

Chapter 10 Fire Containment Test of Waste Stowage Compartments

10.1 Scope

- 10.1.1 These methods are intended for use in determining the fire containment capability of containers, carts, and compartments used to store combustible waste materials according to the requirements of FAR 25.853(e) through Amendment 51.
- 10.1.2 Parts construction used for the top, bottom, and sides of these compartments must meet the requirements of FAR 25.853 and FAR 25.855. These tests are covered elsewhere in this handbook in chapter 1, Vertical Bunsen Burner Test for Cabin and Cargo Compartment Materials, chapter 2, 45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Materials, and chapter 4, 60-Degree Bunsen Burner Test for Electrical Wire.
- 10.1.3 There are multiple test arrangements covered in this specification: Entree Carts, Meal Carts, Waste Carts, and Waste Compartment Meal Boxes (see table 10-1 for meal boxes).

Table 10-1. Meal Box Test Arrangements

Equipment Description	Meal Box Stowed in Open Galley Compartment	Enclosed Galley Compartment	Open Cart Compartment	Enclosed Cart Compartment
Metallic meal box, complete enclosure	No test required	No test required	Test meal box within trolley compartment	Test trolley
Metallic meal box, incomplete enclosure	Uncertifiable for waste storage	Test meal box within the compartment	Uncertifiable for waste storage	Test meal box within trolley compartment
Nonmetallic meal box, complete enclosure	Test meal box (unstowed)	Test meal box (unstowed)	Test meal box within trolley compartment	Test trolley compartment with and without meal box
Nonmetallic meal box, incomplete enclosure	Uncertifiable for waste storage	Test meal box/compartment	Uncertifiable for waste storage	Test trolley compartment with and without meal box

10.2 Definitions

10.2.1 Air Ducting

Air ducting is used for conveying chilled air to and from carts.

10.2.2 Waste Cart

An enclosure on wheels that provides a means of accumulating and/or storing waste.

10.2.3 Meal Cart

An enclosure on wheels used to store food and used or unused service trays that might contain waste.

10.2.4 Entree Cart

An enclosure on wheels used to cook or store food at elevated temperatures and transport/store unused or used food service trays that might contain waste.

10.2.5 Integral Floor

The bottom panel of a waste compartment.

10.2.6 Waste Compartment (Galley or Lavatory Module)

An enclosure or shell structure with access provisions, such as a waste chute opening or doors, designed for the purpose of accumulating or storing waste.

10.2.7 Waste Container

A removable receptacle stored within a waste compartment or waste cart designed to accumulate or store waste within the compartment or cart.

10.2.8 Meal Box

A removable enclosure located in a meal trolley or galley compartment used to store food and used or unused service trays that might contain waste.

10.3 Test Apparatus/Equipment

10.3.1 Thermocouple(s)

A thermocouple may be needed to monitor internal test unit temperature.

10.3.1.1 If a thermocouple is used for meal or entree carts, it will be installed 1.5 to 2 inches above the top-most tray. A second thermocouple will be placed on the bottom tray in a similar manner.

10.3.1.2 For waste compartments/carts, a single thermocouple is inserted through the waste flap and placed 1.5 to 2 inches above the waste combustibles surface.

10.3.2 Thermocouple Readout/Recording

If used, thermocouples will be connected to a system that is capable of providing continuous temperature readings. A recording system will be used so that temperatures can be recorded continuously or at intervals not exceeding 15 seconds.

10.3.3 Galley

Galley structure is used to simulate the interface needed for the stowed cart test arrangements.

10.3.3.1 The galley structure will be equipped with power outlets and air inlet/outlet ducting to circulate ambient air at the design-specified airflow to the cart when set up to conduct testing.

10.3.4 Waste Materials

10.3.4.1 Combustibles

10.3.4.1.1 The meal cart arrangement includes the following combustibles:

One set of plastic eating utensils

One cup

One salad dish

One salad dressing container

One entree dish

One dessert dish

One crumpled 2-ply paper napkin, approximately 16 by 16 inches

The trays, each loaded with the above combustibles or equivalent representative materials found in service, will be inserted into the cart so that 75 percent of the trays are loaded in the cart starting from the bottom.

10.3.4.1.2 For the entree cart test arrangement, combustibles will consist of the same items per tray as for the meal cart for the stowed test. For fire source, the bottom tray will have an entree dish half filled with methyl alcohol to simulate grease. The napkin will not be located near the alcohol source. For the unstowed test, treat the entree cart as a meal cart.

10.3.4.1.3 For the waste compartment/waste cart, combustibles will be crumpled and consist of the following proportions of materials or an equivalent:

Eight 2-ply paper and towels, approximately 10 by 11 inches (40 percent by number)

Five 2-ply paper napkins, approximately 16 by 16 inches (25 percent by number)

Four 8-ounce paper hot drink cups (20 percent by number)

Two 3-ounce paper cold drink cups (10 percent by number)

One empty cigarette package (5 percent by number)

The total amount of the above crumpled combustibles in the above proportions will be sufficient to fill the waste compartment or waste container to three-fourths capacity.

10.4 Test Unit

10.4.1 The unit to be tested will be equivalent to an actual production unit, built to drawing specifications and tolerances.

10.4.2 A statement of conformity will be obtained for each test unit prior to testing.

10.5 Test Arrangements

10.5.1 Meal Cart Test Arrangements

10.5.1.1 The unstowed meal cart arrangement requires a condition where the cart is tested in a freestanding position. Photographs (refer to section 10.7.3) will show the door with the chilled air duct interfaces (if applicable).

10.5.1.2 Stowed Meal Cart

The stowed meal cart test arrangement requires the cart be installed in the galley cart compartment with the air inlet/outlet openings connected to the air ducting. During the test, air is to be circulated through the cart at the design flow rate. To simulate the cart/galley interface, photographs of the meal cart should be taken from the side to show the cart vendor. The maximum cart/galley misalignment will be reproduced during the test.

10.5.2 Waste Cart Arrangements

Testing both with and without the waste container is required if the waste container is nonmetallic. The waste cart interface with the galley (i.e., galley waste flap and waste chute) is also required to be simulated if the waste chute enters the cart enclosure and/or keeps the cart waste flap open.

10.5.2.1 An unstowed waste cart (waste container not installed) test arrangement requires a freestanding position at room temperature and still air. Photographs must be taken showing the cart door and flap.

- 10.5.2.2 An unstowed waste cart (waste container installed) test arrangement requires that the cart be in a freestanding position, per section 10.5.2.1, with the waste container installed.
- 10.5.2.3 A stowed waste cart (waste container not installed) test arrangement requires that the interface of the galley structure with the cart be simulated. The cart will be stowed in a galley mockup that completely simulates the galley/cart interface. Photographs will be taken that clearly show the waste chute/waste cart interface and the cart door during the test.
- 10.5.2.4 The stowed waste cart (waste container installed) arrangement is equivalent to section 10.5.2.3, except that a waste container is installed.

10.5.3 Entree Cart Arrangement

- 10.5.3.1 An unstowed entree cart test arrangement requires that the cart be tested in a freestanding position at room temperature and still air.
- 10.5.3.2 A stowed entree cart test arrangement requires that the cart be connected to the galley power and, if applicable, air ducting outlets. Power will be supplied to the cart for the duration of the test. All heaters and fans will be switched on with any timers set to the maximum duration. If the cart receives air from the galley ducting when the power is switched off, then a third test (stowed meal cart test arrangement) is required.

10.5.4 Waste Compartment Arrangements

- 10.5.4.1 The only condition in which waste compartments without an integral bottom or base panel are to be tested is with the waste container installed within the waste compartment. If a liner is used within the waste container, the test will be conducted both with and without the liner installed. Ambient condition will be room temperature and still air. Photographs will show the compartment door and the waste flap.
- 10.5.4.2 Waste compartments may be tested without a waste container for waste compartments with an integral floor. If the waste container is nonmetallic, then a waste compartment with an integral floor must be tested both with and without the waste container installed. If a liner is used within the waste container, the test will be conducted both with and without the liner installed.

10.5.5 Meal Box Arrangements

The different types and arrangements of meal boxes that require testing are defined in table 10-1. Meal boxes are to be tested in the same manner as a meal cart (see section 10.6.1).

10.6 Procedure

10.6.1 Ignition

10.6.1.1 Meal Cart

10.6.1.1.1 Stowed Meal Cart Test Arrangement

Ignite two crumpled 2-ply paper napkins, approximately 16 by 16 inches in size. Place them side by side adjacent to the combustibles, defined in section 10.3.4, already in place on the bottom tray the greatest possible distance from the air inlet/outlet openings of the cart. Allow a good flame front to develop by allowing approximately 50 percent of the surface of the waste materials to ignite. Insert the tray into the cart, record the temperature, and close the door. Place the cart into the simulated galley structure so that it is connected with the galley duct/cart interface. The airflow through the cart will be at the design airflow rate.

10.6.1.1.2 Unstowed Meal Cart Test Arrangement

Ignite two crumpled 2-ply paper napkins, approximately 16 by 16 inches in size. Place them side by side adjacent to the other combustibles, defined in section 10.3.4, already on the bottom tray. Allow a good flame front to develop by allowing approximately 50 percent of the surface of the waste materials to ignite. Insert the tray into the cart and simultaneously close the door and record the temperature, if the temperature is being monitored.

10.6.1.2 Entree Cart

10.6.1.2.1 Stowed Entree Cart

Connect the entree cart filled with the combustibles of section 10.3.4.1.2 to the power source and energize all heaters and/or fans. Ignite the methyl alcohol in the entree dish on the bottom tray by placing a burning napkin onto the tray. Insert the tray into the cart, close the cart door, and simultaneously record the temperature, if the temperature is being monitored.

10.6.1.2.2 Unstowed Entree Cart

Proceed per the unstowed meal cart test configuration of section 10.6.1.1.2.

10.6.1.3 Waste Cart

10.6.1.3.1 Stowed Waste Cart With Waste Container

Ignite a paper napkin and place it in the waste container through the waste flap. Allow a good flame front to develop by allowing 50 percent of the surface of the waste materials to ignite. Close the waste flap and simultaneously record the starting temperature.

10.6.1.3.2 Stowed Waste Cart Without Waste Container

Proceed per section 10.6.1.3.1, except that no waste container is used.

10.6.1.3.3 Unstowed Waste Cart With Waste Container

Proceed per section 10.6.1.3.1.

10.6.1.3.4 Unstowed Waste Cart Without Waste Container

Proceed per section 10.6.1.3.2.

10.6.1.4 For the waste compartment with and without waste container, proceed per applicable waste can arrangement, sections 10.6.1.3.1 and 10.6.1.3.2.

10.6.1.5 For the meal box, proceed per section 10.6.1.1.

10.6.2 Temperature

If the temperature is being monitored, it will rise rapidly, peak, and then fall below 150°F (66°C) as the flame dies out. The peak in temperature is necessary to identify that combustion has taken place. An example of this temperature peak is visualized in the temperature versus time plot shown in figure 10-1. When the temperature indicated by the thermocouple falls below 150°F (66°C), the test is terminated and the item examined for damage. If a suitable temperature peak above 150°F (66°C) is not obtained after three trials, sufficient ventilation will be provided to achieve a peak.

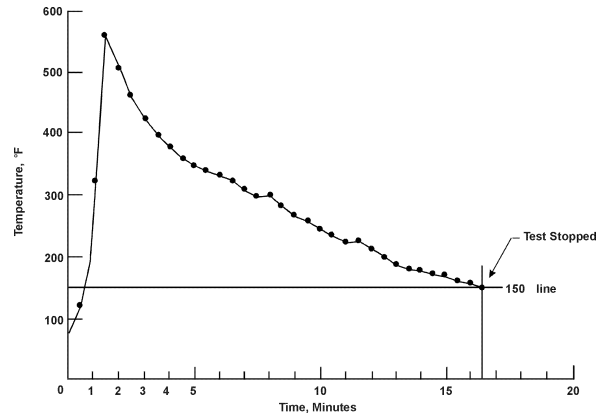


Figure 10-1. Sample Fire Containment Temperature versus Time Plot

10.6.3 Photographs

Photographs, preferably in color, are required to document the progress of the test. Suggested photographs that may be taken include the test unit before test, test setup, at time of ignition (with door or flap enclosed), at 30 seconds, 1 minute, 2 minutes, 3 minutes, 5 minutes, 7 minutes, and 10 minutes into the test, and at 5-minute intervals thereafter. Include detailed photographs showing any damage sustained as a result of the fire. Photographs taken during the test shall have a dark background to show smoke in contrast.

10.6.4 Inspection

After the test has been terminated, the test unit will be inspected for damage. The doors will be opened and the extent of combustion of the waste materials will be noted. Photographs will be taken of these waste materials and any damage to the cart or compartment, or lack of damage. Care should be taken to completely document any damage, from simple smoke stains and melting of trays to major burnthrough of any panels.

10.7 Report

10.7.1 Identification of Specimen

Completely identify the unit being tested and its intended use.

10.7.2 Description

The results of the test will be described in a concise manner regarding any observable smoke or fire from within the item. Any deterioration, burnthrough, or deformation of the panels caused by heat or flame will be noted and described along with the time of occurrence. Any damage to the item and/or surrounding structures during the test will be noted. Any damage to the contents will be described, including the degree of combustion of the articles placed within the unit, and damage to trays, seals, etc.

10.7.3 Temperature Versus Time Plot

A temperature versus time plot may be supplied in the report if temperature is monitored during the test. An example of a temperature versus time plot is shown in figure 10-1.

10.7.4 Test Photographs

The photographs taken (per section 10.6.3) of the test method will be included with the report. Photocopies of photographs are not acceptable. A short description will accompany each photograph.

10.7.5 Acceptance of Results

A statement as to whether the acceptance criteria are met will be made in the report.

10.7.6 Statement of Conformity

The statement of conformity sheet will be included with the test report.

10.7.7 Summary of Data

A summary may be prepared and included with the test report.

10.8 Requirements

- 10.8.1 The temperature indicated by the thermocouple(s), if used, after ignition will rise rapidly, peak, and then fall steadily as the fire burns out. To be valid, the test will have a definitive peak to demonstrate that a fire has taken place. If no peak is visible or a good flame front cannot be achieved, the test will be repeated up to three times to demonstrate that sufficient effort has been made to produce such a temperature peak or flame front.
- 10.8.2 The test unit will be able to contain a fire within the enclosure.
- 10.8.3 Fire/flame will not penetrate through or issue from the bottom, top, or sides of the waste compartment/container, and adjacent material will not be ignited by heat from the test article.
- 10.8.4 Smoke will be contained within the waste compartment/container to the extent that the smoke level produced in the cabin does not create a hazardous condition or interfere with firefighting procedures.

Chapter 10 Supplement

This supplement contains advisory material pertinent to referenced paragraphs.

10.2.5 An integral floor is part of the galley/cart waste compartment. It is not the aircraft floor panel.

10.5.1 Misalignment generally refers to maximum air gaps, maximum seal interfaces, minimum overlaps, etc., allowed by drawing tolerances. Misalignment must be simulated during testing because with repeated waste receptacle handling, seals are unlikely to remain airtight. Misalignment may be represented during the test by using a 3/4-inch-long shim to support the door opening representing the allowable tolerance in the design drawings.