



Ref. T4/4.01

MSC.1/Circ.1316
10 June 2009

GUIDELINES ON DETERMINING THE NO OBSERVED ADVERSE EFFECT LEVEL (NOAEL) AND LOWEST OBSERVED ADVERSE EFFECT LEVEL (LOAEL) VALUES FOR HALOCARBON FIRE-EXTINGUISHING AGENTS

1 The Committee, at its eighty-sixth session (27 May to 5 June 2009), having considered the proposal by the Sub-Committee on Fire Protection, at its fifty-third session, recognized the need for guidelines on the method to determine the NOAEL and LOAEL values referred to in the Revised Guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848) and the Amendments to the Revised Guidelines (MSC.1/Circ.1267), and approved Guidelines on determining the no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL) values for halocarbon fire-extinguishing agents, as set out in the annex.

2 Member Governments are invited to apply the annexed Guidelines when approving fixed gas fire-extinguishing systems in accordance with MSC/Circ.848 and MSC.1/Circ.1267 on or after 29 May 2009 and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

ANNEX

GUIDELINES ON DETERMINING THE NO OBSERVED ADVERSE EFFECT LEVEL (NOAEL) AND LOWEST OBSERVED ADVERSE EFFECT LEVEL (LOAEL) VALUES FOR HALOCARBON FIRE-EXTINGUISHING AGENTS

1 General

MSC/Circ.848 and MSC.1/Circ.1267 permit halocarbon agents to be used in concentrations up to the No Observed Adverse Effect Level (NOAEL) calculated on the net volume of the protected space at the maximum expected ambient temperature without additional safety measures. In no case should halocarbon agents be used at concentrations above the Lowest Observed Adverse Effect Level (LOAEL). These Guidelines prescribe the recommended protocol for determining the referred-to NOAEL and LOAEL levels.

2 Definitions

2.1 *Adverse physiological or toxicological effects* are considered to be evidence of cardiac sensitization, for the purposes of approving halocarbon fire-extinguishing agents in accordance with MSC/Circ.848 and MSC.1/Circ.1267.

2.2 *Halocarbon agent* is a fire-extinguishing medium consisting of one or more carbon atoms linked to one or more Halogen atoms from the elements bromine, chlorine, fluorine and iodine.

2.3 *NOAEL* is the highest concentration at which no adverse physiological or toxicological effect has been observed.

2.4 *LOAEL* is the lowest concentration at which an adverse physiological or toxicological effect has been observed.

3 National Fire Protection Association values

3.1 The NOAEL and LOAEL values for halocarbon agents listed in the National Fire Protection Association Standard (NFPA) 2001 are acceptable as meeting these Guidelines without further testing. For halocarbon agents not listed in NFPA 2001, cardiac sensitization testing in accordance with section 4 below should be performed to determine the NOAEL and LOAEL values.

4 Cardiac sensitization

4.1 The NOAEL and LOAEL values are based on the toxicological effect known as cardiac sensitization. Cardiac sensitization occurs when a chemical causes an increased sensitivity of the heart to adrenaline, a naturally occurring substance, which may result in the sudden onset of irregular heart beats and possibly heart attack.

4.2 The test protocol should measure the cardiac sensitization in a stepwise manner using sufficiently small changes in concentration, such that the interval between the LOAEL and NOAEL can be accurately determined.

4.3 The test animals should be exposed to a predetermined concentration of the halocarbon agent for a 5-min period. At the end of the 5-min exposure, an external dose of adrenaline (epinephrine) should be administered. If the animal experiences cardiac sensitization, an effect should be recorded.

4.4 The following standard protocols for cardiac sensitization may be used for reference:

- .1 Hardy, C.J., I.J. Sharman and G.C. Clark. 1991. Assessment of Cardiac Sensitisation Potential in Dogs. Rep. No. CTL/C/ 2521. Huntingdon Research Centre, Huntingdon, Cambridgeshire, United Kingdom.
 - .2 Reinhardt, C.F., L.S. Mullen and M.E. Maxfield. 1973. Epinephrine induced cardiac arrhythmia potential of some common industrial solvents. J. Occup. Med. 15:953-955.
 - .3 WIL Research Laboratory Reports. Project Nos. WIL12248, 12265, 12318. WIL Research Laboratories, Inc. 1992.
-