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Recommended Fire Safety Practices for Transit Bus and Van Materials Selection; Notice

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DEPARTMENT OF TRANSPORTATION

Federal Transit Administration

[Docket 90-A]

Recommended Fire Safety Practices for Transit Bus and Van Materials Selection

AGENCY: Federal Transit Administration, DOT.

ACTION: Notice.

SUMMARY: The Federal Transit Administration (FTA), after receiving comments on two previously published Notices, is revising its Recommended Fire Safety Practices for Transit Bus and Van Materials Selection guidelines. This Notice describes FTA's recommended procedure for testing the ability of foam materials to retain fire retardant chemicals after they have been exposed to water, discusses FTA's position on smoke emission performance criteria for seat cushions, and corrects a typographical error. These practices are recommendations rather than requirements and are not binding on FTA's grantees, but do reflect FTA's interest in promoting safety issues.

DATES: Effective date: October 20, 1993.

FOR FURTHER INFORMATION CONTACT: For program issues: Judy Meade, Acting Deputy Director, or Roy Field, Transit Safety Specialist, both of the Office of Safety and Security, (202) 366-2896 (telephone) or (202) 366-3765 (fax).

SUPPLEMENTARY INFORMATION:

I. Overview

A. Introduction

In this Notice FTA makes one change in its "Recommendations for Testing the Flammability and Smoke Emission Characteristics of Transit Bus and Van Materials" (Recommended Practices), which are contained in Table 1 of this notice, and which previously have been published in the **Federal Register**. Specifically, FTA recommends the use of FED-STD-191A Test Method 5830 (191A) to test the ability of foam materials to retain fire retardant chemicals if, in the opinion of the grantee based on its own unique operating conditions, the foam materials will be exposed to water. This change is located in Note 3 to Table 1. FTA makes no other change in its Recommended Practices.

In addition, we discuss FTA's position concerning smoke emission performance criteria and toxicity requirements, and we clarify a typographical error that appeared in the Notice published on January 13, 1992.

B. Organization of the Notice

This Notice consists of five sections of text, the first four of which discuss, generally, the development of procedures used to test the flammability and smoke emission characteristics of certain materials, the issues raised in two previously published related Notices, the decisions made by the FTA in this Notice, and comments addressed to the January 13, 1992, Notice. Section V, Recommended Practices, consists of subsections entitled "Scope," "Application," and "Recommended Test Procedures and Performance Criteria," which together comprise FTA's "Recommended Practices for Testing the Flammability and Smoke Emission Characteristics of Transit Bus and Van Materials." The "Scope" subsection explains the reason for these recommendations, "Application" indicates the types of vehicles covered by the recommendations, and "Recommended Test Procedures and Performance Criteria" provides general directions for testing certain materials.

The most important part of this Notice, however, is contained in Table 1 and in the Notes following it. Table 1 contains the actual recommended test procedures for certain components of buses and vans, namely, seats, panels, floors, and insulating materials. (See Table 1). The Notes, labelled 1 through 9, modify or explain those specific testing procedures. This Notice concerns Note 3 in particular.

A list of defined terms and references also follows Table 1.

II. Background

A. The Test Procedures

FTA's Recommended Practices for transit bus and van materials are based on another set of FTA Recommended Practices, "Recommended Fire Safety Practices for Rail Transit Materials Selection" published in the **Federal Register** on August 14, 1984, at 49 FR 32482. Neither set of Recommended Practices is regulatory in nature. Rather, they are recommendations containing voluntary testing procedures (see Table 1 and accompanying Notes), which are intended to be used to assess the fire risk of certain materials. The testing procedures are small-scale laboratory tests designed by organizations such as the American Society for Testing Materials (ASTM) and the Federal Aviation Administration (FAA), and are used to determine how quickly certain materials will burn and the amount of smoke density the fire will produce. These laboratory tests do not duplicate actual fire conditions, but nevertheless have been proven to result in the selection of materials that reduce the threat of fire, thus reducing injuries and property damage resulting from fires. Similar guidelines have been published by the Federal Railroad Administration (FRA) for railroad passenger cars and by the National Fire Protection Association (NFPA) in its 130 Standard for Fixed Guideway Transit Systems.

B. Prior Notices

This Notice is the third that FTA has published about its Recommended Practices for bus and van materials, and responds to an issue that was raised in both of the previous Notices. In the first Notice, published in the **Federal Register** on July 2, 1990, at 55 FR 27402, (first Notice), FTA asked, in general, whether FTA's Recommended Practices for transit buses and vans should be modified. Several commenters suggested that we change the particular recommended procedure used to test whether water will dilute fire retardant chemicals from foam cushions. In response to these comments, in the Notice published in the **Federal Register** on January 13, 1992, at 57 FR 1360 (second Notice), FTA changed that particular test procedure—at Note 3 to Table 1—by deleting the words "if appropriate". Note 3 then read, "[t]he surface flammability and smoke emission characteristics of seat cushion materials should be demonstrated to be permanent by washing according to FED-STD-191A Textile Test Method 5830." Because 191A is designed for textiles and not for foams, the effect of the revision of Note 3 was to no longer recommend 191A for foam materials. In the second Notice FTA also specifically asked for comment about whether any existing test could be used in lieu of 191A for foam materials. In response to that request, FTA received ten comments in support of 191A and thirteen comments in support of ASTM-D-3574 Standard Methods of Testing Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams Section J1 along with either Sections I2 or I3 (ASTM-D-3574). This Notice (third Notice) presents a summary of those comments, as well as FTA's decision concerning the use of a standard test for foam materials.

It is important to note that comments were received on other issues as well and those comments are also discussed and addressed below.

III. Discussion of FTA's Decision on the Recommended Test Procedures for Fire Retardants in Foam Materials

In response to comments received on the second notice, discussed below, FTA has made only one change to its

Recommended Practices, and that change concerns the test which should be used to test foam materials. Specifically, FTA has reinserted the words "if appropriate" into Note 3 of Table 1. Note 3 now reads "[t]he surface flammability and smoke emission characteristics of seat cushion materials should be demonstrated to be permanent by washing, if appropriate, according to FED–STD–191A Textile Test Method 5830." As indicated by the words "if appropriate," FTA now believes that 191A is a relevant selection criterion only for foam materials that, in the opinion of the grantee based on its own unique operating conditions, will be exposed to water.

We note that 191A is recommended by the Federal Railroad Administration and by the National Fire Protection Association in its 130 Fixed Guideway Transit Systems Standard.

The comments on 191A suggest a need for a standard test, representative of the transit environment, to determine the ability of foams to retain fire retardant chemicals if exposed to water. It is our understanding that the ASTM is in the process of developing a suitable test for the retention of fire retardant chemicals in foam materials. Should such a test be developed, the FTA will consider updating its Recommended Practices.

IV. Discussion of Comments

The FTA received thirty-six comments from twenty-nine respondents on the second Notice. Responding organizations included eight materials suppliers, four transit authorities, five seating manufacturers, seven bus manufacturers, a State railroad administration, two consultants, one transit industry organization, and three rubber companies. Although respondents could comment on any issue under the Recommended Practices, most of them focused on Note 3 to Table 1, which concerns the appropriate method for testing the ability of foam materials to retain fire retardant chemicals after they have been exposed to water. This test method is called, generically, a wash test.

A. Wash Test

In general, a wash test is designed to determine whether fire retardant chemicals are permanent, or whether water will dilute them from foam cushions. An important consideration in selecting a particular test is to match the characteristics of the test to the actual operating conditions of a particular transit system. Thirteen respondents recommended the ASTM–D–3574 in the belief that it most appropriately corresponded to the actual transit environment. Ten respondents believed otherwise and recommended 191A as the standard test.

The comments were about evenly divided because the respondents were uncertain about how much water is necessary to replicate transit operating conditions. Respondents who supported ASTM–D–3574, a steam autoclave test, claimed that 191A does not replicate the transit operating environment because they believe it is unnecessarily stringent, requiring a foam material to be soaked continuously for 24 hours in water that is changed every 15 minutes. Because most transit agencies cover their foam materials with nonporous vinyl, these respondents maintained that it is highly unlikely that foams used in transit buses and vans will ever be submerged in water to that extent. On the other hand, these respondents maintained, ASTM–D–3574 does replicate the actual operating conditions of transit buses and vans because it merely exposes the foam to water but does not submerge it in water.

In contrast, respondents who favored 191A maintained that its adoption was in the best interest of safety, precisely because it is so stringent. These respondents stated that transit systems often encounter situations in which cushions are soaked with water, for instance, when a bus window is left open in a rain storm, when a wet passenger sits down, or when a passenger spills a drink on a seat. Given these operating conditions, respondents favoring 191A believed that the steam autoclave test method used in ASTM–D–3574 did not adequately replicate transit operating conditions.

B. Smoke Emission Criteria for Seat Cushions

Seven respondents suggested changing the performance criteria (See Table 1) corresponding to the seat cushion category. These respondents wanted to make the seat cushion smoke emission criteria at four minutes more restrictive, changing it from 200 to 175. FTA decided that this change was unnecessary, because the 200-level criterion is consistent with the National Fire Prevention Association National Standard 130 (NFPA 130) as well as with FTA's Recommended Practices for Rail Transit Vehicles.

C. Toxicity Requirements

Two respondents expressed concern that the FTA was considering adding toxicity requirements to its Recommended Practices, and asked to be kept informed of any FTA activity in that direction. The FTA has taken no action to include toxicity in its Recommended Practices. Instead, FTA requested the National Research Council's (NRC) Transportation Research Board and Materials Advisory Board of the Commission on Engineering and Technical Systems to assist in addressing this issue. In response to this request, the NRC established a Committee on Toxicity Hazards of Materials Used in Rail Transit Vehicles. This committee, consisting of representatives of industry and academia, has reviewed the present state of knowledge concerning combustion toxicity, identifying specific toxicity hazards related to the use of polymeric materials in transit vehicles. A report, "Fires in Mass Transit Vehicles: Guidelines for the Evaluation of Toxic Hazards," was published on June 15, 1991, and reviews the test methods used to evaluate the toxicity of various construction materials for transit vehicles.

D. Carpet Critical Radiant Flux

One respondent noted an error in the Recommended Practices listed in Table 1 as published in the January 13, 1992, **Federal Register** Notice. The Carpet Critical Radiant Flux (C.R.F.) as measured in Test Procedure ASTM–E–648 should be ≥.5 watts per square centimeter, and not ≤.5 watts per square centimeter which appeared in the Notice. (When using ASTM–E–648, the greater the magnitude for C.R.F., the less flammable the material.) This error has been corrected in Table 1 accompanying this Notice.

V. Recommended Practices

A. Scope

The recommended Fire Safety Practices for Transit Bus and Van Materials Selection are directed at improving the selection practices for interior materials procured for new vehicles and the retrofit of existing vehicles. Adoption of these recommended fire safety practices will help to minimize the fire threat in these vehicles and, thereby, reduce the injuries and damage resulting from fires.

B. Application

This document provides recommended fire safety practices for testing the flammability and smoke emission characteristics of materials used in the construction of transit buses and vans. Vehicles considered as transit buses and vans are those used for urban, suburban, rural, and specialized transit services. Types covered by these

recommended practices are revenue (passenger carrying) vehicles that are placed in mass transit service by a recipient of Federal funds from the Federal Transit Administration. Some of the functions in the recommendations may not apply to all vehicles (e.g., not all vehicles have windscreens).

C. Recommended Test Procedures and Performance Criteria

(a) The materials used in transit buses and vans should be tested according to the procedures and performance criteria set forth in Table 1.

(b) Transit agencies should require certification that combustible materials to be used in the construction of vehicles have been tested by a recognized testing laboratory, and that the results are within the recommended limits.

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TABLE 1: RECOMMENDATIONS FOR TESTING THE FLAMMABILITY AND SMOKE EMISSION CHARACTERISTICS OF TRANSIT BUS AND VAN MATERIALS

Category	Function of Material	Test Procedure	Performance Criteria
Seating	Cushion[1;2;3;5;9*]	ASTM D-3675	$I_s \leq 25$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	Frame[1;5;8]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	Shroud[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	Upholstery[1;3;4;5]	FAR 25.853 (Vertical)	Flame time $\leq$ 10 seconds; burn length $\leq$ 6 inches
		ASTM E-662	D_s (4.0)$\leq$ 250 coated;D_s (4.0)$\leq$ 100 uncoated
Panels	Wall[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	Ceiling[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	Partition[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	Windscreen[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
	HVAC Ducting[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (4.0)$\leq$ 100
	Light Diffuser[5]	ASTM E-162	$I_s \leq 100$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200
Flooring	Wheel Well and Structural[6]	ASTM E-119	Pass
	Carpeting[7]	ASTM E-648	C.R.F. $\geq$ 0.5 w/cm^2
Insulation	Thermal[1;3;5]	ASTM E-162	$I_s \leq 25$
		ASTM E-662	D_s (4.0)$\leq$ 100
	Acoustic[1;3;5]	ASTM E-162	$I_s \leq 25$
		ASTM E-662	D_s (4.0)$\leq$ 100
Miscellaneous	Firewall[6]	ASTM E-119	Pass
	Exterior Shell[1;5]	ASTM E-162	$I_s \leq 35$
		ASTM E-662	D_s (1.5)$\leq$ 100;D_s (4.0)$\leq$ 200

* Refers to Notes on Table 1

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1. Materials tested for surface flammability should not exhibit any flaming running, or flaming dripping.

2. The surface flammability and smoke emission characteristics of seat cushion materials should be demonstrated to be permanent after testing according to ASTM D–3574 Dynamic Fatigue Tests I_S (Procedure B).

3. The surface flammability and smoke emission characteristics of a material should be demonstrated to be permanent by washing, if appropriate, according to FED–STD–191A Textile Test Method 5830.

4. The surface flammability and smoke emission characteristics of a material should be demonstrated to be permanent by dry cleaning, if appropriate, according to ASTM D–2724. Materials that cannot be washed or dry-cleaned should be so labeled, and should meet the applicable performance criteria after being cleaned as recommended by the manufacturer.

5. ASTM E–662 maximum test limits for smoke emission (specific optical density) should be measured in either the flaming or non-flaming mode, depending on which mode generates more smoke.

6. Flooring and Fire Wall assemblies should meet the performance criteria during a nominal test period determined by the transit property. The nominal test period should be twice the maximum expected period of time, under normal circumstances, for a vehicle to come to a complete, safe stop from maximum speed, plus the time necessary to evacuate all passengers from a vehicle to a safe area. The nominal test period should not be less than 15 minutes. Only one specimen need be tested. A proportional reduction may be made in dimensions of the specimen provided that it represents a true test of its ability to perform as a barrier against vehicle fires. Penetrations (ducts, piping, etc.) should be designed against acting as conduits for fire and smoke.

7. Carpeting should be tested in according with ASTM E–648 with its padding, if the padding is used in actual installation.

8. Arm rests, if foamed plastic, are tested as cushions.

9. Testing is performed without upholstery.

Definition of Terms

1. Flame spread index (I_S) as defined in ASTM E–162 is a factor derived from the rate of progress of the flame front (F) and the rate of heat liberation by the material under test (Q), such that $I_S=F_S \times Q$.

2. Specific optical density (D_S) is the optical density measured over unit path length within a chamber of unit volume produced from a specimen of unit surface area, that is irradiated by a heat flux of 2.5 watts/cm^2 for a specified period of time.

3. Surface flammability denotes the rate at which flames will travel along surfaces.

4. Flaming running denotes continuous flaming material leaving the site of the during material at its installed location.

5. Flaming dripping denotes periodic dripping of flaming material from the site of burning material at its installed location.

Referenced Fire Standards

The source of test procedures listed in Table 1 is as follows:

(1) Leaching Resistance of Cloth, FED–STD–191A–Textile Test Method 5830.

Availability from: General Services Administration Specifications Division, Building 197, Washington, Navy Yard, Washington, DC 20407.

(2) Federal Aviation Administration Vertical Burn Test, FAR–25–853.

Available from: Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

(3) American Society for Testing Materials (ASTM)

(a) Surface Flammability of Materials Using a Radiant Heat Energy Source, ASTM E–162;

(b) Surface Flammability for Flexible Cellular Materials Using a Radiant Heat Energy Source, ASTM D–3675;

(c) Fire Tests of Building Construction and Materials, ASTM E–119;

(d) Specific Optical Density of Smoke Generated by Solid Materials, ASTM E–662;

(e) Bonded and Laminated Apparel Fabrics, ASTM D–2724;

(f) Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams, ASTM D–3574.

Available from: American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

In all instances, the most recent issue of the document or the revision in effect at the time of request should be employed in the evaluation of the material specified herein.

Issued: October 14, 1993.

Grace Crunican,

Deputy Administrator.

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