NFPA 277
UPHOLSTERED FURNITURE MAIN TASK GROUP
WEB/TELECONFERENCE
MAY 20, 2015 – 2:00 PM – 4:00 PM ET

1. Call to Order/Introductions

2. Approval of January 26, 2015 Minutes

3. Review of TG Chair Questions

4. Follow Up/Discussion Items from JAN 26, 2015 TG Meeting and March 18, 2015 briefing to TC on Fire Tests including:
   a. Test protocol(s) based on second item ignited
   b. Test protocol(s) based on:
      i. Component
      ii. Composite
      iii. Full-Scale
   c. Product Classification Scheme
      i. Cover/outside fabrics
      ii. Fill/interior materials
   d. Role of “Blocking” Systems
   e. Ease of ignition versus fire growth scenarios

5. New/Other Business

6. Next TG Meeting: In Person/Conference Call

7. Adjourn
Upholstered Furniture Main Task Group
Conference Call Meeting Minutes
January 26, 2015

Attendees:
Gordon Damant
William Pitts
Robert Backstrom
Richard Gann
Rohit Khanna
Tracy Vecchiarelli

Guests:
Bob Luedeka- PFA
Said Nurbakhsh- CA Bureau of Home Furnishings
Hardy Pool- National Council of Textiles
Harrison Toms- Hooker Furniture
Avery Linderman- Green Science Policy Institute

1. Introductions/Welcome
2. Discussed items assigned during the last meeting.
   a. Do we develop a new test method or modify an existing method?
      i. Need to find a way to classify furniture first
      ii. Small scale may not relate to large scale – need to justify small scale tests
      iii. Leaning towards existing test method with modifications
   b. How do we select a test method?
      i. Determine the magnitude of the ignition source
      ii. Should we focus on ignition resistance or HRR?
3. Assigned task group members an assignment for the next meeting. Task group members are to list existing test methods and describe their ignition sources, performance requirements, scope, and materials.
4. Discussed presenting to the Fire Test Technical Committee at their First Draft meeting in March.
5. Next task group meeting (conf call) will be held on March 11th from 2:00-4:00 ET.
What Ignition Source do you recommend for a proposed Standard?

Response 1.

The source will depend on the size of the sample chosen for study. I feel that a source comparable to BS 5852 Crib 5 would certainly be the largest that we might want to consider.

Response 2

Multiple test methodologies exist incorporating a variety of ignition sources. Independent of the details (time, duration etc.) the source should be of sufficient energy, and applied for a duration to stress the item being tested to a heated condition to cause ignition. Fire growth resulting from exposure to the ignition source should be a result of the product’s performance, not due to removal of the ignition source.

Response 3

The principal ignition scenarios should be those in which the piece of furniture is ignited by an already burning item. From the table in the minutes of the task group’s September 11, 2014 meeting, there are a number of scenarios that involved an ignition source of 10s of kW applied for a few minutes. From these numbers we should be able to estimate a flux density, gas burner dimension, etc.

Response 4

The Task Group is charged with developing an open-flame fire standard for upholstered furniture, with primary reference to secondary ignition of furniture. With respect to residential upholstered furniture fire tests, most of the current open-flame ignition sources have been small, and intended to typically address accidental ignition of furniture caused primarily by flaming ignition source such as matches, candles, lighters etc. Historically many of the accidental furniture fires, other than those caused by direct cigarette contact, have been the result of child-play. The Task Group’s work to date has shown that the conditions of secondary ignition of furniture are quite different. The task group has identified secondary ignition conditions for upholstered furniture that greatly exceed in energy and duration the very small ignition sources typically used for assessing residential furniture. Therefore the ignition source(s) chosen by the Task Group (TG) should be more in line with
the kW range of ignition sources typical presented to furniture under a variety of possible secondary ignition conditions. To date most of the larger ignition sources for furniture have been intended to address open-flame conditions faced by furniture in a variety of public buildings. It would appear that the TG has two options for addressing open-flame ignition conditions that more adequately address the fire conditions of secondary ignition. One option would be to develop, or suggest, a completely new ignition source for furniture. Another option is to use, as is, or to modify, an ignition source that already exists. The first option is probably the most difficult, and would require some research. Research is out of the direct scope of the TG, but the initial charge to the TG suggests that research needs may be addressed by referral to the NFPA Research Foundation. With respect to the second option the obvious choices appear to be to use, or modify, the ignition source specified by California TB 133, or to select one of the larger ignition sources specified in BS5852. The British standard refers to 7 different ignition sources to be used depending upon type of occupancy. Wood crib ignition, specified by BS5852 ignition source 5, 6 and 7, is intended to be used for furniture used in a variety of public buildings.

**What are the Critical Factors for a test?**

**Response 1**

The most important properties from a safety standpoint are fire spread and fire growth. Would like to see a flaming test provide characterization of the fire spread rate and heat release rate.

**Response 2**

In general not a supporter of an ignition test as a determination of the fire hazard of an object. The hazard lies not in a device simply igniting, but in fire growth and magnitude after ignition. Of the fire performance typically measured during a reaction to fire test (time to ignition, flame extension in terms of distance, critical flux for ignition etc.), for growth of a discrete object of given shape and geometry is best described in terms of heat release rate.

**Response 3**

Do not favor the ignition resistance approach. Since the inclusion of a barrier material is a potential tactic, it is possible to have an ignition of the exterior materials (e.g. the upholstery fabric), but not have a substantial involvement of the furniture item as a whole. The two key factors are the peak heat release rate and the post-ignition time at which substantial heat release occurs.
Response 4

A stand-alone ignitability test is probably not very helpful. Current fire science indicates that fire growth, measured by heat release measurement, or possible weight loss as a surrogate for heat release, seems a much more meaningful way to go. One of the basic concerns that the TG needs to consider is who is going to be testing by the test method proposed by the TG. It is unlikely that any current U.S. producer of furniture will have the capability of performing a complex fire growth test themselves, such as tests that require HRR determinations and measurements. However, the mattress industry has been able to climb the full-scale fire testing hurdle by almost exclusively using independent test laboratories to test for 16 CFR 1633 compliance. One U.S. mattress producer does have its own full-scale 16 CFR 1633 test facility. Historically it has been the position of the furniture industry that they do not want fire tests that require any fire testing on the part of furniture manufacturers. They want to fully rely upon their suppliers for all fire testing, component or otherwise.

Should the task group recommend pass/fail criteria part of a standard? Or should that decision be left to others?

Response 1

The choice of a pass/fail criteria is a regulatory issue, and that the task group should not make that decision. On the other hand, a major contribution of the task groups efforts would be to provide upholstered furniture designers and manufacturers a means for estimating the flammability behavior of their designs. The test should be designed to allow identification of designs that provide significant improvement over existing furniture. Designing a target level for such improvements based on the current understanding of fire dynamics would seem to make sense. A value somewhere around a maximum heat release rate of 100 kW seems appropriate.

Response 2

Thresholds for maximum heat release rate for various fuel packages have been defined (telecommunications equipment, mattresses, etc.). These thresholds have been the basis for acceptance and are well established in the codes.

Response 3

This is the role of the regulator. In particular, the CPSC has to do a cost benefit assessment, and that might affect the degree of enhanced fire safety. However, it is important to the understand that range of peak heat release rates (and their times) that would lead to
mitigation of various fire consequences. This is because the fire test(s) need to be capable of generating data that supports a hazard analysis in this range. For example, reducing the likelihood of room flashover would lead to a significant reduction in fire losses outside the room of origin. Based on the rationales for TB 133 and 16 CFR 1633, it seems that the task group should consider devising a protocol that can resolve furniture burning intensity in the range 100 kW to 200 kW, with the substantial heat release coming perhaps no sooner than 10 min after ignition.

Response 4

Typically, NFPA and ASTM test methods rarely provide pass/criteria. Establishment of acceptability of test results is usually left to the AHJ. However, it may be important in this case for the TG to provide some general guidance. Perhaps in the form of an appendix to the test method. There are some general reference points that the TG needs to consider. TB 133 requires the HRR to be less than 80 kW for contract, or non-residential furniture. This criteria was chosen because research at the California Bureau and at NIST (Vyto) showed that furniture fires that exceeded 120 kW of HRR would generally not self-extinguish, and would become self-propagating. So the Bureau established the 80 kWHRR max. to be on the conservative side of that value. The CPSC mattress flammability standard 16 CFR 1633, also full-scale test of a mattress or a bed-set, has criteria based upon HRR and Total HR. Also as part of the CPSC test criteria test duration is a factor. For example, under 16 CFR 1633, the Peak HRR cannot exceed 200 kW in the first 30 minutes of the test, and there is limit on Total HR in the first 10 mins of the test. The criteria of acceptable controlled limited burning is a factor that the TG should consider with respect to this upholstered furniture activity. Whether this type of information needs to be included in the test method itself, or in some type of guidance document should be considered.

What are the key furniture components to need to be addressed?

Response 1

The rapid fire spread and growth on some upholstered furniture seems to be primarily associated with the seat cushions. Whatever test is developed must be able to assess the role of all the materials making up a cushion, including upholstery fabric, and filling material, fire barriers, and cushioning materials. Geometry is also an important parameter. Given the nearly infinite number of possible geometries, perhaps the best approach is to choose a near worst-case configuration. There are certainly other parameters in furniture flammability, but if the task group addresses materials and geometry it will go a long way
towards meeting the goal of assessing the potential flammability of actual upholstered furniture.

Response 2

All components should be addressed – in the form, mass, geometry and orientation deployed in the finished product. Fire performance of a system is not solely dependent on the components, nor is the performance of an article made of multiple components simply the sum of the parts.

Response 3

Agree with the sentiment that the protocol should be sufficiently general that it includes furniture components that are not currently in use. The list includes upholstery fabrics (potentially multiple), padding materials, any fire protection system (e.g., a barrier fabric; a solid board to prevent burn through of the arms, back or seat support); etc. The next step should be to agree on the specific properties to be test for each type of component. It is possible that these are not independent of each other. For example, the criteria for a seat support might depend on whether the seat padding melts and potentially drips.

Response 4

We have learned in recent years that test data/information generated from small-scale tests of components is generally not very helpful when trying to determine the fire performance of composites, particularly full-scale composites. Some studies, such as CBUF, appear to indicate that the use of tests such as the Cone Calorimeter on furnishing components, may be used to predict larger scale furnishing fire performance. But some find that conclusion debatable. With respect to what should be tested, the experience of the mattress industry in complying with 16 CFR 1633 should be carefully considered by the TG. Other than “Fire Blocker Systems”, and there are many different types, the mattress industry uses almost no FR components. The robustness of the fire barrier system is used by mattress producers to protect the combustible contents of the mattress and foundation, even when some sacrificial layers close to the surface of the mattress may be consumed. For example, all mattresses and foundations sold in the U.S. today, which comply with 16 CFR 1633, use NO FR polyurethane foam. Although there are significant differences in the construction and geometry of upholstered furniture, as opposed to mattresses and foundations, the 8-year experience of the bedding industry in complying with 16 CFR 1633 needs to be carefully considered by the TG. It should also be observed that the bedding industry has found that the use of a Kevlar sewing thread can be helpful for 16 CFR 1633 compliance in some mattress constructions, by preventing or reducing delamination of various components during the test.