



MECAL TECHNICAL NOTE

MTN 15-1

Issued by the *MECAL* Technical Committee

HALON – GUIDE TO ALTERNATIVES

Reference: All vessels operating within EC.

MGN 191 required decommissioning of Halon fire protection systems and extinguishers by 31 December 2003. After that date no Halon should be onboard coded vessels. Vessel owners should be reminded that they must take timely action to replace Halon systems with appropriate alternate fire extinguishing systems.

MCA Guidance for Surveyors (Document OAN 402 Rev 01 issued 11 Jan 2005)

The following information/advice is for Surveyors to assist with assessing Halon replacements currently approved. The MCA cannot advise Ship Owners on what Fire Fighting Product to use. The Ship Owner has to make his own decision from the Products that are available and have been approved and Wheel-marked (M.E.D.). Novel products for which there are no International Test Standards may be approved by the MCA, subject to MCA Test Procedures.

Full MED Certification for gas/product and system hardware is sufficient for UK vessels. Some Class Societies do not approve the gas/product and may certify only the system hardware, and in these cases a UK MCA Approval Certificate will be needed for the gas/product.

For non-SOLAS vessels, the MCA has approved a number of fire fighting systems .

The Table at the end of this OAN compares the various extinguishing products and is for guidance only. Specific information for a product should be in the MED Approval Certification.

1 Criteria for Halon Replacement

When selecting a fire suppression product the following criteria are relevant;

- 1.1 Fire Suppression Effectiveness
- 1.2 Delivery Rate to a protected space (volume)

- 1.3 Toxicity
- 1.4 Contribution to Ozone layer depletion (ODP)
- 1.5 Effect on climate (Global Warming Potential)(GWP)
- 1.6 Decomposition products (toxicity)
- 1.7 Compatibility with hardware (to minimise leakage)
- 1.8 Volumetric efficiency (compared to Halon 1301)
- 1.9 Obscuration on release of the agent
- 1.10 Hold Time
- 1.11 Residue
- 1.12 Atmospheric Lifetime
- 1.13 Hardware & Suppressant Cost
- 1.14 Availability of replacement agent / extinguishant.

2 Safeguards on re-entry after a fire in a protected space

The following should be considered:-

- 2.1 Training of crew
- 2.2 Warning signs (Potential Hazards)
- 2.3 Protective clothing
- 2.4 Fireman's outfits
- 2.5 Self contained Breathing Apparatus
- 2.6 Ventilation
- 2.7 Emergency Power

3. List and brief information on the more common approved Fire Fighting Products for all sizes of vessel

- 3.1 **NOVEC 1230** fluid is a fluorinated ketone and boils at 49 degrees C. It can be transported as a liquid at atmospheric pressure. (MS 22/9/324) The MCA has issued approval certification for the product. Class have issued MED Certification for the system hardware.
- 3.2 **FM200** (HFC227ea) is a hydrofluorocarbon gas. (MS 22/9/316). The MCA has issued approval certification for the product. Class have issued MED Certification for the system hardware.
- 3.3 **HALOTRON II B** (R866) (FC49 C2) is a hydrofluorocarbon gas. (MS 22/9/327). DNV have issued MED Certification for the product and system hardware.
- 3.4 **Carbon Dioxide** (an asphyxiant gas).
- 3.5 **Water Sprinkler Systems**
- 3.6 **Water Mist, Spray or Fog**
- 3.7 **FOAM**
- 3.8 **Dry Powder**

- 3.9 **Inergen Inert gas** (mixture of Argon 40%, Carbon Dioxide 8%, Nitrogen 52%) (MS 22/3/901) (an asphyxiant gas).
- 3.10 **Argonite** Inert gas (equal mixtures of Nitrogen and Argon) (MS 22/9/328). (an asphyxiant gas).

4. List and brief information on the more common MCA approved Fire Fighting Products for vessels of less than 24 metres Load Line Length.

- 4.1 **Pyrogen Aerosol** Approval MS 22/3/904
- 4.2 **Fire Mermaid Aerosol** Approval MS 22/3/906
- 4.3 **MICRO K Aerosol** Approval MS 22/3/905
- 4.4 **AQUAMIST Watermist system** Approval MS 22/9/317

5 Notes:

- 5.1 Carbon Dioxide, Inergen and Argonite are asphyxiant gases. Except as otherwise permitted by the MCA, pressure containers required for the storage of the fixed fire-extinguishing medium shall be located outside the protected space. Suitable provisions shall be provided to prevent inadvertent release of the medium into a manned protected space. It is important that spaces protected by these gases have suitable signage so that personnel are aware of dangers of inadvertent release.
- 5.2 Halocarbon Gases (FM200, NOVEC 1230 and HALOTRON IIB). Suitable provisions should be in place to indicate release of the medium into a manned protected space. In the presence of test fires, all of the halocarbon agents generated higher and unsafe levels of hydrogen fluoride (HF) than did Halon 1301. The HF is in addition to the other unsafe toxic decomposition products.
- 5.3 **NOAEL:** No observed adverse effect level. The maximum dose or ambient concentration which an organism can tolerate over a specified period of time without showing any detectable adverse effect and above which adverse effects are apparent. **LOAEL:** The lowest concentration at which adverse physiological or toxicological effect has been observed.
- 5.4 Both FM200 and HALOTRON IIB have minimum design concentrations very close to the NOAEL limit. The surveyor should satisfy himself/herself that the NOAEL limit is not exceeded in the protected space for the operational conditions experienced by the vessel.
- 5.5 Design delivery concentration is at minimum design temperature, and should not exceed NOAEL at the maximum design temperature, and shall not exceed LOAEL at the maximum design temperature.

- 5.6 Surveyors should confirm gas tight boundaries to ensure retention of products. The boundaries should be secured before release with appropriate notices and instructions to this effect. No automatic discharge shall be permitted into manned spaces.
- 5.7 Large ships may have the necessary safety equipment for safe re-entry into an enclosed space after a fire has been extinguished. Smaller craft should keep the enclosed space secure until satisfied the fire is completely out before ventilating and re-entry, entry should only be made with extreme caution. Procedures, Instructions and notices should be checked to ensure that they adequately cover this aspect.
- 5.8 With all the fire extinguishing products, the conditions of use in the Approval Certification (MED or MCA) should be studied carefully. The Surveyor should be satisfied that the Fire Extinguishing System is fit for purpose. The level of safeguards required should be appropriate for the size of vessel.
- 5.9 Suitable safeguards shall be provided to ensure prompt evacuation of and prevent entry into hazardous atmospheres and also to provide prompt rescue of trapped personnel. The decomposition products (Carbon Monoxide and other toxic gases) generated in the presence of heat can be hazardous. This applies to all fires on ships.
- 5.10 Wherever practicable there should be a clear indication of when the discharge mechanism of each fire-fighting medium reservoir has been activated. This is not yet a requirement but has been recommended following an accident investigation.
- 5.11 Time delays should not be fitted between any opening of activation cabinets/sounding of alarms and release of extinguishing medium, the need to evacuate spaces and time taken to do so should be sufficiently well covered in emergency and operating instructions.
- 5.12 It is important that clear relevant operating instructions are contained in manuals and also at operating stations with components clearly marked. Ships staff should be aware of properties of extinguishing medium in use both before and after fire.

5.13 Table of properties of various firefighting products

Product	Toxicity	Delivery	NOAEL	LOAEL	ODP
NOVEC 1230	low	<10 sec	10%	>10%	0
FM200	low	<10 sec	9%	10.50%	0
HALOTRON IIB	low	<10 sec	13%	15%	0
Carbon Dioxide	(Note 5.1)	2 min, 85%			0
Water Sprinkler	nil	20 min +	n/a	n/a	0
Water Mist	nil	20 min +	n/a	n/a	0
FOAM			n/a	n/a	0
Dry Powder	low				0
Pyrogen	low				0
Fire Mermaid	low				0
Micro K	low				0
Aquamist	nil		n/a	n/a	0
Inergen	(Note 5.1)		43%	52%	0

Argonite	(Note 5.1)		43%	52%	0	
HALON 1301	low		5%	7.50%	12	
Product	GWP	Obscuration	Volumetric Efficiency	Residue	Atmos. Lifetime	Min Design Concentration
NOVEC 1230	1	Poor	1.7	Good	6 days	6%
FM200	3300	Poor	1.7	Good	36.5 yrs	8.70%
HALOTRON IIB	1600	Poor	1.7	Good		12%
Carbon Dioxide	1	Poor	4	Good		40%
Water Sprinkler	0	Poor		Poor		5 l/m2 min
Water Mist	0	Poor		Poor		
FOAM	0	Poor		Poor		
Dry Powder	0	Poor		Poor		0.5kg/m3
Pyrogen	0	Poor		Poor	1 day	100 g/m2
Fire Mermaid	0	Poor		Poor	1 day	100 g/m2
Micro K	0	Poor		Poor	1 day	100 g/m2
Aquamist	0	Poor		Poor		
Inergen	0.03	Good	10	Good		34.90%
Argonite	0	Good		Good		48%
HALON 1301	6900	Poor	1	Good	65 yrs	5%

* LOAEL: The lowest concentration at which adverse physiological or toxicological effect has been observed.

* NOAEL: No observed effect level. The maximum dose or ambient concentration which an organism can tolerate over a specified period of time without showing any detectable adverse effect and above which adverse effects are apparent

6. Further information; can be obtained from Shipping Safety Branch. A more detailed MGN will be published later in 2005 on Fire Extinguishing Products.