

*substitute for total flooding uses.*

HFC227-BC, which contains a combination of HFC-227ea and sodium bicarbonate, is designed for total flooding use in military combat vehicle crew and engine compartments and for industrial fire and explosion suppression systems in occupied and unoccupied areas. HFC-227ea, the main ingredient in HFC227-BC, is a halocarbon fire extinguishing agent that has previously been approved as a total flooding and streaming agent under EPA's SNAP program. It has no ozone-depletion potential and has a global warming potential (GWP) of 3800 compared to CO<sub>2</sub> on a 100-year time horizon. HFC-227ea is non-flammable. Its No Observed Adverse Effect Level (NOAEL) is 9.0% and the Lowest Observed Adverse Effect Level (LOAEL) is 10.5%. The calculated design concentration of HFC-227ea is 7.0% which provides a sufficient margin of safety for use in normally occupied areas in accordance with the safety guidelines in the latest edition of the National Fire Protection Association (NFPA) 2001 Standard for Clean Agent Fire Extinguishing Systems (*see discussion below*).

EPA is providing specific use conditions designed to protect military crew members and workplace personnel who may be present in areas where HFC227-BC is discharged. HFC227-BC is approved for use in military combat and vehicle crew and engine compartments and industrial fire or explosion suppression systems for occupied and unoccupied areas. Extinguisher bottles should be clearly labeled with the potential hazards associated with the use of HFC-227ea and sodium bicarbonate, as well as handling procedures to reduce risk resulting from these hazards. Sodium bicarbonate, while low in toxicity, also has the ability to affect blood pH level; therefore, its release in all settings should be targeted so that increased blood pH level would not adversely affect those exposed.

The addition of sodium bicarbonate in the mixture is to minimize the formation of toxic hydrofluoric acid (HF) formed by the decomposition of HFC-227ea during a fire. Sample calculations and assumptions for respirable and released sodium bicarbonate for varied enclosure sizes are included in the risk screen conducted for this substitute and available in public Docket A-2002-08 for this rule.

EPA is also providing additional comments regarding use of HFC227-BC. Use of HFC-227ea, the primary ingredient in HFC227-BC, should be in

accordance with the safety guidelines in the latest edition of the NFPA 2001 Standard for Clean Agent Fire Extinguishing Systems. Use of HFC227-BC should conform with relevant Occupational Safety and Health Administration (OSHA) requirements, including 29 CFR part 1910, subpart L, sections 1910.160 and 1910.162. Per OSHA requirements, protective gear (self-contained breathing apparatus) should be available in the event personnel should reenter the area. Discharge testing should be strictly limited to that which is essential to meet safety or performance requirements. The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

On January 29, 2002, EPA published a Direct Final Rule (67 FR 4185) to replace the use conditions imposed under SNAP for halocarbon and inert gas agents used in the fire suppression and explosion protection industry with safety standards that have been established by the National Fire Protection Association (NFPA). NFPA is an independent, voluntary membership, non-profit international organization that is dedicated to reducing the burden of fire on the quality of life by advocating scientifically-based consensus codes and standards, research, and education for fire and related safety issues. NFPA codes and standards are used by the fire protection community throughout the United States and the world.

Based on the above rule, the revised SNAP listings for halocarbon alternatives, such as HFC-227ea, include the following comment, "Use of this agent should be in accordance with the safety guidelines in the latest edition of the NFPA 2001 Standard for Clean Agent Fire Extinguishing Systems." In the edition of NFPA 2001 that was published in March 2000, safety guidelines for halocarbon and inert gas agents are found in section 1.6, entitled "Safety."

EPA's precautionary requirements are consistent with worker safety conditions required by OSHA and the NFPA 2001 Standard, as mentioned above. Individuals must adhere to OSHA regulations in all commercial applications. EPA has no intention of duplicating or displacing OSHA coverage related to the use of personal protective equipment (e.g., respiratory protection), fire protection, hazard communication, worker training or any other occupational safety and health standard. As stated in the preamble to the original SNAP rule at 59 FR 13099,

"EPA has no intention to assume responsibility for regulating workplace safety especially with respect to fire protection, nor does the Agency intend SNAP regulations to bar OSHA from regulating under its Pub. L. 91-596 authority."

HFC227-BC reduces risk to the public compared to the ODS it replaces because it has no ODP. HFC227-BC also has a lower global warming impact and produces less toxic, caustic HF than HFC-227ea alone, because less of the halocarbon agent is needed when sodium bicarbonate is also being used. Other substitutes already listed as acceptable for total flooding have a higher global warming impact and comparable toxicity. Thus, we find that HFC227-BC is acceptable, subject to use conditions, because it reduces overall risk to public health and the environment in the end use listed.

#### *B. Listing Decisions: Fire Suppression and Explosion Protection—Streaming Agents*

##### *1. Acceptable Subject to Narrowed Use Limits*

###### *a. C6-perfluoroketone*

*C6-perfluoroketone is acceptable, subject to narrowed use limits, as a halon 1211 substitute for streaming agent uses.* The narrowed use limits require that C6-perfluoroketone be used only in nonresidential applications. C6-perfluoroketone is comprised of a perfluoroalkyl ketone (1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone). C6-perfluoroketone has no ozone-depletion potential, a global warming potential of 6–100 compared to CO<sub>2</sub> on a 100-year time horizon, and an atmospheric lifetime of less than one year. It is marketed under the trade name Novec-1230. The NFPA 2001 standard refers to C6-perfluoroketone as FK-5-1-12myy2. In studies on C6-perfluoroketone, the NOAEL is 10% and the LOAEL is >10%.

EPA has reviewed the potential environmental impacts of this substitute and has concluded that, by comparison to halon 1211, C6-perfluoroketone significantly reduces overall risk to the environment. With no ozone-depletion potential, a global warming potential value of less than 1, and an atmospheric lifetime of less than three days, C6-perfluoroketone provides an improvement over use of hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) in fire protection. EPA's review of environmental and human health impacts of this blend is contained in the public docket for this rulemaking.