



Fire Protection Industry
(ODS & SGG) Board

ARTICLE

Fire protection in the marine industry

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Every year, fires on board vessels lead to the loss of lives and severe damage to ships. Many fires start in engine rooms (engine compartments in the case of small craft) and machinery spaces. Gaseous fire suppression systems, which vary according to vessel size, protect internal combustion, gas turbine, main or auxiliary propulsion and similar machinery spaces, paint and oil lockers, pump rooms, control rooms and enclosed ventilating systems for electric propulsion motors and generators.

The vessels that can be affected by fire range from leisure craft through to fishing boats, work boats, tugs and tenders to ferries, roll on-roll off ships, offshore supply vessels, cruise ships, bulk carriers, tankers, LNG carriers, container ships and warships.

A fire example or two

Ship fires are devastating, especially for passenger ships because it is difficult to safely evacuate people out at sea. It is also dangerous when a ship carries inflammable cargo such as gasoline and oil. Fires on ships or vessels can be prevented by rectifying leakages of fuel oil, lubricating oil, and exhaust gases.

To prevent such devastation incidents, it is important that ships and vessels have adequate fire protection and fire detection systems installed and that these systems are maintained by licensed technicians.

Ship fires are a major threat to property and the following are some real life examples:



Readers may recall the fire in 1980 on the passenger ferry 'Scandinavian Star' where 159 lives were lost. There have been many others, including the fire on the 'Achille Lauro' cruise liner where over 1000 passengers and crew were evacuated as fire raged through the engine room and accommodation areas on 30 December 1994. Three people died in the incident which took place off the coast of north-east Africa. The ship subsequently sank. Reports suggested that the fire broke out when oil used for cooling pistons in one of the liner's eight engines entered the exhaust system.

For small craft, the US National Fire Protection Association reminds us that "a pleasure boat contains a number of unique problems not found in an average residence. A typical pleasure boat has a fuel source (diesel fuel or gasoline) plumbed to as many as two engines and a generator. A DC electrical system, an AC electrical system, and possibly propane and alcohol for cooking. All of which are subject to salt and water as well as other various forms of corrosion."

There are many types of fire incidents that occur on vessels. Typical small craft reports on fires are set out below:

"Petrol leaking from a fuel pump onto the hot exhaust pipe was vapourised and ignited by the hot surface of the pipe. The ensuing fire in the engine compartment was extinguished by the boat operator using first attack equipment."

"This 13 m cruiser was extensively damaged by fire that broke out while the craft was moored at a wharf. Investigators believe that a short circuit at a switch box in the engine compartment caused the fire. No one was aboard when the fire occurred but the owner, on seeing smoke rising from his boat, rushed aboard and operated the fixed fire extinguishing system. The fire was practically extinguished when firemen arrived."

"A leaking fuel line was believed to be the source of petrol whose vapours exploded in the engine compartment when the motor was started. Prompt manual operation of the fixed fire suppression system kept relative loss to the 15 meter cruiser to 'moderate'. The boat was on a fishing excursion when the explosion occurred."



Fire extinguishing system history

Carbon dioxide fire extinguishing systems have been extensively used since the 1930s for shipboard machinery-space protection. Halon 1301 has been a widely accepted substitute since the 1960s, especially for the protection of engine compartments. Halon 1301 is efficient in suppressing fires, has low toxicity, low chemical reactivity, is not conducted by electricity and is stable when stored long term. However, because of its negative impacts on the ozone layer, production was halted in the 1990s.



The result was that most manufacturers reverted to carbon dioxide (despite the risk of asphyxiation) for large new ship builds. Clean agents, such FM-200® / FE - 227™, which extinguishes fire primarily by physical means but also by some chemical means, inert gases (nitrogen, argon and other gas mixtures) which extinguish fire by oxygen reduction and HCFC blends such as NAF S-III for smaller vessels were adopted progressively.



These clean fire protection agents preserve the desirable properties of Halon 1301—highly efficient, low toxicity, low chemical reactivity, electrical non-conductivity and high stability—and also have almost no impact on the environment. These properties, along with rapid detection and how quickly they work, make these agents excellent choices to protect marine vessels.

The applicable regulations

The Safety of Life at Sea Convention is probably the most important of the international treaties governing the safety of marine vessels, and was adopted in 1914 following the Titanic disaster. The current iteration is SOLAS 74, Chapter 11-2 which covers fixed gaseous fire suppression system requirements. Most foreign flagged vessels visiting Australia will have fixed gaseous fire suppression systems complying with International Maritime Organisation requirements.

The Australian Maritime Safety Authority regulates light commercial vessel safety around Australia while state and territory agencies administer safety requirements for private vessels. Ozone depleting substances and synthetic greenhouse gases (scheduled extinguishing agents) used in marine fire protection systems in Australia are regulated by the Australian Government through the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* (the Act) and the *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995*. Certain fire extinguishing agents are scheduled under the Act and the regulations. Scheduled extinguishing agents are listed



in the Act and include synthetic gases which deplete stratospheric ozone. The most commonly encountered scheduled extinguishing agents include:

- Halon 1301, requires a Halon Special Permit (HSP)
- Halon 1211, requires a HSP
- FM-200® (FE-227™, HFC-227ea, heptafluoropropane)
- NAF S-III (a blend)
- NAF P-III (also a blend designed primarily for use in hand portable fire extinguishers).

The inert gases and Novec™ 1230 (dodecafluoro-2-methylpentan-3-one) are not scheduled under the Act.

Servicing gaseous fire suppression systems

The environment is protected by strictly controlling the discharge of scheduled extinguishing agents (other than for putting out fires). The regulations govern the acquisition, possession, handling, storage and disposal of scheduled extinguishing agents used in Australia. They also require that technicians who work on systems containing scheduled extinguishing agents are licensed.

The value and effectiveness of marine gaseous fire suppression systems requires that they be properly designed, installed, commissioned and maintained. Put simply, if you don't get these elements right your fire protection system is more likely to fail when you need it.

Australian Standard AS 1851, *Routine service of fire protection systems and equipment*, "provides a systematic basis for minimum routine service applicable to fire protection systems and equipment". Section 7 (special hazard systems) applies to fire protection systems which use scheduled extinguishing agents such as FM-200®/ FE-227™ (heptafluoropropane), NAFS-III (an HCFC blend), FE-25 (pentafluoroethane) and FE-36 (hexafluoropropane). It cautions against unwanted discharge during servicing.



Other Australian standards which need to be understood by licensed technicians installing or maintaining systems containing scheduled extinguishing agents on boats or crafts include:

Australian Standard	Title
AS 2030.1-1999	The verification, filling, inspection, testing and maintenance of cylinders for storage and transport of compressed gases - cylinders for compressed gases other than acetylene
AS 1210-1997	Pressure vessels
AS 4214-2002	Gaseous fire suppression systems
AS 4077.1-1992	Fire protection - Fire extinguishing media - Halogenated hydrocarbons - Specifications for halon 1211 and halon 1301
AS 4077.2-1992	Fire protection - Fire extinguishing media - Halogenated hydrocarbons - Code of practice for safe handling and transfer procedures of halon 1211 and halon 1301
ISO 14520	Gaseous fire suppression systems - Physical properties and system design

Foreign flagged vessels may contain halon systems. Such systems may be recharged by purchasing halon from the National Halon Bank in Melbourne or by purchasing from companies which hold a HSP. Halon cannot be supplied to vessels registered in non-Montreal Protocol signatory countries.

A register can be viewed at:

www.environment.gov.au/protection/ozone/montreal-protocol/register-montreal-protocol-countries

Halon systems are not permitted on Australian vessels. In all cases technicians working on systems containing scheduled extinguishing agents must hold an Extinguishing Agent Handling Licence (EAHL). Scheduled extinguishing agents must only be obtained from companies holding an Extinguishing Agent Trading Authorisation (EATA).

Halons may be approved for 'essential use' and can, for example, be found on some warships. 'Essential use' status may be granted when a safe alternative is not currently available or practicable. Other naval vessels including HMAS Tobruk, HMAS Kanimbla, HMAS Success, HMAS



Leeuwin and others may be fitted with halocarbon (FM-200®) gaseous fire suppression systems.

Fire Protection Industry (ODS & SGG) Board

The Fire Protection Industry (ODS & SGG) Board, appointed by the federal Minister for the Environment, administers the fire protection division of the regulations on behalf of the Australian Government. The board exercises a range of powers and functions listed in sub regulation 311(2) in all states and territories in Australia, including to:

- receive applications and application fees for fire protection industry permits
- process applications within the 30 day time frame specified in the regulations
- issue fire industry permits in accordance with the regulations
- inspect premises as specified in the regulations.

The board also undertakes other functions outside the regulations and:

- provides customer services support to members of the fire protection industry and the general public
- undertakes a program of communications and awareness activities aimed at encouraging compliance with the fire protection industry permits scheme.

The board provides ongoing information to the fire protection industry and the general public on its activities and purpose. This improves the awareness and understanding of scheduled extinguishing agents, the legislative requirements surrounding them and the need to reduce their use and the potential risk for accidental emissions.

Marine fire safety summary

For a gaseous fire suppression system to operate effectively on boats or crafts, the board recommends the following:

- That all technicians working on gaseous fire suppression systems hold an appropriate and mandatory licence and / or authorisation (EAHL or EATA) when acquiring, possessing, disposing of or handling scheduled extinguishing agents.
- That owners of gaseous fire suppression systems use a maintenance log book to record all maintenance activity. The use of logbooks documents the process and provides a full life-cycle chain of custody document for all installed systems. A log book should record all maintenance activity and the details of the licensed technician who is servicing the system.
- Ongoing maintenance of systems to greatly improve the efficiency and longevity of the system.



The board has also published a marine industry factsheet and an *Ozone Depleting Substances and Synthetic Greenhouse Gases (ODS & SGG) Good Practice Guide*. Technicians servicing or working on marine gaseous fire suppression systems containing scheduled extinguishing agents are encouraged to download a copy of the Good Practice Guide and the factsheet from www.fpib.com.au/ozone.

The guide and factsheet provide additional information on your obligations under the regulations and further details on the issues discussed in this article.

Finally, if you would like further information in relation to this article or wish to contact the Board, please contact Julia Nicolas, Communication and Compliance Coordinator at julia.nicolas@fpib.com.au or (03) 8892 3131.

