Lloyd's Register

CERTIFICATE OF FIRE APPROVAL

This is to certify that

The product detailed below will be accepted for compliance with the applicable Lloyd's Register Rules and Regulations and with the International Convention for the Safety of Life at Sea, (SOLAS), 1974, as amended, for use on ships and offshore installations classed with Lloyd's Register, and for use on ships and offshore installations when authorised by contracting governments to issue the relevant certificates, licences, permits etc.

Manufacturer	Kidde Fire Protection
Address	1st Floor Stokenchurch House Oxford Road Stokenchurch High Wycombe Buckinghamshire, HP14 3SX United Kingdom (UK)
Type	**FIXED GAS FIRE EXTINGUISHING SYSTEM**
Description	Fixed Gas Fire Extinguishing System – Type: "FM-200 GX20 Series Engineered Fire Suppression System" for Machinery Spaces of Category A and Cargo Pump Rooms equivalent to fire-extinguishing systems required by SOLAS 1974 as amended, Chapter II-2/10.4 and 10.9
Specified Standard	IMO MSC/Circ. 848 as Amended by MSC.1/Circ.1267, MSC.1/Circ. 1316 and MSC.1/Circ.1317

The attached Design Appraisal Document forms part of this certificate.
This certificate remains valid unless cancelled or revoked, provided the conditions in the attached Design Appraisal Document are complied with and the equipment remains satisfactory in service.

Date of issue	21 April 2015	Expiry date	13 October 2018
Certificate No.	SAS F130282/M1	Signed	Fire & Safety Lloyd's Register EMEA
Sheet No	1 of 5	Name	M. Farrier Surveyor to Lloyd's Register EMEA A Member of the Lloyd's Register Group

Note:

This certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify Lloyd's Register of any modification or changes to the equipment in order to obtain a valid Certificate.

Lloyd's Register EMEA
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7423 2416 Fax 020 7423 2053
Email med@lr.org

Document number
SAS F130282/M1

Issue number
1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
21 April 2015	MTES/TA/SFS/MF/WP19576567

ATTACHMENT TO CERTIFICATE OF TYPE APPROVAL No. SAS F130282/M1

This Design Appraisal Document forms part of the Certificate.

APPROVAL DOCUMENTATION

U.S. Coast Guard Research and Development Center, Connecticut, United States of America, Test Report No. CG-D-02-99, "An Evaluation of the International Maritime Organization's Gaseous Agents Test Protocol with Halocarbon Agents and an Inert Gas, 180° Nozzles, and Low Temperature Conditioned Cylinders", dated December 1998.

Kidde Fire Systems – Design, Installation, Operation and Maintenance Manual Document No: 90-FM200M-021, dated June 2012 incorporating:

1. Supplement Rev. AA, dated June 2003.
2. Kidde Fire Protection, Marine Product Identification Cross List, Issue 2 dated April 2005.

CONDITIONS OF CERTIFICATION

1. The National Authorities of the vessel concerned are to accept the use of FM200 as being acceptable for compliance with The International Code for Fire Safety Systems (Fire Safety Systems Code), Chapter 1, paragraph 4 and Chapter 5, paragraph 2.5 at the design stage. The manufacturers of the system are to advise, whoever they are contracted to, of this requirement at the earliest opportunity.
2. If the system is to be of the modular type, i.e. with the cylinders distributed within the machinery space, the National Authorities are to accept the arrangements with due reference to the Fire Safety Systems Code, Chapter 5, paragraph 2.1 and MSC/Circular 848, paragraph 11 of the Annex, as amended by MSC.1/Circ.1267, MSC.1/Circ.1316 and MSC.1/Circ.1317.
3. The computation of the discharge time for each application is to be produced by Kidde ECS Series FM-200 Flow Calculation Program Version GX4.0 Part Number 1-D3882-017 and is to be independently verified at the design stage. The system should be designed so that 95% of the extinguishing agent can be discharged in 10 seconds.
4. The quantity of FM200 for the protected space is to be calculated at the minimum expected ambient temperature (which is to be no greater than zero degrees Celsius) with a minimum design concentration of 8.7%. The maximum concentration is not to exceed 10.5% (LOAEL Limit) at the maximum expected ambient temperature, (not less than 50 degrees Celsius). Other temperature ranges may be considered on a project by project basis, subject to agreement by the National Authorities.
5. The design concentration is to be based on the net volume of the protected space, including the casing, the bilge and the volume of free air contained in air receivers that in the event of a fire is released into the protected space. All 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: auxiliary machinery, boilers, condensers, evaporators, main engines, reduction gears, tanks and trunks.
6. The discharge of FM200 is to be evenly distributed over the protected space and the nozzle spacing is not to exceed 5 metres for a 360 degree nozzle or 5 metres for a 180 degree nozzle or equivalent nozzle coverage arrangement. The maximum nozzle vertical spacing is not to be greater than 5 metres.

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7. The average minimum pressure at each nozzle is to be not less than 5.1 bar, at a maximum cylinder fill density of 1121 kg/m^3, for nozzle types: 180 degrees (PART No. C3333-301 to 306) and 360 degrees (PART No. C3333-307 to 312). The drill sizes of each nozzle orifice and the quantity of agent to be discharged from each nozzle is to be determined by the software calculation program. Nozzles to be manufactured from ASTM B16 Brass or equivalent BS EN 12164CW609N or CW614N.
8. The arrangements and parts used in the system are to be in accordance with the Kidde Fire Systems – Design, Installation, Operation and Maintenance Manual Document Number: 90-FM200M-021, dated June 2012 and Supplement Rev. AA, dated June 2003 and the Kidde Fire Protection, Marine Product Identification Cross List, Issue 2. This manual also contains recommended procedures for the control of products of agent decomposition, including HF vapour generated from fluorocarbon extinguishing agents which could impair escape.
9. Arrangement drawings and calculations are to be submitted for acceptance in each case where it is proposed to install this system. Control panel schematics are also to be submitted. All principle components of the system are to be identified and their location indicated.
10. The means of control of the fixed gas fire-extinguishing system shall be readily accessible, simple to operate, and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system having regard to the safety of personnel.
11. Production items are to be manufactured in accordance with a quality control system which shall be maintained to ensure that items are of the same standard as the approved prototype.

GENERAL NOTES

1. The system is to be designed in accordance with the Annex of IMO MSC/Circ. 848 as amended by MSC.1/Circ.1267, MSC.1/Circ.1316 and MSC.1/Circ.1317. In particular, revised requirements apply where agent containers are stored within a protected space.
2. All systems should be designed to allow evacuation of the protected spaces prior to discharge. Means should also be provided for automatically giving audible and visual warning of the release of the fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm should operate for the period of time necessary to evacuate the space, but not less than 20 seconds before the medium is released. Unnecessary exposure, even at concentrations below an adverse effect level, should be avoided.
3. Even at concentrations below an adverse effect level, exposure to gaseous fire extinguishing agents should not exceed 5 minutes. If a halocarbon agent is to be used above its NOAEL, means should be provided to limit exposure to no longer than the time specified according to a scientifically accepted physiologically based pharmacokinetic (PBPK) model or its equivalent which clearly establishes safe exposure limits both in terms of extinguishing media concentration and human exposure time. In no case should a halocarbon agent be used at concentrations above the LOAEL nor the ALC, calculated on the net volume of the protected space at the maximum expected ambient temperature.
4. The mechanical ventilation of the protected space(s) must be stopped before the activation of the fixed gas system and compartment closure arrangements should be designed to provide an agent hold time of at least 15 minutes. The release of an extinguishing agent may produce significant over and under pressurisation in the protected space. Measures to limit the induced pressures to acceptable limits should be provided.

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5. The system should be supplied by both main and emergency sources of power, with the emergency power supply being provided from outside the protected machinery space.
6. The system pipe work including: pipes, valves and fittings are to be in accordance with the requirements of the approval authority.
7. 10% of the distribution piping is to be tested to 1.25 times the maximum pressure likely to be experienced in service. For the KIDDE FIRE PROTECTION FM-200 GX20 system, this equates to 1.25 x 34.5 bar (at 50 deg. C) = 43.5 bar. The manifold pipework is to be tested to at least 1.5 times the setting of the manifold relief valve. The manifold relief valve is to be set at a minimum pressure of 52 bar and the minimum manifold test pressure is to be 78 bar. All pipework and fittings should be of suitable galvanised steel or stainless steel construction. Threaded joints in fixed gas systems shall be allowed only inside protected spaces and in cylinder storage spaces.
8. The system storage containers and associated pressure components are to be designed and tested to codes of practice recognised by the approval authority, indicating that they can withstand the pressure expected in service, having regard to their installed location and that they are suitable for the agent identified.
9. Provisions should be made to ensure that escape routes which are exposed to leakage from the protected space are not rendered hazardous during or after discharge of the agent in the event of fire. In particular, HF vapour can be produced in fires as a breakdown product of the fire extinguishing agent and can cause health effects such as upper respiratory tract and eye irritation to the point of impairing escape. Control Stations and other locations that require manning during a fire situation should have provisions to keep HF and HCl below 5 ppm at that location. The concentrations of other products should be kept below concentrations considered hazardous for the required duration of exposure.
10. Where agent containers are stored within a protected space, the containers should be evenly distributed throughout the space and meet the following provisions:
    - 10.1. 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.
    - 10.2. Electric power circuits connecting the containers should be monitored for fault conditions and loss of power. Visual and audible alarms should be provided to indicate this.
    - 10.3. Pneumatic, electric or hydraulic power circuits connecting the containers should be duplicated and widely separated. The sources of pneumatic or hydraulic pressure should be monitored for loss of pressure. Visual and audible alarms should be provided to indicate this.
    - 10.4. Within the protected space, electrical circuit's essential for the release of the system should be fire resistant according to standard IEC 60331 or other equivalent standards. Piping systems essential for the release of systems designed to be operated hydraulically or pneumatically should be of steel or other equivalent heat-resisting material to the satisfaction of the Administration.
    - 10.5. Each pressure container should be fitted with an automatic overpressure release device which, in the event of the container being exposed to the effects of fire and the system not being operated, will safely vent the contents of the container into the protected space.

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10.6. The arrangement of containers and the electrical circuits and piping essential for the release of any system should be such that in the event of damage to any one power release line or container valve 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 minimum extinguishing concentration (known as the cup burner concentration) can still be discharged having regard to the requirement for uniform distribution of medium throughout the space.

10.7. The containers should be monitored for decrease in pressure due to leakage and discharge. Visual and audible alarms in the protected area and on the navigation bridge or in the space where the fire control equipment is centralised should be provided to indicate this condition.

11. As longer exposure of the agent to high temperatures would produce greater concentrations of HF and HCl gases, the type and sensitivity of detection, coupled with the rate of discharge, should be selected to minimise the exposure time of the agent to the elevated temperature. The performance of fire-extinguishing arrangements on passenger ships should not present health hazards from decomposed extinguishing agents, for example on passenger ships, the decomposition products should not be discharged in the vicinity of muster (assembly) stations. Other mitigating steps include evacuation and donning masks.

12. Warning signs and audible and visual alarms should be located outside each entry to the protected space(s).

13. On completion of the installation final acceptance of the system is dependent on satisfactory survey and testing in accordance with the manufacturer's Design, Installation, Operation and Maintenance Manual Document.

PLACE OF PRODUCTION

Kidde Fire Protection
Station Road
High Bentham
Near Lancaster, LA2 7NA
United Kingdom (UK)

Martin Farrier
Lead Specialist
Statutory Fire & Safety
Marine Technology and Engineering Services
Lloyd's Register EMEA

Supplementary Type Approval Terms and Conditions

This certificate and Design Appraisal Document relates to type approval, it certifies that the prototype(s) of the product(s) referred to herein has/have been found to meet the applicable design criteria for the use specified herein, it does not mean or imply approval for any other use, nor approval of any products designed or manufactured otherwise than in strict conformity with the said prototype(s).