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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

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Item 3 of the provisional agenda
Listing, classification and packing

Fire suppression devices that contain a pyrotechnic material

Transmitted by the Council on the Safe Transportation of Hazardous Articles (COSTHA)*

Introduction

1. This document is submitted in response to multiple discussions, beginning in the fifty-fifth session of the Sub-Committee and proposals presented previously by France and COSTHA. There have also been several deliberations within the Working Group on Explosives (EWG). COSTHA respectfully submit this proposal for a new entry to the dangerous goods list for fire suppression dispersing devices on the basis of information and recommendations provided during the previous work. With the ever-increasing number of these devices being transported as cargo and used for fire protection including within the cargo containers, it is important to have a consistent method of classification and handling to ensure international harmonization and to avoid the need for domestic and regional competent authority approvals. These devices directly support life and safety of passengers and operators of vehicles as well as inhabitants and property in facilities around the world.

2. Aerosol extinguishing systems offer significant advantages over traditional extinguishing systems, including improvements in space, weight which advance the ability to protect hazards such as vehicles, vessels, etc. Aerosol systems are being adopted to provide fire protection in applications where fire protection was considered prohibitively expensive previously. Aerosol extinguishing systems are also preferred because they do not pose the environmental detriments or occupied space safety risks as compared to other fire suppression alternatives.

3. Numerous working documents and informal documents have been submitted expressing the need for a method to safely transport fire suppression dispersing devices in a consistent manner across the global, regional, and local dangerous goods safety regulatory system. These devices are becoming more and more common as fire extinguishing solutions for buses, trains, trucks, vessels, planes as well as stationery and storage facilities due to their ability to extinguish fires without destroying the surrounding environment. They are particularly effective in support of battery energy storage systems that are needed to support

* A/75/6 (Sect.20), para. 20.51

the global environmental protection goals, promote sustainable development, and combat global warming. Previous submissions on this topic include documents:

- ST/SG/AC.10/C.3/2019/61
- UN/SCETDG/56/INF.28
- UN/SCETDG/56/INF.51
- ST/SG/AC.10/C.3/2020/25
- UN/SCETDG/59/INF.3
- UN/SCETDG/59/INF.32
- ST/SG/AC.10/C.3/2022/25
- UN/SCETDG/60/INF.33
- UN/SCETDG/60/INF.41

4. Document ST/SG/AC.10/C.3/2022/25 proposed a new entry to the dangerous goods list. The new entry included the proper shipping name: Fire Suppression Dispersing Devices. As discussed in document ST/SG/AC.10/C.3/2022/25, many competent authorities have granted approvals classifying these devices as UN 3268, Safety Devices, Class 9 or even as unregulated. There have been concerns that this proper shipping name does not provide an appropriate description of the intended function of the device since the proper shipping name is very broad and non-descriptive.

5. Additionally, when these devices are classified as an explosive, based upon containing a pyrotechnic substance, they typically are classified as: UN 0432 Articles Pyrotechnic for technical purposes. This proper shipping name does not adequately describe the intended function associated with these devices which is to extinguish fires. For this reason, COSTHA requests a new entry be included in the Dangerous Goods List to describe these articles more appropriately.

6. During the EWG discussions at the sixtieth session, there were three main concerns expressed that are addressed in this paper: (i) the temperature of the device in the unlikely event of actuation in transport; (ii) the devices when actuating can emit carbon monoxide (CO), when functioning; (iii) the device, as it is designed to function produces fire suppressant, which would likely fail the obscuration requirement within the exclusion criteria in 2.1.3.6.4.

7. When the device actuates, an exothermic reaction takes place, which can produce temperatures in excess of those stipulated in the exclusion criteria in 2.1.3.6.4. The auto-ignition temperature of paper is between 218 °C and 246 °C, it is important to reduce the probability of any heat dissipation that might cause a fire in an adjacent packaging. This is similarly tested using the 6(d) test; however, that test protocol authorizes a distance of 25 cm from the package. COSTHA proposes a test protocol that could quantitatively show that no effect of heat can propagate from one package to another. Although the probability of actuation of these types of devices in conditions normal to transport is negligible, COSTHA proposes that the following language be included in the special provision to ensure that this effect is mitigated for the Class 9 entry:

> *"The article shall be packaged in a manner such that in the event of unintentional actuation, temperatures of the outside of the package shall not exceed 200 °C."*

This provision will provide a quantitative, performance-based solution to the concern regarding the potential temperature on the external surface of the device during actuation.

8. The devices when actuating can emit carbon monoxide (CO). CO is a common result of the degradation of pyrotechnic substances. There was concern that CO in high concentrations could lead to a toxic environment. These types of devices are designed, manufactured, installed, and maintained in accordance with a number of different national and international standards (e.g., NFPA 2010, EN 15276-2:2019, ANSI/CAN/UL-2775:2022A, ISO 15779, US EPA SNAP List, etc.) that address the safety of personnel in confined spaces. Within these standards, there is a differentiation between devices approved

for occupied spaces and those NOT approved for occupied spaces. COSTHA believes the special provision allowing these to be transported as Class 9 should only include devices approved through national or international standards for the safe use in occupied spaces.

9. The device, as it is designed to function, produces fire suppressant that would likely fail the obscuration requirement within the exclusion criteria in 2.1.3.6.4. It is our contention that the obscurant requirement is intended to prevent the production of fumes or smoke that would impede firefighting efforts in the immediate area of the package. This dispersant is a product of the degradation of the pyrotechnic substance, which is designed to emit particles that extinguish fires. It is not smoke or harmful fumes that would impede firefighting capabilities. In fact, the fine particulate emitted is a fire suppressant; therefore, the presence of the obscurant emitted by the device would assist in fire suppression.

10. The decision to develop the new entries is a policy decision with precedent. This policy decision should include consideration of the following factors:

Risk, probability and consequence. These devices, as designed and constructed, have a negligible probability of accidental or unintentional actuation during conditions typical to transport. As prepared for shipment, these devices will not actuate unless they reach an internal temperature of around 300 °C at which point they will actuate and disperse fire suppression aerosols.

Public benefit. These devices are used in public transport vehicles, office buildings, server farms and electric storage systems to protect people and high value objects. Additionally, these devices have been proven to be very successful in inhibiting and slowing thermal runaway propagation in lithium battery incidents and are increasingly being used in cargo containers in lieu of piped in systems.

International harmonization. Having articles described and classified differently by different countries has a significant negative impact to the dangerous goods safety system. COSTHA believes this proposal will provide the structure to improve harmonization as more and more of these devices are shipped and used.

11. It is important to reiterate the effectiveness of these devices in suppressing thermal runaway in lithium battery incidents. The proliferation of energy storage systems and electric vehicles to support green energy initiatives and protection of the environment will result in an increased demand for green and effective fire suppression systems. These devices, when manufactured in accordance with the well-known industry standards, will provide this effective and environmentally friendly solution.

12. Regarding the toxicity concern expressed previously, the United States Environmental Protection Agency (EPA) has developed the Significant New Alternatives Policy (SNAP) Program, which is intended to identify acceptable and unacceptable substitutes for ozone-depleting substances (ODS) that have been used in sectors including: refrigeration, cleaning, aerosols, sterilization, and fire suppression, etc. Acceptance of an end-product into the SNAP program is typically based upon screening assessments of potential human health and environmental risks posed by the ODS substitute. For fire suppression systems, the SNAP program evaluates the relative toxicity risk of systems intended for “normally occupied spaces”. The SNAP acceptance includes an evaluation of the substance including:

- Atmospheric assessment
- Potential health effects
- Occupational exposure assessment
- End-use exposure assessment
- General population assessment
- Volatile organic compound assessment

Acceptable methods of testing the toxicity of these types of fire suppression devices include a 15 minute exposure test. Results of these tests were submitted to the EPA as part of the SNAP acceptance application.

13. The SNAP Program is an example of how national authorities are evaluating the toxicity of fire suppression systems. Other examples of national and industry standards for these devices, including provisions for occupied spaces, are:

- NFPA 2010
- EN 15276-2:2019
- ANSI/CAN/UL-2775:2022A
- ISO 15779:2011 – *NOTE: This standard has not been reviewed or updated since 2011. It appears that this standard has effectively replaced by EN 15276-2:2019.*

14. The relevance of being approved for "normally occupied spaces" is that these devices are designed, manufactured and tested for the protection of life, with applications including aircraft, ships, trains, motor vehicles, kitchens, offices and machinery spaces. Within these standards, there is a differentiation between devices approved for occupied spaces and those NOT approved for occupied spaces. COSTHA believes the special provision allowing these to be transported as Class 9 should only include devices approved through national or international standards for the safe use in occupied spaces.

15. The authors are aware of at least eleven companies around the world producing these types of devices. There are no known transport incidents involving these devices, regardless of their classification, which further supports the inherent safety built into their design and intended function.

Proposal

In 3.2 insert new entries to read as follows:

UN No.	Name and description	Class or div	Sub hazard	UN packing group	Special provisions	Limited and excepted quantities		Packagings and IBCs		Portable tanks and bulk containers	
								Packing instruction	Special packing provisions	Instructions	Special provisions
35XX	Fire Suppression Dispersing Devices	9			XYZ	0	EO	P003			
0XXX	Fire Suppression Dispersing Devices	1.4S				0	E0	P135			

In 3.3.1 add a new special provision XYZ to read as follows:

"XYZ This entry applies to fire suppression dispersing devices. The article shall only be transported as Class 9 with the means of actuation removed or disconnected and a secondary means of protection to prevent inadvertent activation. These articles, as presented for transport shall be successfully tested in accordance with test series 6(c) of Part 1 of the Manual of Tests and Criteria, with no explosion of the device, no fragmentation of the device casing and no projection hazard which would significantly hinder firefighting or emergency response efforts in the immediate vicinity. The dispersant shall be deemed safe for normally occupied spaces in compliance with international or regional standards. The article shall be packaged in a manner such that in the event of unintentional actuation, temperatures of the outside of the package shall not exceed 200 °C.

Additionally, these devices shall meet the exclusion criteria in 2.1.3.6.4 (b), (c) and (d). Any article not meeting the provisions of this special provision shall be classified as UN 00XX, Fire Suppression Dispersing Device, 1.4S.

This entry does not apply to "SAFETY DEVICES, electrically initiated" described in special provision 280 (UN 3268)."

16. The entry name in the index should be amended as follows:

Name and description	**Class**	**UN Number**
Fire Suppression Dispersing devices	9	35XX
Fire Suppression Dispersing devices	1.4S	0XXX

17. In 3.3.1 amend special provision 280 by adding the following language at the end:

"This entry does not apply to life saving appliances described in special provision 296 (UN Nos. 2990 and 3072) and fire suppression dispersing devices (UN Nos. 35XX and 0XXX)."

18. In Appendix B, Glossary of Terms, add the following entry:

"Fire suppression dispersing devices"

"Articles which contain a pyrotechnic substance that are intended to disperse a fire extinguishing agent (or aerosol) when actuated. The devices shall be either electrically activated, manually actuated, or thermally activated."