

Appendix 1: Hand Held Fire Extinguisher Hidden Fire Test

DRAFT

PURPOSE

The purpose of this test is to evaluate the effectiveness of candidate replacement hand held streaming agents in a flooding situation. Halon 1211, a streaming agent, has been shown to be an effective flooding agent, both in this test and in the field. This test will ensure that there is no loss of safety when newer, more environmentally friendly agents replace Halon 1211 in service.

BACKGROUND

Halon 1211 was initially selected for use in aircraft cabins in response to the Arsonist / Hijacking scenario. This scenario, consisting of gasoline splashed on a seat cushion and ignited, is still a concern and the basis for the second performance test described in Appendix 2. Later, it was determined that Halon 1211 in hand held extinguishers, while primarily a streaming agent, provided the capacity to act as a flooding agent. This was demonstrated on an in flight cheek area fire in a large transport aircraft, possibly preventing the loss of the aircraft. KIDDE International –UK, developed the test described in this section by Mr. A Chattaway. (ref 2) The operating procedure has been refined and standardized at the FAA Technical Center, USA.

TEST DESCRIPTION

A candidate fire extinguisher is discharged into the left side of a rectangular box. Inside the box are twenty small cup fires arranged in five arrays of four. The arrays are separated by solid and perforated baffles. The baffles require the agent to extinguish the fire by indirect means. The extinguisher is discharged fully and the total fires extinguished are counted. Baseline testing with Halon 1211 extinguished nine fires.

TEST APPARATUS

The test is conducted in a rectangular box two meters high, 2 meters long and one half meter wide. One long side of the box is fitted with clear Plexiglas to allow an unobstructed view of the interior. The interior of the box is fitted with 20 metal cups, 35mm in diameter, arranged in three vertical arrays of four cups and one vertical array of eight cups. Baffles perforated to allow thirty-three percent hole area separate the arrays. The lower end of each baffle is fitted with solid stop plates, in line with the extinguisher injection port. The first three arrays and the top four cups of the fourth array are installed in the upper half of the test fixture. The lower four cups of the fourth array are installed in the lower half of

the fixture. Two ventilation ports are cut into the left side of the box, at the top and bottom of the fixture. A two-inch hole is cut into the same side, through which the extinguisher agent is introduced.

Fire Loading

The twenty cups in the four arrays are loaded with 10 ml of water and 5 ml of nheptane, floated on top of the water.

Instrumentation

The interior temperature of the box is measured in a central location near the top of the fixture. The temperature is to be recorded prior to each test. The test is recorded on videotape.

Extinguisher Rating.

The candidate extinguisher must be approved by a recognized fire testing laboratory and have a minimum rating of UL 5BC, or an equivalent rating to 2.5 pounds of Halon 1211.

TEST PROCEDURE

This test is to be performed five times for each extinguisher / agent combination to be certified. The results from the five tests are to be averaged. Subsequent changes in hardware that affect the spray pattern or discharge time, or quantity and formulation of agent, require that the extinguisher be recertified.

1. Operating Temperature: The test fixture and the extinguishers are to be equilibrated at a temperature of 70-90 degrees Fahrenheit. If successive tests are to be run, the test fixture must be allowed to cool to the prescribed temperature.
2. Agent Weight: The extinguisher is to be weighed before and after discharging to determine the weight of the agent discharged.
3. Extinguisher Mounting: The loaded extinguisher is mounted on the side of the fixture such that the nozzle is directed through the two inch hole in the left side of the fixture. Care must be taken with the nozzle orientation to insure that the discharge stream is level and centered left to right through the discharge port.
4. Fire Loading: The cups are loaded with 10-ml water and 5 ml nheptane and ignited. The access doors are closed at this time. A preburn of 30 seconds is timed from the closing of the access doors.
5. Extinguisher Discharge: The extinguisher is discharged fully at the end of the 30 second preburn. A stopwatch is used to measure the discharge time.

6. Test Results: The number of fires extinguished up to 60 seconds after discharge is noted.

At the conclusion of the test, the access doors are to be opened to vent the fixture and any remaining fires are extinguished. The temperature in the box is allowed to return to 70 to 90 degrees F. The remaining contents of the cups are emptied and the cups are cleaned to remove any residue to insure that subsequent tests are not compromised.

Test Report

A report is generated at the end of each series containing the following information:

Agent, extinguisher manufacturer, extinguisher rating, extinguisher model and serial numbers, weight of agent, fixture temperature at the start of the test, number of fires extinguished for each test, average number of fires extinguished for the series of five tests.

Minimum Performance

The candidate replacement agent must extinguish a minimum of nine fires when averaged over the five tests.