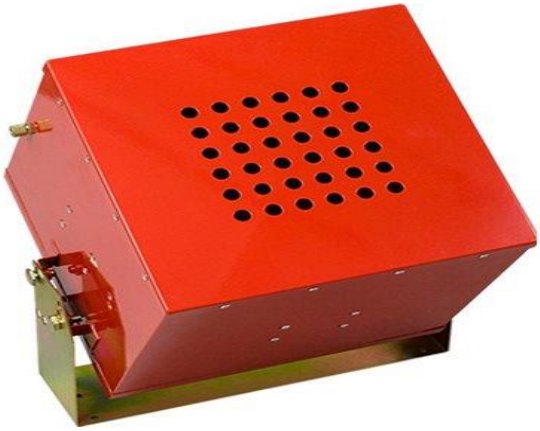
Flasher buzzer

Manual release

Detector

Wires fire resistance

Control panel



Generator