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United States
CONSUMER PRODUCT SAFETY COMMISSION
Washington, D.C. 20207

MEMORANDUM

DATE: October 14, 1997

TO : Dale R. Ray, Project Manager, Upholstered Furniture
Through : Warren J. Prunella, AED, EC *WJP*
FROM : Charles L. Smith, EC *C.L.S.*
Subject : Regulatory Options for Addressing Small Open Flame Ignitions of Upholstered Furniture

Attached is a report entitled, "Economic Considerations of Options for Addressing Small Open Flame Ignitions of Upholstered Furniture." This report discusses the economic effects of various options that would result in reductions in upholstered furniture fires started by small open flames. Information is provided on upholstered furniture and upholstery fabrics, and on the industries that produce and market the products.

A draft standard developed by the CPSC staff is the benchmark for estimating potential costs. Impacts related to complying with the standard include direct expenditures for testing and/or costs of materials, as well as indirect effects, such as potential adverse health effects and/or reduced utility. Where possible, monetary costs are given in the report.

**Economic Considerations of Options for Addressing
Small Open Flame Ignitions of Upholstered Furniture**

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Summary

The staff of the U.S. Consumer Product Safety Commission has considered options for addressing small open flame ignitions of upholstered furniture. The Directorate for Economic Analysis has evaluated the economic effects of various options identified by the staff, including a draft standard for open flame ignition resistance. The Directorate also developed information on upholstered furniture and upholstery fabrics, and on the industries that produce and market the products. Among the significant findings are:

- From 1990 to 1994, fires started by small open flame sources such as lighters, matches, and candles accounted for an annual average of 100 deaths, 460 injuries, and \$46 million in property damage. In all, estimated societal costs for these fires averaged \$625 million annually over these years.
- About 10 percent of the upholstery found on furniture (such as leather, wool, and some vinyl coated fabrics) does not readily ignite from small open flames. However, furniture items covered with fabrics that are prone to ignition from small open flames are associated with an average expected value of about \$16 in societal costs over their useful lives. This represents the maximum average benefit that any action to address the hazards could achieve. Actual benefits are proportional to the effectiveness of the action. For example, an action that is 80 percent effective would have expected benefits (over the life of an affected item of furniture) of about \$13; at 50 percent effectiveness, expected benefits would be about \$8.
- Additional benefits are likely to result from a performance standard to address small open flame ignitions. For example, some flame retardant (FR) treatments for fabrics reduce the likelihood of ignition by cigarettes as well as open flame ignitions. For each 10 percent reduction in the risk of cigarette ignition, the estimated present value of additional benefits is nearly \$6 per affected item of furniture.
- Potential costs include higher prices to furniture manufacturers for treated (or for treating) fabric, including testing costs passed on from fabric suppliers. These costs may be passed on to the retail level. Various FR treatment processes and chemicals are available that would enable upholstery fabrics to pass the seating area test. Information from experience in the U.K., which has been operating under a furniture flammability standard with very similar testing provisions, indicates that

increased costs to furniture manufacturers generally would be in the range of \$1.00 to \$1.25 per linear yard of FR-treated fabric.

- Average estimated unit costs to consumers for improved small open flame ignition resistance of living room and family room furniture are \$23 to \$30, assuming manufacturing costs are passed on in the form of higher retail prices. Aggregated estimated costs to consumers for furniture that complies with the draft standard option range from about \$460 to \$720 million annually.
- For a standard that is highly (80 percent) effective at reducing small open flame-ignited fire losses, costs would equal expected benefits if the draft standard results in a 20 to 30 percent reduction in societal costs of cigarette ignitions of upholstered furniture.
- A standard that reduces annual small open flame furniture fire losses by 80 percent (with annual estimated benefits of \$256 million) and annual smoking material fire losses by 50 percent (with a midpoint of the range of annual estimated benefits of \$630 million) may have annual net fire safety benefits of about \$300 million (after subtracting the midpoint of estimated annual costs, about \$590 million).

I. Introduction

In 1993 the National Association of State Fire Marshals (NASFM) petitioned the Consumer Product Safety Commission (CPSC) to initiate a proceeding to regulate hazards associated with upholstered furniture fires started by small open flame ignition sources, cigarettes, and larger open flame sources. To address hazards associated with small open flame ignitions, NASFM sought the adoption of California's Bureau of Home Furnishings Technical Bulletin 117 as mandatory requirements for upholstered furniture sold for consumer use in the U.S. Technical Bulletin 117 requires testing of the fabric and filling material components used to make furniture to assure their resistance to ignition from small open flame sources. The Commission determined that ignitions of upholstered furniture by small open flames might constitute an unreasonable risk to the public. Without judging the merits of Technical Bulletin 117, that part of the petition was granted by the Commission. An Advance Notice of Proposed Rulemaking was published on June 15, 1994, in the Federal Register.

NASFM's petition also sought the adoption of the California Bureau of Home Furnishings Technical Bulletin 116, and some aspects of Technical Bulletin 117, to address hazards associated with ignitions of furniture by cigarettes and other smoking materials; action on this part of the petition was delayed pending CPSC staff review of the effectiveness of the voluntary activities of the furniture industry. Another aspect of the NASFM petition asked the Commission to adopt Technical Bulletin 133, which addresses large open flame ignition performance of furniture; this was denied by the Commission on May 12, 1994.

This report discusses the impacts of various options for addressing the small open flame hazard. It provides information on the products and industries that are likely to be affected by actions taken to reduce upholstered furniture fires. It also discusses potential costs and benefits associated with requirements drafted by the CPSC staff and of selected alternatives. This report also discusses potential effects on small firms and competition generally.

II. Products and Industries Potentially Affected

A. Upholstered Furniture

The largest class of products that would be affected by the regulation of small open flame flammability is household upholstered furniture on wood frames, classified by the Census Bureau in Standard Industrial Classification (SIC) 2512. Slightly more than 1,000 U.S. companies manufacture wood upholstered household furniture as their primary product. Several hundred companies that primarily manufacture other products, such as wood household furniture (SIC 2511), also make upholstered furniture, although they only accounted for 3 percent of wood upholstered household furniture shipments in 1992. Other types of potentially affected products include: sleep furniture;

upholstered metal, reed, and rattan furniture; upholstered kitchen and dining room chairs; and upholstered office furniture intended for household use.¹

Although there are a large number of manufacturers, the upholstered furniture market is fairly concentrated among the larger firms. The top 4 companies accounted for 25 percent of the total value of wood upholstered furniture shipments in 1992, and the 50 largest companies accounted for 69 percent.² Reports from the trade press indicate that the industry has become more concentrated in recent years, mainly through buyouts of firms by the larger companies. The firms that are brought into the larger corporate structure often retain their trade names and production facilities as new divisions. The industry includes many small establishments: the Bureau of the Census reports that, in 1992, 56 percent of all establishments manufacturing upholstered furniture as their primary product had fewer than 20 employees. By some measures, such as the Small Business Administration's definition for qualification for Small Business Loans, a furniture manufacturing establishment is considered to be "small" if it has fewer than 500 employees. This would encompass nearly all establishments in the industry.

The estimated value of shipments of wood upholstered household furniture by U.S. firms in 1996 was \$7.9 billion. Exports of goods in two major product categories (upholstered seats, wood frame, and upholstered chairs, wood frame) had an estimated value of about \$170 million, or about 2 percent of the total value of shipments. Since the value of imports in 1996 for these two product categories was about \$550 million, there were net imports of about \$380 million. The apparent consumption of upholstered furniture (domestic shipments plus imports, minus the value of exports), was about \$8.3 billion. The leading country of origin for imported upholstered seats and chairs on wood frames (as in other recent years) was Italy, which accounted for 51 percent of the value of imports.

Upholstered metal household furniture is classified in SIC 2514, *Metal Household Furniture*. The products in this industry group include metal household dining furniture; some of which are upholstered chairs. SIC 2514 also includes tubular metal, cast & wrought iron, and other metal chairs, rockers, and seating furniture. Much of the upholstered metal furniture, however, is outdoor furniture. The number of units of metal upholstered furniture shipped is not provided by the Census data. About 300

¹ Dual purpose sleep furniture, such as sleep sofas, are classified in SIC 25155; many of the manufacturers of these products are primarily classified in SIC 2512. Upholstered metal furniture is classified in SIC 2514798, and upholstered reed and rattan furniture and other related furniture are in SIC's 2519033 and 2519098. Upholstered dining room and kitchen chairs are in SIC's 2511331 and 2511391.

² Bureau of the Census, U.S. Department of Commerce, 1992 Census of Manufactures, report MC92-S-2, "Concentration Ratios in Manufacturing."

U.S. firms manufacture metal household furniture (upholstered and non-upholstered) as their primary product.

Upholstered furniture, such as those made with reed and rattan frames (including willow, wicker, and cane), are included in SIC 2519, *Household Furniture, N.E.C.* Domestic shipments of reed and rattan seating in 1992 totaled 262,000 units, with a value of shipments of \$53 million. Fourteen companies reportedly had shipments totaling at least \$100,000. Imports of reed and rattan seating furniture are significant, with a value of shipments totaling about \$80 million in 1996, some of which was upholstered.

Upholstered furniture manufactured under contract for nonresidential settings is not likely to be covered by any regulatory alternative under consideration. However, items such as desk chairs marketed as residential products may be affected, if they have upholstered seats and backs. The number of people maintaining home offices reportedly has grown significantly in recent years, rising from about 27 million in 1989 to 41 million in 1993, and 50 million in 1996.³ This indicates that there may be much upholstered office furniture in household use, principally as desk chairs.

Chairs intended for seating at dining or kitchen tables, and having upholstered seats *and* backs are generally products of firms classified in the wood household furniture industry, SIC 2511 (in subcategories SIC 2511331 and 2511391). The *Census of Manufactures* reports that nearly 8 million dining room chairs were shipped in 1992, with a value of shipments totaling about \$580 million; the value of shipments of other dining room and kitchen seating was about \$20 million (unit shipments were not reported). Census data are not reported separately for upholstered and non-upholstered dining chairs. The 1994 Heiden Associates survey of participants in the UFAC Program sought information from manufacturers of upholstered dining room and kitchen seating. Heiden Associates estimated that the total value of shipments of such furniture that complied with the UFAC Program (and, therefore, had upholstered seats) was about \$250 million for 1993. Based on the value of 1992 shipments, perhaps 3 to 4 million upholstered dining chairs were shipped by these UFAC participants. A large percentage of these items probably did not have upholstered backs. Other firms that are not participants in the UFAC Program also manufacture upholstered dining furniture. Based on these limited data, roughly 2 to 4 million dining chairs with upholstered seats and backs might be affected by regulation of small open flame ignition of upholstered furniture.

Annual domestic retail sales of upholstered furniture is in the range of 25 to 30 million units with a value of about \$16 billion. Furniture manufacturers, especially smaller firms, commonly market their products through independent sales

³ *Handbook of Furniture Manufacturing and Marketing*, AKTRIN Furniture Research, Oakville, Ontario, Canada, June 1994, p. 51.



representatives who provide information on the market, and get and service new retail accounts for manufacturers. Recently some manufacturers have reduced their reliance on independent representatives, by employing their own salespeople. Besides purchasing from manufacturers through independent sales representatives or the manufacturers' own sales staff, retailers may purchase furniture from wholesale furniture distributors. These wholesalers purchase from perhaps 25 to 30 manufacturers of different types and styles of furniture, which are placed in their warehouses. The sales staff of the wholesalers then call on retailers within their areas. Dealing through local wholesalers that stock an assortment of furniture, and which also offer, competitive prices, credit, and other services, is advantageous to many retailers, particularly smaller firms.⁴

Sales of furniture, bedding, and decorative accessories (including lamps and area rugs) by the top 100 furniture retailers totaled \$13.3 billion in 1996. These firms accounted for 41 percent of the \$38.8 billion in sales of all product categories by all furniture stores. Twenty-eight of the top 100 stores specialize in specific products, including bedding (10 stores) and upholstered furniture (8 stores). These specialists had combined sales of \$3.1 billion in 1996. For the 72 conventional furniture stores in the top 100 furniture retailers, upholstered furniture accounted for about one-third of total sales.⁵ Approximately 30,000 establishments retail upholstered furniture. Larger retailers are more likely to purchase directly from furniture manufacturers, and smaller firms are more likely to purchase through wholesale distributors. Furniture retailers often seek to promote sales of furniture by offering items at "price points," such as \$499 or \$599. Retail prices of upholstered furniture fall into a very broad range, depending on materials and manufacturing techniques used.

About 260 companies reportedly participate in the Upholstered Furniture Action Council (UFAC) Voluntary Action Program, which is intended to address cigarette ignition hazards of upholstered furniture.⁶ Most of the larger producers of furniture are believed to be UFAC participants. According to estimates provided by officials of upholstered furniture manufacturers surveyed by Heiden Associates in 1994 (under contract to UFAC), 85 to 88 percent of the total value of shipments of wood frame upholstered furniture in 1993 conformed to the UFAC program requirements. Adding sleep furniture to upholstered wood furniture brought estimated compliance up to 86 to

⁴ *Handbook of Furniture Manufacturing & Marketing, Volume 9, Wholesaling*, AKTRIN Research Institute and High Point University, May 1994.

⁵ "The Top 100 Furniture Stores," *Furniture/Today*, Cahners Publishing, Greensboro, NC, May 26, 1997, pp. s3-s30.

⁶ The 260 companies now participating in the UFAC program are fewer than the 376 firms that reportedly were involved in the middle-1980's. However, this change is most likely related to consolidation of firms within the industry. Also, the earlier enrollment may have included branch locations in addition to company headquarters.

89 percent of the dollar value of shipments of these two major categories of upholstered furniture.⁷ Heiden Associates' information on the value of shipments of UFAC firms is consistent with Dun & Bradstreet data acquired for a 1995 survey of manufacturers.⁸ Also, the recent testing of furniture components by the CPSC's Directorate for Laboratory Sciences to determine conformance with UFAC tests supports the assertion that a high percentage of the total value of shipments of upholstered furniture conforms with the UFAC Program. An overall market estimate of 90 percent conformance with the UFAC Program (if production by non-UFAC firms that technically is not certified is included) is reasonable.

B. Upholstery Fabric/Materials

A review of fabric manufacturers listed in trade publications and in the American Textile Manufacturers Institute (ATMI) Directory of Manufacturers indicates that approximately 100 to 200 manufacturers derive a significant share of their revenues from fabric for household upholstered furniture. This number includes textile mills that produce finished upholstery fabric and textile finishers that purchase unfinished goods and perform additional operations, such as printing and dyeing. The top five companies reportedly accounted for \$1.08 billion of the nearly \$2 billion domestic upholstery market in 1993. The top 15 had combined sales of \$1.6 billion in 1993, or about 80 percent of the upholstery market.⁹ As with the upholstered furniture industry, recent years have seen consolidation of firms specializing in upholstery fabric production. Larger firms have bought out competitors or divisions of competitors, often retaining much of the existing production and management structure. By recent accounts in the trade press, the top two producers of upholstery fabrics, Joan Fabrics and Culp (and their subsidiaries), will soon combine for annual sales of about \$950 million, more than one-third of the upholstery market.¹⁰

Although some of the firms are quite large, most of the firms supplying upholstery fabric to the furniture market are small. Textile mills that make upholstery fabrics as their primary products are included in SIC 2211 (Cotton Broadwoven Fabric Mills) and SIC 2221 (Manmade Fiber Broadwoven Fabric Mills). Other firms receive unfinished fabrics ("greige goods") and perform additional manufacturing operations (e.g. printing, dyeing, backcoating, stain guarding). Fabrics may be purchased by the

⁷ Heiden Associates, Inc., "Report on Survey of UFAC Members re: Compliance with Upholstered Furniture Cigarette Ignition Flammability Standard," December 15, 1994.

⁸ Charles L. Smith, EC, CPSC, "Results of Surveys of Furniture Manufacturers," September 1996.

⁹ *Furniture/Today*, Cahners Publishing, Greensboro, NC, May 2, 1994, p. 8.

¹⁰ *HFN The Weekly Newspaper for the Home Furnishing Network*, April 7, 1997, p. 114; and *Furniture/Today*, July 21, 1997, p. 38.

finishers, or the finishing is done under contract to other firms that supply the fabrics. Of 168 establishments primarily classified in "Finishing Plants, Cotton" (SIC 2261), 103 had fewer than 50 employees (61 percent); only 5 had more than 500 employees, the number used by the Small Business Administration to determine whether firms are "small businesses" for the purposes of obtaining loans. Of 180 establishments finishing fabrics made from manmade fibers (SIC 2262) in 1992, 77 had fewer than 50 employees (43 percent) and 9 had more than 500. Although these Census data are indicative of the sizes of establishments involved in the production of furniture upholstery fabrics, these SIC codes include firms that produce fabrics other than furniture upholstery.

U.S. upholstery production in 1996 was 533.5 million square yards.¹¹ About 4,300 looms are in operation for the production of these fabrics. The major end-use markets for upholstery production are in upholstered furniture and automobile manufacturing. Based on discussions with furniture manufacturers concerning average fabric yardage requirements for chairs and sofas, the Directorate for Economic Analysis estimates that annual consumption of upholstery fabrics for the production of upholstered furniture is in the range of 290 to 340 million square yards. This total does not include consumption of leather upholstery.

A 1995 CPSC survey of domestic furniture manufacturers found greater use of jacquards, dobbies, and thermoplastic prints and less use of velvets and flocked fabrics than did previous surveys conducted in 1984 and 1981.¹² According to the survey, jacquards were the most commonly-used fabric in 1995, an estimated 28 percent of total fabric yardage, followed by velvets and cotton prints, each with 17 percent; dobbies, 16 percent; thermoplastic prints, 13 percent; vinyl-coated fabrics, 5 percent; and flocks, 4 percent. Questions about the primary fiber or material of fabrics or upholstery covers found that an estimated 51 percent of the total yardage used in 1995 was primarily thermoplastic fibers (e.g., polyester, polyolefin, and nylon); 31 percent was primarily cellulosic (e.g., cotton and rayon); 10 percent was leather or wool; and 5 percent was vinyl-coated. Two percent were made from other fibers. The 1995 survey results may understate the importance of leather as an upholstery cover, since its use has been reported to be growing in recent years, and there has also reportedly been an increase in the use of leather on furniture imported from Italy and other countries. The 1997 market share for leather in residential upholstered furniture may be about 15 percent.

¹¹ Bureau of the Census data cited in "Textile Highlights," American Textile Manufacturers Institute, March 1997, p. 10.

¹² Charles L. Smith, EC, CPSC, "Results of Surveys of Furniture Manufacturers," September 1996, *op. cit.*

III. Potential Benefits of Reducing Small Open Flame Ignitions of Upholstered Furniture

Between 1980 and 1994, upholstered furniture fires ignited by open flames showed a significant downward trend, according to analysis by the Directorate for Epidemiology and Health Sciences. However, the number of deaths from open flame ignited upholstered furniture fires has remained relatively steady during that time, and there was a significant increase in the rate of injuries per fire. In 1994 there were a total of 3,800 residential fires involving open flame ignitions of upholstered furniture. These fires resulted in an estimated 160 deaths, 540 injuries, and property losses of \$69 million.¹³ NFPA and CPSC staff analysis of the national fire data from 1990 to 1994 indicates that an annual average of 100 deaths, 460 injuries, and property losses of \$46 million were caused by ignition of upholstered furniture by small open flame sources, such as matches, lighters, or candles. The value of these fire losses to society totaled an estimated \$625 million annually.¹⁴

The 1994 Commission rule requiring most cigarette lighters to be child-resistant should lead to a reduction in the hazard. Based on projected effectiveness of the lighter standard and information developed by the Directorate for Epidemiology and Health Sciences, the remaining estimated annual losses from lighter, match, and candle ignitions of upholstered furniture that would not have been eliminated by the lighter rule are about 75 deaths, 350 injuries, and \$35 million in property losses.¹⁵ The estimated value of these losses totals about \$470 million annually. Assuming no significant changes in fire losses in the absence of remedial action, this level of societal cost comprises the maximum potential benefits of a standard or other hazard reduction measures.

¹³ Kimberly Long, EHHA, CPSC, "Small Open Flame Ignitions of Upholstered Furniture - Final Report," October 1996.

¹⁴ The value of total societal losses is based on a value of \$5 million per life, which is supported by studies of the "statistical value of life" reported in economic literature; a value of \$170,000 per injury, as shown by analysis of injury costs associated with fires started by lighters, which was done in support of the CPSC lighter standard; and the \$46 million in property losses estimated by the NFPA.

¹⁵ For the purposes of calculating reductions in losses resulting from the lighter standard, the Directorate for Economic Analysis (EC) considered data developed by the Directorate for Epidemiology and Health Sciences on the percentages of lighter fires, deaths, and injuries involving childplay. EC also assumed that the standard would be 70 percent effective in reducing the upholstered furniture fire losses associated with lighters used by children under age 5. Of the estimated annual average of 40 deaths from 1990 through 1994 involving upholstered furniture ignited by lighters, about 90 percent involved lighters used by children under age 5. Therefore, the lighter standard is projected to save about 25 lives annually of the average of 100 deaths from ignitions by lighters, matches, and candles. Similarly, injuries are projected to be reduced by 110 (of 210), and property losses reduced by about \$11 million (of \$18.5 million).

Testing data indicate that most fabrics used in the manufacture of upholstered furniture will ignite from a 20-second exposure to a small open flame. Notable exceptions may be wool fabrics, which do not comprise a substantial share of the fibers used in the production of upholstery fabrics, and leather, which is widely reported to be gaining in importance as a furniture cover material. Some vinyl-coated fabrics also reportedly resist ignition. Leather and ignition-resistant fabrics might currently combine for about 20 percent of the upholstery covers currently used by the furniture industry, and perhaps 10 percent of the coverings found on furniture in households.

Based on CPSC Product Population Model estimates, there are nearly 400 million pieces of upholstered furniture in use. Assuming virtually all of the risks associated with small open flame ignitions of furniture are attributable to materials used in the manufacture of 90 percent of the furniture in use (perhaps 360 million pieces), the annual expected hazard costs of those items is about \$1.30 per unit, and the average discounted present value of expected hazard costs over the life of such products is about \$16 per unit.¹⁶ This expected per-unit cost applies to each piece of furniture in the household, whether covered by its original fabric, reupholstered, or covered by a slipcover or throw. This would be the expected benefits if a regulatory action resulted in the elimination of fires started by matches, lighters, and candles. For each 10 percent effectiveness in reducing the hazard over the expected product life, the present value of benefits would be about \$1.60 per unit of furniture affected. For example, a regulatory option that is 70 percent effective at reducing risks would have expected benefits of about \$11.20 per unit; if 20 million units were affected in a year (perhaps 80 percent of total production of 25 million units), then total benefits would be expected to be \$224 million. If the option were 90 percent effective, expected benefits per affected unit would be \$14.40, and total expected benefits would be \$288 million.

In addition to benefits from reductions in fires started by small open flames, regulatory actions taken by the CPSC primarily to address small open flame ignitions could also result in reductions in fire losses from other ignition sources. Testing of fabrics that have been treated to comply with the match test of British standard (BS-5852) indicates that fire retardant (FR) treatments used to reduce small open flame ignitions will also often improve the resistance of furniture to ignition by a smoldering ignition source, such as a cigarette. This suggests that if upholstered furniture is produced to resist small open flame ignitions, there may also be additional reductions in deaths, injuries, and property damage from improvements in the cigarette ignition resistance of furniture. These potentially substantial fire loss reductions would greatly increase the overall benefits of addressing small open flame ignitions of upholstered furniture.

¹⁶ Based on an average product life of 14 years, and a discount rate of 2.5 percent. The discount rate reflect's society's time preference for a stream of costs or benefits realized in future years.

The expected annual hazard costs of cigarette ignited fires attributable to upholstered furniture produced with materials currently in use is estimated to range from \$1.7 to \$1.8 billion.¹⁷ For the approximately 400 million pieces of household upholstered furniture in use, the average expected annual hazard costs are a little over \$4. Based on the results of chair testing in recent years, perhaps 95 percent of expected cigarette ignition hazard costs may reasonably be attributed to the estimated 31 percent of furniture covered with predominantly cellulosic fabrics.¹⁸ Because of the magnitude of the losses attributable to cigarette-ignited upholstered furniture fires, even a modest improvement in cigarette ignition resistance effected by actions to improve small open flame ignition resistance would have significant benefits to society. For each 10 percent reduction in cigarette ignition losses resulting from compliance with a regulatory option primarily addressing small open flame ignition hazards, the estimated present value of additional benefits from reduced cigarette ignitions is nearly \$6 per affected unit. If, for example, 50 percent of the expected losses from cigarette ignitions of upholstered furniture were eliminated, the estimated additional benefits would be about \$29 per item of furniture affected by the standard, on average. The total present value of expected benefits from reduced cigarette ignitions (at 50 percent effectiveness) would range from about \$570 million to \$690 million for each year's production of upholstered furniture.

If upholstered furniture complies with criteria to reduce small open flame ignition propensity, it is possible that the changes made will alter the burning characteristics of furniture when subjected to larger open flame sources, or when the furniture is not the first item ignited. These changes could afford residents additional time for fire detection, fire suppression, or escape, thereby resulting in additional benefits from reduced deaths, injuries, and property losses. The potential benefits are not readily quantifiable, and are not included in the estimates of benefits that might result from adoption of the draft requirements.

IV. Potential Costs

One of the regulatory options for reducing the small open flame fire hazard of upholstered furniture is for the CPSC to promulgate a mandatory performance standard. The standard drafted by the staff to address upholstered furniture fires started by small open flames contains performance requirements based on mockup tests of seating area materials and dust cover assemblies. The testing procedures would be published to

¹⁷ Charles L. Smith, EC, CPSC, Memorandum to Dale R. Ray, Project Manager, Upholstered Furniture, CPSC, November 15, 1996.

¹⁸ Although probably accounting for less than 2 percent of total fabric yardage used, chair testing indicates that silk fabrics might have no better resistance to cigarette ignition than cellulosic fabrics. Also, previous chair tests found that some chairs covered with predominantly thermoplastic fabrics resulted in sustained ignitions at one or more testing locations.

advise manufacturers and importers of the means by which CPSC staff would test furniture and other products within the scope of the standard to ascertain compliance.

The seating area test involves a small gas flame impinged for 20 seconds at the junction of vertical and horizontal mockup assemblies, comprised of the upholstery fabric and a standard polyurethane foam. Testing upholstery cover fabrics over a standard polyurethane foam is indicative of the performance of fabrics over a wide variety of filling materials used in the manufacture of furniture; this will facilitate testing by fabric suppliers and minimize the testing burden on industry.

The dust cover mockup test assembly consists of a sample of the dust cover on a horizontal test frame. The assembly is exposed to a small gas flame for a period of 20 seconds. The dust cover must cease combustion within two minutes after the flame source is withdrawn. Dust covers that develop holes or other openings during the testing may not be used in constructions that have ignitable materials within one inch above them.

The most likely means of complying with the draft CPSC standard is to use fire retardant (FR) materials in upholstery fabrics and, depending on the construction, dust covers. These changes would result in cost increases related to testing and increased fabric prices because of the treatments involved. Consumers would likely face higher retail prices for most upholstered furniture as a result.

A. Upholstery Fabric/Covering Testing Costs

A probable outcome of a standard would be certification of fabrics by suppliers. This would reduce the total testing burden since the same fabric would not have to be tested by all manufacturers of upholstered furniture. If furniture manufacturers relied on certification of compliance by their fabric suppliers, manufacturers' only significant cost increase would be higher prices for treated fabrics, assuming suppliers are able to pass on these costs, and, further, that changes to the fabrics would not require other major modifications in equipment or labor.

The draft standard does not include provisions specifying a sampling plan. Therefore, the frequency of testing might well differ depending on the types of fabrics, treatment methods used, and other factors. Fabric suppliers in the United Kingdom are operating under such circumstances: they are to provide evidence that they have shown "due diligence," but no sampling frequency is specified in the British standard. Some knowledgeable persons in the U.K. provided differing opinions on the frequency of testing. The director of a major testing facility in the U.K. said that "due diligence" has come to be interpreted as having evidence that fabrics have been tested every six months. However, if field tests result in failures, fabrics going back to the last passing test can be recalled. Therefore, he thought that fabric suppliers might test more frequently, even every production run. The largest commission fabric finisher in the

U.K. provided more detailed information on the frequency of testing under the British standard. This firm backcoats fabrics supplied by fabric manufacturers, including those of U.S. companies. Production runs are comprised of fabrics of similar weight and fiber contents; therefore, a production run might include 20 fabric patterns provided by 10 different customers. Production runs of 5,000 to 10,000 linear meters are typical. Samples of fabrics are tested at the beginning of each run, and every 500 meters up to 5,000 meters. Thereafter, if all tests had passing results, samples are tested every 1,000 meters for the remainder of the production run. This is reportedly typical of the British finishers, although some might test less frequently. Based on this firm's policy, testing might be done on about 10 samples in a 5,000 yard backcoating run, and 15 samples in a 10,000 yard run.

The frequency of testing may be less for a fabric manufacturer that controls every step of the process than would be the case for a commission finisher that treats different fabrics from several suppliers. Fabric manufacturers would most likely conduct seating area tests when fabrics are initially designed and manufactured. Thereafter, tests might be done for every production run so that information about compliance with the standard can be provided to furniture manufacturers, jobbers, and others that might purchase the fabric. An estimated 190 to 230 million linear yards of fabric are consumed annually in the production of household upholstered furniture. The amount of testing that would be done on inherently ignition resistant upholstery materials is not clear. Leather, for example, is generally expected to pass the seating area test without modifications. Testing could become infrequent if tanneries and furniture manufacturers become confident that leather would consistently pass. Experience with other complying materials may also encourage reduced testing over time.

Available information indicates that outside laboratories might charge \$50 to \$75 to conduct each seating area test. However, it is likely that most testing would be done at testing facilities at fabric manufacturing establishments. The U.K. fabric finisher stated that they have one employee on each of two shifts who is primarily responsible for testing to the British standard, in addition to performing other duties. Based on this firm's experience, it appears that testing costs can be lower for firms that conduct their own testing. Also, reliance on an outside testing facility could lengthen production schedules more than would result from on-site testing. Assuming that tests would be done, on average, every 1,000 linear yards of fabric produced or treated, the total annual number of seating area tests on fabric intended for upholstered furniture within the scope of the standard might range from 190,000 to 230,000. Total production run testing costs attributable to the draft standard could range from about \$2 to \$3 million (including about \$1 million in fabric costs), assuming company employees were responsible for testing. Average production run testing costs would be less than \$.02 per linear yard of fabric. If testing were by outside laboratories at a cost of \$50 to \$75 per test, testing costs would range from \$.05 to \$.08 per linear yard.

B. Costs for FR Treatments

1. Effects on Fabric Prices

The draft seating area test is very similar to the "match test" of the British standard for upholstered furniture (BS-5852). This standard is the basis for U.K. regulations that became effective in 1988. Therefore, the experience with the U.K. regulation is indicative of the possible costs of the draft seating area test if followed in the U.S. Fabric manufacturers, including some major U.S. fabric companies, have been supplying fabrics that comply with the U.K. standard's match test. Means of compliance with this test include using backcoatings which include FR chemicals, application of FR chemicals to the fabric in a way that withstands the pre-soaking requirements of the British standard, and incorporating FR chemicals into the polymeric fibers that are used to make upholstery fabrics. Other U.S. fabric producers ship their fabrics to fabric converters in the U.K. where they are backcoated with FR chemicals.

According to information provided by a British FR chemical manufacturer that reportedly produces most of the FR chemicals used in backcoating in the U.K., the increased cost to the furniture manufacturer to have fabric shipped to a fabric converter for backcoating is about \$.90 per linear yard of fabric (converted at mid-1997 currency exchange rates), including inspection and transportation. The increased costs to treat fabrics were similar for FR treatment methods that did not involve backcoating. Comparable cost estimates were provided by a major testing facility (which is a division of the largest British upholstered furniture manufacturer). This firm's estimates indicate that treatment with FR backcoatings results in increased fabric costs to furniture manufacturers in the range of about \$1.05 to \$1.20 per linear yard of fabric.

Based on estimates of the British Interior Textiles Association (BITA), treatment with FR chemicals not incorporated in backcoating generally adds about \$1.15 to \$1.35 per linear yard of fabric. Estimates by another major upholstered furniture manufacturer in the U.K., responding on behalf of the trade organization of furniture manufacturers, British Furniture Manufacturing, indicates that costs of chemical immersion treatments typically range from about \$.75 to \$1.10 per linear yard of fabric at current exchange rates.

The National Cotton Council provided results of an analysis of the costs of FR treatments in the U.K. Converted to dollars per linear yard, that analysis found that the costs to British furniture manufacturers for semi-durable, non-backcoated FR treatments range from about \$1.05 to \$2.25 per linear yard; backcoated FR treatments are about \$.80 to \$1.20 per linear yard. The British experience with a small open flame testing requirement suggests increased fabric costs to U.S. furniture manufacturers will generally fall in the range of \$1.00 to \$1.25 per linear yard for most fabrics.

Manufacturers could use fabrics that do not pass the seating area test in parts of furniture items that would not have to be tested, such as outside backs and arms. Some savings in fabric costs could be realized, if manufacturers choose this strategy. However, this would involve carrying dual inventories of fabrics, which could present difficulties regarding cutting, pattern and color matching, and other processes. This assessment of the potential costs of the standard is based on the assumption that manufacturers will not carry treated and untreated stocks of fabric patterns.

2. Effects on Retail Prices and Consumer Expenditures for Furniture, and Impacts on Purchasing Decisions

The costs of FR treatments of fabrics (and other increases in manufacturing costs) would be reflected in increased retail prices paid by consumers. The unit price increases (discussed below, by furniture type) may influence purchasing decisions. To the effect that price influences selection, consumers may purchase different styles or fabrics than they would in the absence of any standard-related price increases. They may also postpone purchases, the effects of which may be a postponement of realization of the benefits of the standard. In the U.K. when prices rose as a result of BS-5852, retail demand did not appear to be affected, although promotional activities reportedly accompanied the price increases.

Living Room and Family Room Furniture

Typically, fully-upholstered chairs require about 7 linear yards of fabric, and sofas require 11 to 15 yards, depending on factors such as the need to match patterns (which results in more fabric waste in pattern cutting). Estimated increased fabric costs of \$1.00 to \$1.25 per linear yard may lead to average retail price increases of about \$17 to \$22 for chairs and about \$30 to \$38 for sofas, assuming that costs are passed on. Considering units of chairs and sofas shipped, the average retail price increase per item of furniture requiring changes is estimated to range from \$22 to \$28. As noted previously, furniture retailers often seek to promote sales of furniture by offering items at "price points," such as \$499 or \$599, typically in \$100 or \$50 increments. Retailers and manufacturers might adjust to the increased costs related to FR treatments by selecting lower-priced fabrics or realizing savings in other furniture frame or filling materials that would allow retention of price points, or they might improve the value of items by upgrading fabrics or filling materials and increase the retail price by a full price point. Annual upholstered furniture shipments range from 25 to 30 million units, of which perhaps 80 percent would require FR treatments of upholstery fabric. Fabric treatments necessary to pass the seating area test could result in increased consumer expenditures for upholstered furniture totaling about \$440 to \$670 million annually, if manufacturers and retailers are able to pass along their cost increases.

Most, if not all, leather upholstery reportedly passes the 20-second flame test of the British standard without treatments; a small percentage of fabrics are also

assumed to be able to pass the seating area test without modification. Most vinyl-coated fabrics also pass without modification. The need for treatments of vinyl-coated fabrics reportedly depends on the polyurethane content of the polymer (for pliability). FR chemicals can be added to the polymer if needed, at a much lower cost than for post-production treatments. Some wool fabrics, which are rarely used in the U.S. and the U.K., might also pass a 20-second flame test.

Dining Chairs

Although data with which to estimate the numbers of dining chairs that might fall within the scope of the standard are limited, perhaps 2 to 5 million dining chairs of all frame materials would be covered. The fabrics of many of these products would need FR treatments, although the average fabric requirements of such items are much smaller than most other upholstered furniture subject to the standard. Assuming about two linear yards of fabric are typically used to make dining chairs, total fabric consumption for chairs within the scope of the standard might be on the order of 4 to 10 million yards. Further, if about 80 percent of fabrics require FR treatments at an increase in costs to furniture manufacturers of \$1.00 to \$1.25 per linear yard, total manufacturing cost increases for dining chairs might range from about \$3-10 million annually. Resulting increases in retail prices could total \$8-25 million, or about \$5 to \$6 per chair covered with fabric that would require FR treatment.

Home Office Furniture

Estimated annual sales of upholstered office furniture to the residential market are about 4 to 5 million units. The percentage of these items covered with leather and vinyl may be higher than for other household upholstered furniture, perhaps 30 to 40 percent. Therefore, about 2 to 4 million chairs might require modifications in order to comply with the standard, if they are not excluded. Fabric requirements for desk chairs are much smaller than for other upholstered furniture, perhaps 1.5 linear yards, on average. Therefore, perhaps 4 to 5 million linear yards of fabric may require FR treatments in order to be used on furniture bound for household use. Costs to the furniture industry might be about \$4-7 million annually for the industry. These costs might result in increased consumer outlays totaling about \$10-15 million annually. The estimated average price increase is about \$4 to \$5 per chair.

C. Other Costs

Other costs of the draft standard might include those related to the dust cover provisions, changes in business operating practices of fabric distributors, costs related to effects of product changes on aesthetic characteristics of furniture, and potential adverse health effects. Many of these impacts on industry and consumers cannot be easily monetized or quantified.

1. Dust Cover Provisions

A dust cover is fabric or other nonstructural material attached to the bottom of a chair, sofa, or other upholstered piece. Its purpose is to keep dust from accumulating in the item's interior, as well as to improve the appearance. CPSC's 1995 survey of UFAC Program participants found that 72 percent of residential furniture items had thermoplastic dust covers, about 11 percent had cellulosic or blended fabrics as dust covers, and about 17 percent were made without dust covers. The types of products made without dust covers are not identified by the survey data. However, reclining chairs and convertible furniture such as sofa beds are believed to comprise most of the units that do not have dust covers.

The draft standard also includes testing provisions for dust covers. The dust cover test could be done by or for suppliers of the dust cover materials, who could provide certification to the furniture manufacturers regarding the types of materials which comply. For example, thermoplastic (usually nonwoven) fabrics commonly used by the furniture industry would meet the standard if no other combustible materials were above them, because they melt away from the flame source without progressive combustion. Woven fabrics made from blends of cellulosic and thermoplastic fibers (used in a small percentage of furniture pieces) probably could not be used. Other constructions that would require modifications would be those having materials close to the dust cover that ignite and sustain combustion. Such constructions might require modifications to create a wider gap between the dust cover and other materials (if nonwoven fabrics were used), the addition of materials above the dust cover that would resist ignition, or use of dust covers that resist ignition and protect materials above them.

The costs of compliance (for furniture manufacturers and consumers) with the dust cover requirements in the draft standard could be minor for most furniture styles. Styles with long legs are more likely to have dust covers in contact with or close to combustible materials above them. Such constructions might require the use of fire blocking fabrics or barrier materials. It probably will be necessary to use substitute fabrics for most woven cellulosic or blended fabrics used as dust covers because FR treatments have not yet been developed to allow them to be used.

Furniture manufacturers would also switch to the lower cost alternative of existing nonwoven fabrics for furniture constructions with no combustible materials within one inch of the dust cover. An estimated 15 percent of furniture pieces are made without dust covers. Information on the percentage of furniture items having combustible materials in contact with dust covers is not currently available, although furniture styles with short legs and adequate gaps between dust covers and other combustible materials are believed to dominate. Perhaps 5 to 10 percent of items have longer legs and dust covers in contact with, or close to, combustible materials. Most of the longer-legs pieces probably are chairs, rather than sofas or loveseats. If these

items required the use of flame-resistant materials at an average increase in costs of materials of \$.50 to \$1.00 per unit, total annual cost increases for the industry would range from about \$625,000 to \$3 million. Markups to the retail level could result in increased consumer expenditures in the range of about \$1.5 million to \$7.5 million.

2. Fabric Distributors

A mandatory standard may affect wholesale and retail fabric suppliers, to the extent of reduced demand for upholstery fabrics that do not comply with the seating area test. The impacts on individual firms would depend on the proportion of their revenues from sales to the furniture industry. Some fabrics may be diverted for purposes other than furniture upholstery, such as window treatments. If such fabrics continue to be available without FR treatments these firms would have to increase their number of Stock Keeping Units (SKU's) to satisfy their customers' needs for both forms of the fabrics. The associated costs could include those related to recordkeeping, ordering in smaller quantities, reducing the number of styles offered, and increasing space devoted to fabric stocks. These costs could be spread over the fabric line offered, and, therefore could result in some price increases for fabrics that are not FR treated.

3. Aesthetic Characteristics

In the U.K., initial fabric treatments reportedly resulted in poor aesthetic qualities and physical characteristics of fabrics (such as altered colors, poor drapability, handling, and breathability of the fabrics, and decreased fabric tear-strength and abrasion resistance. According to officials of British government, textile, FR chemical, and furniture manufacturing organizations, these initial problems have largely been overcome. For instance, backcoating treatments now are applied in much thinner applications that do not detract from most fabrics to which they are applied. FR chemicals applied to fabrics without backcoating when the match test was first required were applied in loadings similar to those used for fire-resistant clothing; this was more than necessary, and the fabrics' abrasion performance and tear-strength were adversely affected. These problems have also been resolved, according to the testing facility associated with the largest upholstered furniture manufacturer in the U.K. Also, although FR chemicals applied without backcoating can affect the colors of fabrics, BITA reports that chemical manufacturers now advise fabric producers on adjustments to make in order to achieve the desired colors after treatment.

V. Costs and Benefits

As discussed earlier, the estimated potential benefits of reduced small open flame ignitions of upholstered furniture are about \$16 over the life of each item made with materials more prone to ignition. Actual benefits will depend on the effectiveness of the remedy in reducing losses from fires started by matches, lighters, and candles.

Information from the U.K. experience and CPSC testing indicates that the fabrics that would comply with performance requirements would be highly resistant to ignition from small open flames. A conservative assumption of 80 percent effectiveness in reducing these losses leads to projected benefits with a present value of about \$13 per item. The average estimated costs to consumers for improved small open flame ignition resistance of living room and family room furniture is \$23 to \$30 per item. (Average costs for other types of furniture, such as desk or dining chairs would be lower.) These costs would be in the form of increased prices paid at the time of purchase. Aggregated estimated costs to consumers for furniture that complies with the performance requirements range from about \$460 to \$720 million annually, most of which would be attributable to the cost of FR-treated upholstery fabrics.

In addition, performance requirements that address small open flame ignitions of upholstered furniture are expected to reduce the hazards of cigarette ignition for affected items. As noted earlier, the costs to society of upholstered furniture fires from cigarette ignitions of current production averages about \$4 annually per item, and the expected present value of societal costs over the life of a piece of furniture is about \$50. If the action taken to address open flame ignitions also addresses 20 to 30 percent of cigarette ignitions, the expected benefits to society of the open flame remedy would roughly equal the estimated costs. The U.K. experience and other European data indicate that this range understates the effectiveness of FR fabric treatments in reducing cigarette ignitions of upholstered furniture.

Although the extent of the improvement in cigarette ignition resistance resulting from measures taken to meet a small open flame ignition standard, it is reasonable to expect that at least 50 percent of the cigarette-ignited fire losses would be prevented. The resulting benefits would have an estimated average present value of about \$29 per unit of furniture affected (perhaps 80 percent units produced). A standard that reduces annual small open flame furniture fire losses by 80 percent (with annual estimated benefits of \$256 million) and annual smoking material fire losses by 50 percent (with a midpoint of the range of annual estimated benefits of \$630 million) may have annual net fire safety benefits of about \$300 million (after subtracting the midpoint of estimated annual costs, \$590 million).

This analysis assumes that manufacturers will use FR treatments that pose no additional risk of injury or adverse health effects to consumers. Also, there is no evidence that furniture that resists open flame or cigarette ignition leads to any offsetting risky behavior.

VI. Small Business Considerations

A. Furniture Manufacturers

Nearly all of the furniture manufacturing companies that will be affected by the draft requirements are small businesses, as defined by the Small Business Administration (SBA) for most of its programs. The SBA size standard for furniture companies, including their affiliates, is 500 employees. Research by *UDM Upholstery Design & Manufacturing* magazine found that only 31 of the top 50 upholstered furniture manufacturers had 500 or more employees, including some that specialize in the contract furniture market.¹⁹ Therefore, by the SBA size standards, the great majority of furniture manufacturers are small businesses. For these firms, for the most part, the costs of compliance with the draft requirements would arise from higher costs for FR treated upholstery cover fabrics. These costs are directly related to production volume: manufacturers should incur similar cost increases per unit produced. Therefore, smaller manufacturers may not bear disproportionately greater cost increases. In fact, to the extent that smaller furniture manufacturers use higher-priced upholstery fabrics, the increased material costs from FR treatments could represent a smaller increase in total costs, relative to their current fabric expenditures and average price they receive per unit.

B. Fabric Producers

Most producers of upholstery fabrics used in the production of upholstered furniture, whether textile mills that finish their own fabrics or textile finishers that finish fabrics (that they purchase or under contract), also are small firms. The SBA size standards for cotton broadwoven fabric mills (SIC 2211) or finishers of cotton broadwoven fabric (SIC 2261) (categories that include cotton upholstery fabric) are 1,000 employees; the size standards for producers of other types of upholstery fabric are 500 employees. The impact of the standard on small textile producers is likely to be mixed. Small textile finishers that are able to apply FR treatments by the immersion or backcoating methods are likely to realize increased demand. Although leather, most vinyl coated fabrics, and most wool fabrics may not require FR treatments, those products are generally expected to be sufficiently distinguished for most upholstery fabrics in terms of price or appearance that they are not close substitutes for fabrics that will have to be treated. Therefore, fabric suppliers should be able to pass along cost increases to the furniture manufacturers without realizing significant reductions in demand. Smaller firms that specialize in fabrics that could be more adversely affected aesthetically by FR chemical treatments could face reduced demand for their fabrics unless methods are developed to allow their products to be used under the standard at

¹⁹ "The udm Top 50," UDM Upholstery Design & Manufacturing, Cahners Publishing Company, May 1997, pp. 22-29.

reasonable cost increases. Among the fabrics that might be more adversely affected, based on the British experience, are delicate decorative fabrics, such as those made from silk.

VII. Scope, Testing, Labeling, and Effective Date Options

A mandatory standard has a number of alternative features that could be adjusted or modified to alter potential economic effects. These alternatives include expanding or narrowing the scope of product coverage, proposing additional tests, labeling requirements, and changing the effective date. Labeling, by itself, in lieu of a standard, could also be an option.

A. Scope

1. Futon Covers

Futons have become more popular in recent years as dual purpose furniture. They are normally marketed with adjustable frames that allow them to be configured as a flat sleeping surface or as a sofa. In the sofa configuration, the futon is folded, serving as both the seat and back cushion. When used this way, futons may be reasonably expected to present a similar risk of ignition from small open flames to that of an upholstered sofa. Usually, consumers purchase a futon mattress and frame, and select a futon cover from stock held by the retailer, or order a cover separately. Although futons are mainly marketed as an alternative to sleep sofas, futon mattresses are also purchased alone for use on the floor in the traditional Japanese manner, and they may also be used on platform bed frames. Futon mattresses must comply with the CPSC standard on mattress flammability, which addresses cigarette ignition resistance. Most, but not all, futon mattresses that are bought for use with a convertible frame are covered with the separately-purchased slipcover.

An industry trade organization, the Futon Association International (FAI), reportedly includes 125 futon cover manufacturers among its members. FAI stated that only very rough estimates are now available regarding the numbers of futon cover manufacturers, and industry sales. FAI is sponsoring a survey intending to gather reliable data on the industry, but the findings are not yet available. FAI believes that, if futon retailers that manufacture their own covers are included, there may be roughly 400 to 800 futon cover manufacturers.

Sales of futons and covers are believed to have risen significantly in the last few years. FAI provided a "very rough" estimate that annual shipments of frames, mattresses, and covers have a wholesale value of \$300 million to \$500 million, and \$700 million to \$1 billion at retail. Of total sales value, mattresses were estimated to comprise 31 to 35 percent and covers 23 to 25 percent, with frames accounting for the remainder. Based on these rough estimates, the value of shipments of futon covers

might be \$70 to \$125 million, with a retail value of \$160 to \$250 million. Futon mattress, frame, and cover manufacturers are generally separate firms; mattress manufacturers usually do not also make the outer upholstery cover, which is usually zipped onto the mattresses. Based on the rough estimates of sales and participants, the futon cover market is mainly comprised of small establishments, although many could also be involved in other lines of business, such as furniture slipcovers. The available information indicates that the average value of shipments by manufacturers of futon covers is less than \$320,000, and could be less than \$100,000. Based on the rough estimates of total retail sales value of futon mattresses and covers, and estimated average retail prices, annual sales recently might have been approximately 1.5 to 2 million futon covers.

Estimated consumption of upholstery fabric in the manufacture of futon covers is approximately 15 million linear yards. Increased manufacturing costs of using FR treated fabric in the production of futon covers may be about \$8 to \$10 per unit, and the increased costs to consumers may be about \$20 to \$25. This increase would be significant for most futon covers, since information from trade press indicates that futon covers commonly retail for under \$100. Total increases in consumer outlays as a result of product changes needed to pass the seating area test could be about \$30 to \$50 million.

2. Slipcovers and Throws

The Flammable Fabrics Act authorizes the Commission to regulate certain slipcovers and throws. Given data showing the importance of covering fabrics in determining the small open flame ignition resistance of furniture, the Commission could extend coverage of the standard to include these products. It is reasonable to assume that small open flame ignition hazards associated with slipcovers and throws may be similar to furniture upholstered with the same types of materials, if other household characteristics are equal. Slipcovers may be purchased ready-made or custom-made. Slipcovers and throws are bought to preserve the appearance of upholstery fabric, to extend the useful life of a chair or sofa with worn or damaged upholstery fabric, or to change the appearance of an item of furniture without replacing it.

Recent articles in the trade press indicate that throws are more likely to be used to extend the life of worn furniture and slipcovers are more likely to be used for decorative purposes. However, some custom-made slipcovers may cost hundreds of dollars. Ready-made slipcovers have increased in popularity in recent years: the total retail sales value of slipcovers increased from about \$75 million in 1993 to \$150 million in 1994.²⁰ Retail sales in 1997 are projected to total about \$180 million. About 80

²⁰ "Slipcovers in Fashion Limelight," *HFN The Weekly Newspaper for the Home Furnishings Network*, April 3, 1995, p. 34.

percent of sales are by mass merchants and through catalogs, with the remaining 20 percent through department and specialty stores. Throws retail for about \$20 for a chair and \$50 for a sofa. Lower priced slipcovers are about \$10 to \$15 more than throws. Much of the slipcover market is for decorative purposes, using more expensive and heavier upholstery fabrics. These products generally fall within a retail price range of \$50 to more than \$100 for chair-sized slipcovers, and \$110 to \$160 for sofa slipcovers. Unit sales estimates are not available, but the total estimated retail value and sales price information indicates that current year unit sales will be on the order of three million slipcovers and throws. Estimated consumption of fabric used to make furniture slipcovers to be about 20 to 30 million linear yards.

Manufacturers of slipcovers and throws could rely on testing results obtained by the fabric mills or finishers. As with furniture manufacturers, the expected costs of compliance mainly would be attributable to increased fabric costs related to FR treatments. Similar to furniture manufacturers, manufacturers of slipcovers and throws might face fabric price increases of about \$1.00 to \$1.25 per running yard; many smaller firms and reupholsterers who make custom slipcovers might pay greater increases if they must purchase fabrics in smaller quantities from jobbers whose markups are included in the final price. Since nearly all of the material costs of production of slipcovers and throws are costs of fabric purchased, and many of the lower-priced products are made from inexpensive fabrics, the relative increase in retail prices of these items attributable to the small open flame ignition standard would be considerably greater than for upholstered furniture. Per unit price increases might be roughly \$15 to \$20 for slipcovers and throws intended for chairs and \$25 to \$30 for those made for sofas. Annual sales of slipcovers are estimated to be about three million units. Total annual costs passed on to consumers might, therefore, be \$60 to \$75 million.

3. Outdoor Furniture

Outdoor casual furniture is often used in screened-in patios or porches, or used as casual furniture inside residences. Approximately 60 million linear yards of fabric were consumed in the production of casual outdoor furniture in 1994, and the outdoor fabric category was expected to grow 8 percent a year. The value of 1994 sales of outdoor fabric was about \$75 million.²¹ Vinyl-coated polyester fabrics became popular choices in the 1970's; these are said to be more comfortable, more durable, faster drying, and easier to clean than the vinyl-coated fabrics that used to dominate the market. These fabrics cost \$2 to \$3.50 a yard. In the last several years, solution-dyed acrylic fabrics reportedly have become the leading fibers for outdoor furniture fabrics.

²¹ "The Great Cover-Up," *HFN the Weekly Magazine for the Home Furnishings Network*, August 14, 1995, p. 11.

Current information indicates that vinyl-coated fabrics, perhaps including many of those used in the manufacture of outdoor/casual furniture, may pass the small open flame test, unless the polymer formula includes sufficient quantities of more flammable urethane. Other outdoor furniture fabrics would require changes, such as FR backcoatings, or incorporating FR chemicals in the fiber polymerization, if the product category were included within the scope of the standard.

4. Dining Furniture

Annual production of perhaps 2 to 5 million dining chairs with upholstered seats and backs might be subject to the draft standard. As discussed previously, compliance with the standard could lead to estimated increased consumer outlays in the range of \$8 to \$25 million, about \$5 to \$6 per affected chair.

Society would not receive the benefits of reduced open flame ignitions of upholstered dining chairs if these items were excluded from the scope of the standard. Little information is available on the extent to which dining chairs are involved in fire losses. The CPSC special study of upholstered furniture fires associated with small open flame sources found that 12 of 76 investigated fires involved chairs, and 63 involved sofas or sofa beds, although annual sales of chairs exceeds sofas and sofa beds. This indicates that the expected societal costs of fires involving chairs, including dining chairs, are lower than average costs. It is also possible that the generally smaller fuel loadings of dining chairs (*e.g.*, weight of fabrics and combustible filling materials) present less dangerous fire conditions than other types of upholstered furniture, when ignition occurs.

5. Home Office Furniture

Annual sales of upholstered office furniture to the residential market might be about 4 to 5 million units. Compliance with the standard might result in increased consumer outlays totaling about \$10 to 15 million annually, as discussed previously. The estimated average price increase is about \$4 to \$5 per chair. Little information is available on the extent to which home office furniture is associated with small open flame ignitions.

B. Testing Requirements

1. Skirt Test

A skirt test in the standard would involve a vertical flame test of the loose decorative layer of fabrics around the bottoms of some chairs, loveseats, and sofas. The skirt test would likely test a finished product, unlike the seating area test which uses a composite of the fabric and filling material. Fabric manufacturers might have skirts with a variety of construction methods made (*e.g.*, with multiple layers of various

fabrics, or with stiffener materials) which could then be subjected to the test. They could then provide statements to furniture manufacturers that the fabric complies with the CPSC skirt test when made in specified ways. If the skirt test is more severe than the seating area test, so that something like an FR stiffener is needed in addition to the FR fabric, that might present difficulties for certification by fabric suppliers. Therefore, it is possible that the burden of testing would fall on the furniture manufacturers for a skirt test. This would significantly increase total testing costs. If 500 fabric patterns used for items with skirts were tested by manufacturers that have them in their product lines, testing costs could be about \$25,000 to \$40,000 per firm. If 1,000 to 1,500 establishments make furniture with skirts, total industry testing costs might be in the range of \$25 to \$60 million to qualify fabrics used in the first year of the standard. In subsequent years costs may be reduced if tests are not repeated on fabrics that passed in the previous year. If 1/3 to 1/2 of fabrics used are introduced each year by furniture manufacturers, annual skirt testing costs might range from about \$8,000 to \$20,000 per establishment, and \$8 to \$30 million for the industry. If these manufacturing costs are spread out across the product lines by manufacturers, average increases per unit produced would range from about \$.30 to \$1.20 per unit.

If the skirt test is included in the standard, it might be reasonable to use topical flame retardant treatments to be used by furniture manufacturers, since the need for durability might not be as critical as in the seat and back locations. Perhaps fire retardant materials could be laminated to the upholstery fabric. About 1.2 to 2 square yards of fabric may be used to make the skirts of sofas, and .6 to 1 square yards may be used for chairs. By way of illustration, if skirt treatments increase manufacturing costs by \$.50 per square yard, those modifications might increase manufacturing costs by about \$.50 per chair and up to \$1 per sofa. Total annual increased manufacturing costs would depend on the number of furniture pieces made with skirts. If 25 to 50 percent of pieces are made with the feature, increased costs could be about \$5 to \$10 million annually.

Considering the combined costs of testing and product modifications, total annual costs related to the skirt test might be \$30 to \$70 million in the first year of the standard, and \$13 to \$40 million annually in subsequent years. If the manufacturing costs are apportioned over the broader product lines, average increases would range from about \$.65 to \$1.45 per unit. The average increase faced by consumers at the retail level could range from about \$1.60 to \$3.60 per piece of upholstered furniture.

The special investigation of open flame ignition upholstered furniture fires found that only 1 out of 76 fires involved the skirt of a piece of furniture. Based on this information, and the potential costs of compliance, the staff concludes that the involvement of skirts in open flame ignitions is a rare event that does not warrant the inclusion of a skirt test in the standard.

2. Exempting Some Constructions from the Dust Cover Testing

Some upholstered furniture is designed so that the dust covers are very close to the floor. Depending on the space between the furniture frames and the floor, this could reduce the likelihood that these items' dust covers would be contacted by a small

open flame source. All dust covers are within the scope of the draft standard because no information has been developed indicating the absence of a hazard. It is likely that constructions having dust covers close to the floor would not have combustible materials within an inch of the dust covers. In such cases, low-cost nonwoven dust covers would comply with the standard, and the industry and consumers would not be adversely affected by the requirements of the dust cover test.

3. Adopting a Flame Impingement Time of Less than 20 Seconds

The draft CPSC standard calls for a 20-second flame exposure time. This exposure time balances risk reduction with technical feasibility and commercial practicability. Adoption of a shorter flame impingement time (such as 15 seconds) could enable additional fabrics, such as some heavier-weight cellulosic fabrics, to be used without the need for FR treatments. Staff experiments showed that matches and lighters often can be impinged for longer than 15 seconds. Also, adoption of a shorter flame exposure time could adversely affect the hazards of cigarette ignition of upholstered furniture should the use of such fabrics increase as a result of a shorter flame impingement time.

C. Labeling

Labeling of furniture could be part of a voluntary or mandatory standard to inform consumers that the item complies with a performance criteria designed to reduce the likelihood of ignition from small open flames. Cautionary statements concerning small open flame sources could also be included on labeling, in conjunction with a standard, or in lieu of a standard. The costs of labeling would be just a few cents per item (based on reported labeling costs under the UFAC Voluntary Action Program). However, the impacts of such labeling on consumer behavior and product safety may be minimal. As noted by the CPSC's Division of Human Factors, for a warning label to have any chance of improving the safety of a product, it must be aimed towards those people whose behavior needs to be changed.²² The small open flame hazards are largely attributable to children playing with lighters and matches, who are unlikely to read, or be affected by, the statements provided. Informing consumers at the time of purchase that the item complies with a performance standard would have minimal

²² Timothy P. Smith, ESHF, CPSC, memorandum to Dale R. Ray, Human Factors Response to Upholstered Furniture ANPR Comments," April 3, 1997.

impacts on safety if nearly all household upholstered furniture was in compliance, or if consumers did not consider the hazards of small open flame ignition to be a significant consideration in the purchasing decision.

D. Effective Date

Furniture manufacturers generally introduce new fabrics and styles twice each year; for many, these introductions coincide with the Spring and Fall Furniture Markets at High Point, NC. Manufacturers may stock a few hundred to more than 1,000 fabric patterns, each in perhaps 3 to 5 colors. Although fabrics are constantly introduced and dropped from product lines of furniture manufacturers, some fabrics might be kept for a few years even though they are not being used. Several options might be available to furniture manufacturers that have fabric that does not comply with a regulatory alternative adopted by the CPSC as the effective date for the action approaches: they might send the remaining fabric yardage to contract finishers for backcoating with FR chemicals; they might sell the fabric to jobbers that would market it to purchasers that are not within the scope of the regulation; they could use it for furniture exported to another country; and it is conceivable that they could still use the fabric in furniture locations that are not subject to the regulation, such as outside backs and sides (matched with fabrics identical in appearance that have been FR-treated).

The announcement of the open flame testing requirement in the British standard was made in June 1988, with an effective date for the new requirements of March 1990, about 20 months later. The requirements applied to furniture sold to consumers after the effective date. This reportedly caused significant short-term disruption of the British furniture and fabric industries, which had relatively little experience with fabric backcoating. The capacity of the fabric industry reportedly was inadequate to meet such a short effective date.

The U.S. textile industry is in a better position than their U.K. counterparts were to provide fabrics that would meet similar requirements for small open flame ignition resistance. U.S. firms reportedly have used backcoating more extensively for reasons other than to provide fire retardance than was the case for U.K. fabric producers. Experience gained in complying with the U.K. regulations by FR chemical suppliers, fabric mills and finishers, and furniture producers will benefit U.S. firms; in fact, many of the major U.S. upholstery fabric manufacturers are supplying complying fabrics to the U.K.

Adopting a longer period before a regulatory action such as a performance standard becomes effective, for example, 24 months, rather than 18 months, would provide the affected industries with additional time to efficiently adapt their production to the new requirements. Furniture manufacturers would be afforded additional time to use stocks of untreated fabrics that do not comply with the standard's testing provisions and fabric manufacturers and finishers might develop more effective and efficient processes to comply with the standard.