ASTM Standards for Halon 1211

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Background

- Need for a standard specification for Halon 1211 prompted by the mid-2009 discovery of contaminated Halon 1211
- Handheld extinguishers containing contaminated Halon 1211 installed on European aircraft, some on US carriers



Background

- Prior Halon 1211 Standards
 - ISO 7201-1
 - MIL-DTL-38741A
 - Both standards lack detailed methodology for purity assay via gas chromatography (GC)
 - Presents risk of failure to detect and/or identify impurities in Halon 1211



ASTM D7673-10 Standard Specification for Halon 1211

- Issued 2010
- Requirements for Halon 1211 as a firefighting medium
- Does not address equipment or hardware
- Does not address handling, transportation or storage



Material Requirements

- Type I Mixtures of Halon 1211 and Nitrogen
- Shall conform to the following requirements

Table 1: Requirements

Property	Requirement
Halon 1211 purity, % by mol, min	99.0
Acidity, ppm by mass, max	3.0
Water content, ppm by mass, max	20
Nonvolatile residue, % by weight, max	0.02
Suspended matter or sediment	None visible
Color	Report value



Material Requirements

- Type II Halon 1211
- Shall conform to purity requirements of Type I
- Shall contain no more than 1.5% by volume non-condensable gases in the vapor phase, expressed as air
- By agreement between purchaser & supplier, analysis may be required and limits established for compounds not specified in Table 1



Test Methods

- Purity: by gas chromatography (GC) or gas chromatography/mass spectrometry (GC/MS)
- Acidity: 2008 App. C to AHRI 700-2006, part 1
- Water Content: 2008 App. C to AHRI 700-2006, part 2
- Nonvolatile Residue: 2008 App. C to AHRI 700-2006, part 3
- Non-condensable gases: 2008 App. C to AHRI 700-2006, part 4
- Suspended Matter and Sediment: Visual observation
 - Any observed suspended matter or sediment = failure
- Color: ASTM D2108
 - Results should be used as an indicator of other contamination
 - Results inconsistent with the outcome from other required tests will be basis for repeat testing to validate test results of specific properties



ASTM D7815-12



- Standard Practice for Handling, Transportation, and Storage of Halon 1211, Bromochlorodifluoromethane (CF₂BrCl)
- Issued Fall 2012
- Addresses Handling, Transportation and Storage of Halon 1211



ASTM D7815-12

SCOPE

"Covers guidance and direction to suppliers, recyclers, reclaimers, purchasers, and users in the handling, transportation, and storage of Halon 1211"

SIGNIFICANCE & USE

"Provides requirements for the handling, transportation, and storage of Halon 1211 encountered in distribution through both commercial and military channels. It is intended to ensure that Halon 1211 is handled, transported, and stored in such a way that its physical property values are not degraded. Transport may be by various means, such as, but not limited to, highway, rail, water, and air."



ASTM D7815-12: Handling

- Personnel trained in relevant CGA, CFR documents
- Personnel who handle or store cylinders of Halon 1211 trained to recognize and identify the characteristics of the product and the proper methods of safely handling full, partly full, and empty cylinders
- All Halon transfers between storage containers and recycling processes performed by personnel trained in handling procedures



ASTM D7815-12: Handling

- Halon 1211 recycling/transfer processes in conjunction with the equipment requirements specified by the manufacturer
- Provisions made to ensure that service areas limit
 Halon 1211 concentrations to not exceed 1 % v/v
 for 1 min and 0.01 % v/v for an 8 h time weighted
 exposure
- Cylinders shall not be overfilled



ASTM D7815-12: Handling

- Handling of materials in a manner that prevents contamination or commingling of materials other than Halon 1211
- Cylinders free of dirt and contamination
- Precautions taken to prevent the entry of oil, water, or any foreign matter into the container



ASTM D7815-12: Transportation

- Transportation in accordance with DOT regulations of CFR Title 49
- Shipment of materials between distributors, collectors, recyclers, and reclaimers within approved DOT guidelines for Class 2.2, regulated materials
- Design pressure requirements in accordance with 49 CFR 173.304



ASTM D7815-12: Transportation

- Compressed gas cylinder marking requirements in accordance with 49 CFR 178
- Shipping name for Specification D7673 Type II (pure)
 Halon 1211 is "Chlorodifluorobromomethane "or
 "Refrigerant Gas R12B1," UN 1974, Hazard Class
 2.2 (nonflammable gas).
- Shipping name for superpressurized Halon 1211 is "Liquefied Gas, nonflammable charged with nitrogen," UN1058, Hazard Class 2.2 (nonflammable gas).



ASTM D7815-12: Storage

- Storage in accordance with CGA Publication P-1 Safe Handling of Compressed Gases in Containers, in qualified cylinders in accordance with 49 CFR 173 and 178
- Storage containers fitted with pressure-release mechanisms to limit vessel pressure to not more than the minimum required test pressure of the cylinder. Safety relief valves shall be set at no less than 75 %, nor more than 100 %, of the minimum required test pressure of the cylinder



ASTM D7815-12: Storage

- Periodic hydrostatic testing and re-inspection of cylinders used for Halon 1121 shall comply with 49 CFR 173.34
- Containers used for storage of Halon 1211 conforming to Specification D7673 shall be clearly marked and labeled to identify whether the Halon 1211 contained conforms to either Type I or Type II of Specification D7673
- Cylinders shall be stored in a manner that will prevent contamination from external sources



ASTM D7815-12: Storage

Extreme Elevated Temperature Considerations

- When Type I or Type II mixtures of Halon 1211 may be exposed to constant temperatures at or greater than 131°F (55°C) during transportation or storage, higher container pressures will be encountered that require alternative fill in the container
- A maximum non-condensable gas content of 1.5 % is recommended for long-term storage of Type II Halon 1211



ASTM D7815-12: Inspection

- Halon 1211 that has been reclaimed or recycled using approved reclamation systems may be released for reissue, provided test examination to validate the material to specification is fulfilled
- Reclaimed or recycled Halon 1211 that cannot be proven to comply with Specification D7673 shall not be reissued



ASTM Specifications for Halon 1301

ASTM D5632-12 Standard Specification for Halon 1301

- Requirements for Halon 1301 as a firefighting medium
- ASTM D5631-11 Standard Practice for Handling, Transportation and Storage of Halon 1301
 - Guidance and direction to suppliers, recyclers, reclaimers, purchasers, and users in the handling, transportation, and storage of Halon 1301



Conclusion

- ASTM D7673-10 covers the requirements for Halon 1211 as a fire fighting medium
 - Purity analysis includes detailed GC and GC/MS methodologies
- ASTM D7815-12 covers the requirements for the handling, transportation and storage of Halon 1211
- Adherence to ASTM D7673-10 and ASTM D7815-12 will ensure the performance and safety in use of Halon 1211 for suppliers, recyclers, reclaimers, purchasers and users

