



ABOUT CODE CORNER

CCFS would like to remind you to check with your local "Authority Having Jurisdiction (AHJ)" for questions and opinions concerning your local Fire and Building Codes. The information contained in this article is supplied as a courtesy by the International Code Council (ICC) and is based on the International Fire and Building Codes and their respective commentaries. Your local codes or ordinances may vary.

While the criteria of Section 805 specifically applies to I-1 residential board and care facilities, it is offered as background on the thoughts, rational and various test methodology for regulating upholstered furniture and mattresses. Discussion of applicability of flammability standards for certain campus facilities is an issue being deliberated the CCFS Codes and Standards Committee. If you have thoughts or opinion, please share them with the committee at: codescommittee@campusfiresafety.org

SECTION 805

UPHOLSTERED FURNITURE AND MATTRESSES IN NEW AND EXISTING BUILDINGS

805.1 Group I-1, board and care facilities. The requirements in Sections 805.1.1 through 805.1.2 shall apply to board and care facilities classified in Group I-1.

∩ Furnishings and contents are a subject that codes have not addressed very strongly in the past. Ultimately, the fire hazard potential within a building depends heavily upon what is in the building and where it is placed. First, the burning characteristics of the materials will vary and the location of the material will change the characteristics of a fire. For instance, a couch within a small compartment will create a much different fire event than the same couch burning in a large open atrium (see Figure 805.1). The compartment may be limited by the amount of oxygen available, while the atrium fire will be limited only by the amount of combustibles to burn because oxygen will be plentiful; therefore, the compartment is likely to reach flashover while the atrium will not. Generally, upholstered furniture and mattresses are the largest fire hazards in most residential buildings because a mattress or an upholstered chair or sofa are the only products typically present where people live that can cause room flashover on their own.

Board and care facilities house, in a supervised setting, more than 16 persons on a 24-hour basis because of age, mental disability or other reasons. These occupants are also considered more vulnerable than the general population and have had a history of starting fires in beds or upholstered furniture. There is also more of a concern than with a Group I-2 occupancy over occupants having the ability to purposely start a fire. This is less likely in an assisted living setting but more likely in a halfway house setting; therefore, limitations on combustibility of upholstered furniture and mattresses are also required.

Reducing ignitability and combustibility will significantly reduce the level of fire hazard. The requirements are slightly different than for Group I-2 occupancies in that different tests and performance criteria are required because of the nature of the hazards.

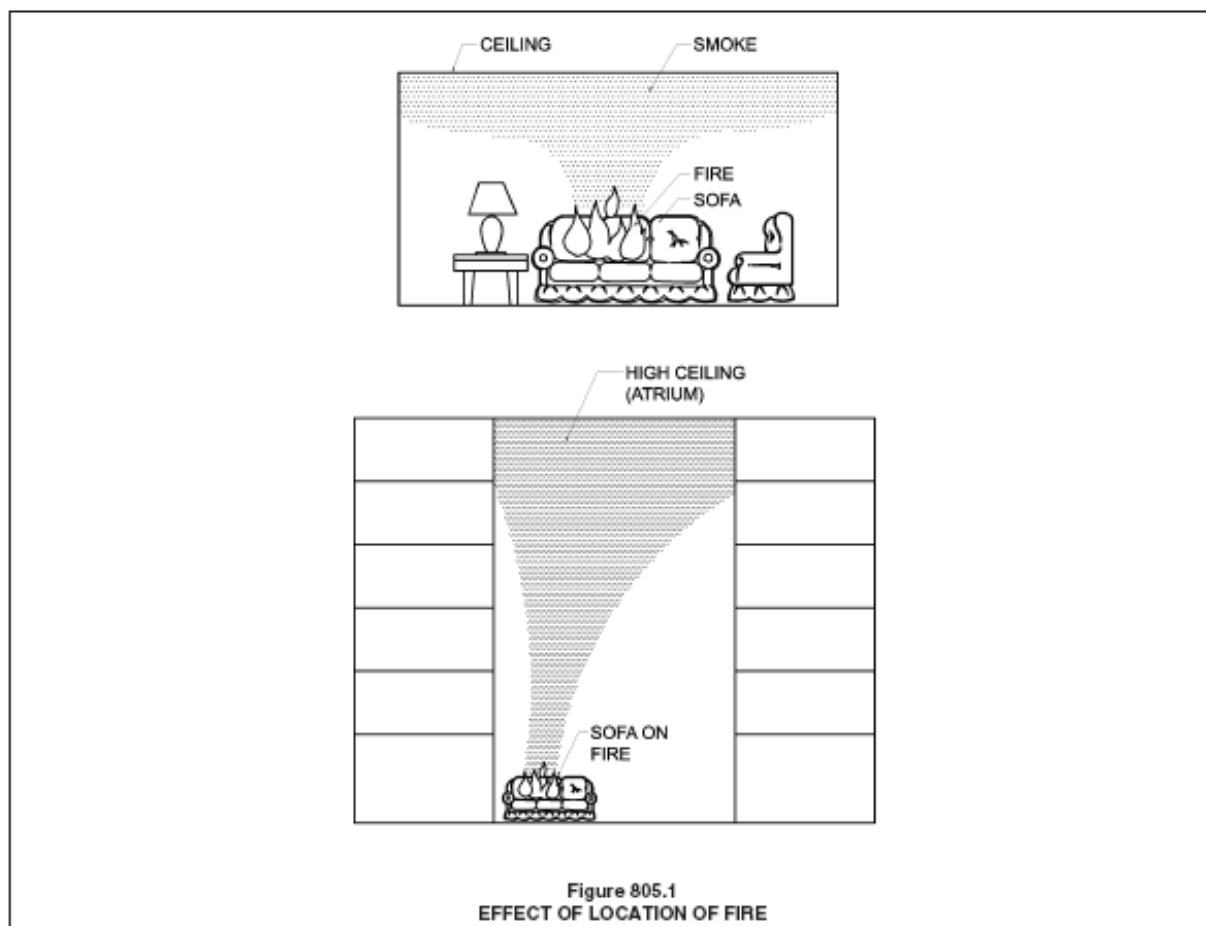
805.1.1 Upholstered furniture. Newly introduced upholstered furniture shall meet the requirements of Sections 805.1.1.1 and 805.1.1.2.

∞ *This section informs the user that two aspects of upholstered furniture are regulated: the ignitability by cigarettes and the maximum allowable heat release in accordance with ASTM E 1537.*

805.1.1.1 Ignition by cigarettes. Newly introduced upholstered furniture shall be shown to resist ignition by cigarettes as determined by tests conducted in accordance with NFPA 260 and shall meet the requirements of Class I.

Exception: Upholstered furniture in rooms or spaces protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

∞ *This section focuses on the ignitability of furniture when exposed to lighted cigarettes. The test required by this section is NFPA260. NFPA260 uses an overall classification system that looks at the cigarette ignition behavior of the individual components that may be found in upholstered furniture. Section 805.1.1.1 requires a Class I rating for upholstered furniture, meaning that no evidence of ignition occurred and specific limitations on char length must be met based on each specific component of the furniture. For example, the cover fabric would be allowed a 1.77-inch (45 mm) char length, whereas the interior fabric would be allowed only a 1.5-inch (38 mm) char length to be considered Class I.*



The other components of upholstered furniture tested using NFPA 260 include the welt cords, filling/padding, decking material and barrier materials. This section differs from Section 805.2.1.1 for Group I-2 nursing homes and hospitals and Section 805.3.1.1 for Groups I-3 detention and correction facilities in that it only references NFPA 260 as a compliance method.

Groups I-2 and I-3 are also allowed to comply with NFPA 261, which specifically looks at ignitability of a mock-up of upholstered furniture. NFPA 261 simply presents a method for study of the ignitability of the furniture mock-up and a technique to measure the char length, and limits the maximum char length to 1.5 inches (38.1 mm).

As with Sections 805.2.1.1 and 805.3.1.1, when the room or space is sprinklered in accordance with NFPA 13, this test is not required. The code requires new facilities of this occupancy classification to be sprinklered except that sprinkler systems in accordance with NFPA 13R and 13D are allowed.

805.1.1.2 Heat release rate. Newly introduced upholstered furniture shall have limited rates of heat release when tested in accordance with ASTM E 1537 or California Technical Bulletin 133, as follows:

1. The peak rate of heat release for the single upholstered furniture item shall not exceed 80 kW.

Exception: Upholstered furniture in rooms or spaces protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

2. The total energy released by the single upholstered furniture item during the first 10 minutes of the test shall not exceed 25 megajoules (MJ).

Exception: Upholstered furniture in rooms or spaces protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

∞ *The two tests specified in this section measure the overall combustibility of the furniture. When a building is sprinklered in accordance with NFPA13, this section does not apply. Upholstered furniture must be tested to either ASTM E 1537 or California Technical Bulletin 133 (which are basically the same test, but ASTM E 1537 has no pass/fail criteria). This test uses a full-scale calorimeter, with the furniture item either in a standard room or under a hood. A full-scale calorimeter allows a representative piece of furniture to be burned and the products of combustion to be collected and analyzed in the exhaust duct by measuring gases (principally oxygen) in order to measure heat release.*

The test also measures weight loss during the test [see Figure 805.1.1.2(1) for a representation of the test]. The acceptance criteria set by the code are as follows:

- *Peak heat release is limited to 80 kW, and*
- *Total energy (or heat) release within the first 10 minutes cannot exceed 25 mega joules (MJ).*

Limitations are placed on the maximum intensity and fire effluents produced by restricting the peak heat release rate and the amount of combustibles actually burned. The total energy release of 25 MJ could be translated to a steady fire as follows, where:

X = Steady fire heat release rate expressed in kW:

X × 10 minutes = 25 MJ

(10 minutes = 600 sec and 25 MJ = 25,000 kJ)

X × 600 sec = 25,000 kJ

X = 25,000 kJ / 600 sec = 41.66 kJ/sec

X = 41.66 kJ/sec = 41.66 kW ~ 42 kW heat release rate

A steady fire of 42 kW (133 kJ/sec) for 10 minutes will result in a total energy release of 25 MJ. Because fires in more realistic conditions do not burn steadily and vary in their characteristics, the criterion is given in the form of a peak heat release rate and total energy release. To provide a better understanding, if the were burning at the maximum peak heat release rate of 80 kW for the first 10 minutes, the total energy output would be 75 MJ, [80 kW(kJ/sec) H 10 minutes (600 sec) = 48,000 kJ = 48 MJ], which is well over the criterion of 25 MJ. A fire burning at a steady rate from start to finish is not realistic because fires must go through an initial growth stage before a peak heat release rate will be reached, followed by a decay phase; therefore, because a realistic fire will not burn at the peak heat release rate from the start of the fire, it is possible for a piece of furniture to

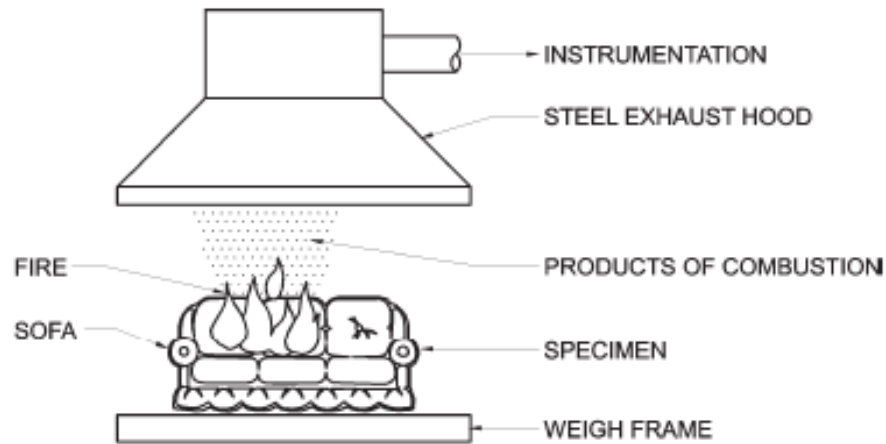


Figure 805.1.1.2(1)
TYPICAL FIRE TEST SETUP

have a peak heat release rate of 80 kW and still stay within the 25 MJ limitation. Figure 805.1.1.2(2) demonstrates the difference between a steady fire and a more realistic unsteady fire. As stated in the exceptions, the heat release rates will not apply to buildings sprinklered in accordance with NFPA 13.

Sections 805.2.1.2 and 805.3.1.2 address the heat release rate limitations for upholstered furniture in the same manner. It should be noted that Section 805.3.1.2 does not reference California Technical Bulletin 133.

805.1.1.3 Identification. Upholstered furniture shall bear the label of an approved agency, confirming compliance with the requirements of Sections 805.1.1.1 and 805.1.1.2.

⚡ *In order to achieve verifiable compliance, labeling by an approved agency is required. Otherwise this information would be extremely difficult to verify in the field. See the commentary for the definition of "Labeled" in Section 202.*

805.1.2 Mattresses. Newly introduced mattresses shall meet the requirements of Sections 805.1.2.1 through 805.1.2.3.

⚡ *Sections 805.1.2.1 and 805.1.2.2 deal with the combustibility of mattresses. Section 805.1.2.1 focuses on initial ignition and the ability of a mattress to sustain a fire; Section 805.1.2.2 is focused primarily on the burning characteristics of mattresses.*

805.1.2.1 Ignition by cigarettes. Newly introduced mattresses shall be shown to resist ignition by cigarettes as determined by tests conducted in accordance with DOC 16 CFR Part 1632 and shall have a char length not exceeding 2 inches (51 mm).

Exception: Mattresses in rooms or spaces protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

⚡ *This section sets a maximum char length of 2 inches (51 mm) when the mattress is tested under DOC 16 CFR, Part 1632. This test is actually a mandatory regulation for all mattresses sold within the United States. More specifically, it is part of the regulations governed by the Consumer Products Safety Commission (CPSC) under the Department of Commerce (DOC). Sections 805.2.2.1 and 805.3.2.1 have the same reference and requirements for Groups I-2 and I-3 occupancies. Thus, mattresses that fail to meet the 16 CFR 1632 test will be those that were sold before the CPSC regulation went into effect (in 1972) or that were sold outside of the United States.*

805.1.2.2 Heat release rate. Newly introduced mattresses shall have limited rates of heat release when tested in accordance with ASTM E 1590 or California Technical Bulletin 129, as follows:

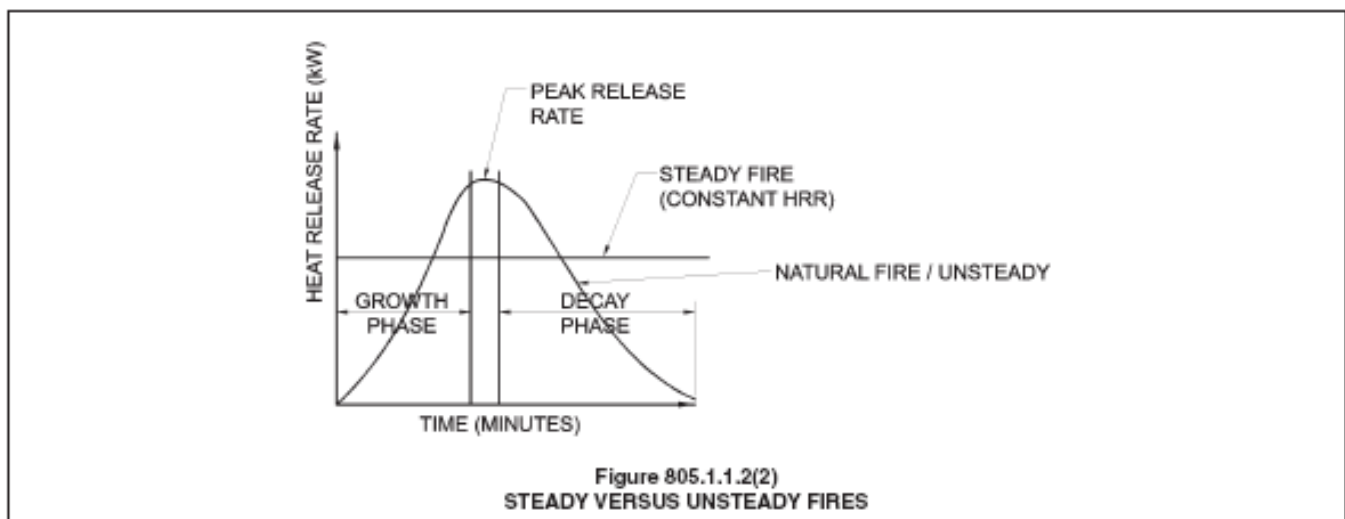
1. The peak rate of heat release for the single upholstered furniture item shall not exceed 100 kW.

Exception: Mattresses in rooms or spaces protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

2. The total energy released by the single upholstered furniture item during the first 10 minutes of the test shall not exceed 25 MJ.

Exception: Mattresses in rooms or spaces protected by an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

⚡ *As noted, an occupant smoking in bed and initiating a mattress fire is a major fire hazard in board and care facilities. This section, like Section 805.1.1.2, limits combustibility through a limitation of the peak heat release rate and on the total energy output in the first 10 minutes of burning.*



These limitations vary slightly from those for upholstered furniture. Each mattress is allowed a maximum heat release rate of 100 kW, whereas each upholstered furniture item is limited to 80 kW. The total energy (or heat) release limitation is the same as for upholstered furniture items, which is 25 MJ in the first 10 minutes. As with upholstered furniture, these restrictions are not applicable in buildings sprinklered in accordance with NFPA 13. The tests that determine the peak heat release rate and total energy (or heat) release are specific to mattresses. These tests are detailed in ASTM E 1590 and California Technical Bulletin 129 (which are the same test, except that ASTM E 1590 does not have pass/fail criteria). These tests, like that referenced in Section 805.1.1.2, make use of a full scale calorimeter to measure the products of combustion. There are two differences between ASTM E 1537 and ASTM E 1590: (a) the object being tested (see commentary, Section 805.1.1.2) and (b) the ignition source. Both tests use a gas burner, but they are different in geometry, gas flow rate, duration of gas flow and position of flame application.

Section 805.2.2.2 contains the same restrictions and testing requirements on combustibility for mattresses in Group I-2 nursing homes and hospitals and Section 805.3.2.2 for Group I-3 detention and correction facilities.

805.1.2.3 Identification. Mattresses shall bear the label of an approved agency, confirming compliance with the requirements of Sections 805.2.2.1 and 805.2.2.2.