

an option available to manufacturers, the aggregate manufacturing costs related to FR treatments and barriers could be lower.

Furniture items covered with other types of upholstery materials, ranging from moderately cigarette-ignition-prone cellulose to ignition-resistant leather, wool, and vinyl-coated fabrics, should not require FR-treated fabrics or barriers. However, all would require filling materials that comply with other material tests of the draft standard, unless the cover material is also qualified as a barrier. We assume that cover materials such as leather, wool, and vinyl-coated fabrics would pass the optional cover material barrier test. Therefore, items covered with these materials would not incur significant costs for cushioning materials under the draft standard. We assume that all items that are made with complying cushioning materials would incur similar per unit cost increases, with total increases varying according to current estimated market shares and annual units produced (shown in column 8 of Table 5).

Based on the estimated increases in manufacturing costs associated with changes in fabrics and filling materials, aggregate increases in manufacturing costs, costs of recordkeeping, and distribution costs under the draft standard are estimated to range from \$174.8 million to \$193.6 million annually. The midpoints of the estimated ranges of costs total \$184.2 million.

7. COMPARISON OF COSTS AND BENEFITS

7.1. Benefits and Costs of the Draft Proposed Standard

The expected benefits of the staff's draft standard, which will vary depending on the cigarette ignition propensity of the upholstery cover material used, were discussed in Section 5 (and shown in Tables 2 and 4) and are summarized in Table 6 on the following page. Table 6 shows the estimated benefits (per unit of furniture) in columns 1, 2, and 3. For example, the benefits associated with bringing furniture pieces now covered with severely cigarette ignition-prone cellulosic fabrics into compliance are estimated to total \$166.29 per unit (comprised of \$155.48 from reduced losses from furniture fires started by cigarettes and \$10.81 from reduced losses from fires started by small open flames). The projected benefits resulting from modifications to furniture covered with other types of covering materials range from \$87.59 per unit for items covered by moderately cigarette ignition-prone cellulosic fabrics to \$10.31 for items covered with predominantly thermoplastic fabrics. The benefits for items covered with cigarette and open flame-ignition resistant materials such as leather have not been projected, but they are assumed to be small.

Table 6 also shows (in column 4) the midpoints of the ranges of estimated per unit costs of compliance with the draft standard, which were derived in Section 6 (and shown in column 7 of Table 5). For example, items covered by severely cigarette

Table 6.

Estimated Costs and Benefits of the Draft Standard

(Per Unit and Aggregate for Production in One Year, in 2004 Dollars)

Type of Upholstery Cover	Projected Benefits Per Unit, by Source of Ignition			(4) Costs Per Unit	(5) Net Benefits per Unit	(6) Annual Units Produced ----- (% of Total)	(7) Total Net Benefits (million \$)	(8) Cumulative Net Benefits (million \$)
	(1) Cigarettes	(2) S.O.F.	(3) Total Benefits					
Severely Cigarette Ignition-Prone Fabrics	\$155.48	\$10.81	\$166.29	\$18.33	\$147.95	3,250,306 (10.32%)	\$480.9	\$480.9
Moderately Cigarette Ignition-Prone Cellulosic Fabrics	\$81.16	\$6.43	\$87.59	\$6.65	\$80.94	1,557,614 (4.94%)	\$126.1	\$607.0
Lower Cigarette Ignition-Prone Cellulosic Fabrics	\$26.47	\$6.43	\$32.90	\$6.65	\$26.25	3,634,433 (11.54%)	\$95.4	\$702.4
Thermoplastic Fabrics	\$3.78	\$6.52	\$10.31	\$6.65	\$3.66	13,532,327 (42.96%)	\$49.5	\$751.8
Ignition Resistant Materials	See note			See note		9,525,321 (30.24%)	See note	

Note: Based on limited ignition testing data, societal costs, and, hence, any potential benefits associated with ignition resistant materials such as leather, wool, and vinyl-coated fabrics are assumed to be small, but are unknown. Assuming these materials pass the optional cover material barrier tests, compliance costs for such furniture items would also be minimal.

ignition prone cellulosic fabrics were estimated to incur costs ranging from \$15.44 to \$21.23, with a midpoint in the estimated range of \$18.33 per unit. Furniture items covered with most other materials were estimated to incur average total costs of \$6.65. Furniture items covered with ignition resistant materials, such as leather, probably will incur small average total costs; however, information that would enable us to estimate these minor costs is not available at this time.

Table 6 also shows aggregate and cumulative net benefits associated with the staff's draft proposed standard. The total net benefits shown in column 7 are the product of per unit net benefits and number of units produced annually by type of cover material. For example, the total net benefits from furniture covered with moderately cigarette ignition-prone cellulosic fabrics amounts to \$126.1 million, given by the product of 1.56 million units produced and per unit net benefits of \$80.94. The cumulative net benefits (shown in column 8 of Table 6) are calculated by the vertical summation of the "Total Net Benefits" column. Total net benefits of the staff's draft standard are estimated to be \$751.8 million. This analysis assumes that manufacturers would use FR treatments in a manner that poses no additional risk of injury or adverse health effects to consumers.

7.2. Sensitivity Analysis

The previous analysis compares benefits and costs of the staff's draft standard using a discount rate of 3 percent to express expected benefits accruing in the future in their present value, an estimated value of a statistical life of \$5 million, and an estimated average cost of injury of \$187,449. Net benefits were also estimated based on estimated increases in costs of producing and marketing furniture that complies with the draft standard. In addition to these factors, the estimation of benefits was based on assumptions regarding the effectiveness of the standard at reducing losses from cigarette and small open flame ignitions. This section examines the effect of changing any of these assumptions on the expected net benefits that would result from compliance with the draft standard. In all cases, the estimated net benefits of the draft proposed standard remain positive.

A discount rate of 3 percent was used to express expected benefits accruing in the future in their present value. Using this rate, total estimated benefits of the standard are \$936 million, the midpoint of the range of estimated total costs is \$184.2 million, and total net benefits are \$751.8 million. To show the sensitivity of the results to the 3 percent discount rate, societal costs were also discounted at a rate of 7 percent. A higher discount rate decreases the present value of the future expected benefits. In the case of a 7 percent discount rate, the present value of benefits over an expected 16-year product life of a piece of furniture is decreased by about 28 percent from that estimated with a 3 percent discount rate. Costs would not be affected since they are incurred in the year of production. Using a 7 percent discount rate, the present value of the total

estimated benefits of the standard would be about \$670 million; consequently, with total costs of \$184.2 million, total net benefits would be about \$486 million.

Estimated benefits of the staff's draft standard were based on a value of a statistical life of \$5 million. If benefits are calculated based on a lower bound of \$3 million as the value for a statistical life,⁹⁷ total estimated benefits of the standard would be about \$613 million, and total net benefits would be \$429 million. Alternatively, if a value of \$7 million is assigned to a statistical life, total estimated benefits would increase to about \$1,259 million; total net benefits would increase to about \$1,074 million.

Estimated benefits of the staff's draft proposed standard are based on an average societal cost of \$187,449 per injury. Changing the estimate used for the cost of injury will have minimal impact on the results, because the share of benefits from reduced injuries is only 6.5 percent of total benefits. Hence, even if there were no reduction in injuries from the draft proposed standard, the total estimated benefits would be \$875 million and total net benefits would be \$691 million.

Section 6 addresses the expected costs of the standard. Estimates of costs are based on judgments regarding changes to materials that will be required to meet performance tests of the draft proposed standard, the costs of those changes per unit, and the number of affected furniture items produced annually. Based on the midpoints of ranges of estimated cost impacts of material changes, aggregate costs of the standard were estimated to be \$184.2 million for annual production of upholstered household furniture. With these costs, total estimated net benefits of the draft proposed standard are \$751.8 million. Even if we assume that the costs of the standard are twice those estimated in Section 6 (*i.e.*, \$368.4 million) the standard would still have estimated net benefits totaling \$568 million from annual production of upholstered furniture.

Estimated benefits of the staff's draft standard were based on assumptions regarding the effectiveness at reducing societal costs of cigarette and small open flame ignitions of furniture. However, if we assume that the standard will have one-half the effectiveness that our estimated benefits are based upon, aggregate benefits would still be about \$468 million, and net benefits would be about \$284 million.

7.3. Impact of the Draft Proposed Standard on Retail Prices

The estimated costs of the staff's draft standard include the increased costs of materials, labor, and distribution directly attributable to the rule. It is likely that manufacturers will pass on at least some of the costs of complying with the standard to the consumer, in the form of higher retail prices. The actual increase in retail prices will depend on the price elasticity of demand for furniture products (*i.e.* the responsiveness of quantity demanded to the change in price). If demand is highly price elastic, then manufacturers will experience a relatively large decrease in sales of upholstered

⁹⁷ Viscusi, W. Kip. *op. cit.*

furniture products in response to a price increase, and their ability to pass on increased regulatory costs to the consumer is limited. If demand is price inelastic, consumers respond less intensely to price increases, enabling producers to successfully pass through cost increases.

Regarding the market for upholstered furniture, it is anticipated that demand is relatively price elastic in the short run, because consumers can always postpone the purchase of a durable good. Increases in retail prices are thus likely to be limited. In the long run, demand is less elastic and any attempt to pass through increased costs is more likely to succeed. Consequently, increases in retail prices are more likely to be observed.

In the absence of information on the price elasticity of demand for upholstered furniture products, it is possible to make use of traditional industry markup rates to provide an upper bound estimate for retail price increases. Such estimates may be viewed as upper bound estimates because they do not reflect the price elasticity of demand. Moreover, traditional markups do not factor in the role of competition, which can also influence attempts to increase prices. Rather, the markup simply reflects the price that producers will want to charge based on historical accounting costs. As noted above, an increase in price will result in a reduction in sales and in the case of highly elastic demand, revenues will decline as well, which will tend to moderate attempts to increase retail prices.

According to industry sources, higher production costs for materials and labor could result in retail prices that are higher by a factor of 2.5, or 150 percent. Based on this markup, the average retail price impact of the draft proposed standard on furniture items made with FR treated fabrics could be \$37.49 (for about 6 percent of all items), and the average retail price impact for furniture produced with barrier materials could be \$47.94 (for about 4 percent of furniture items). The average retail price impact for furniture that will require complying cushioning materials, but not FR fabric treatments or barriers under fabrics (perhaps 60 percent of units), could be \$15.13 per unit. Any increases in retail prices of furniture covered with ignition-resistant materials that pass the optional cover material barrier test (perhaps 30 percent of units) should be minor -- associated with minor testing and compliance verification costs for this furniture. The average increase in retail prices for all upholstered furniture is estimated to be about \$13.29 per item, based on the traditional industry markup rates.

8. ALTERNATIVES TO THE DRAFT STANDARD

This section evaluates a number of possible alternatives to the staff's current draft proposed standard, including an alternative that primarily addresses open flame ignited fires; adoption of an industry proposal as a mandatory rule; adding a small open flame ignition resistance test for cover fabrics; adopting only provisions of the draft standard relating to smoldering ignition resistance; adopting requirements

without open flame provisions for loose fill; requiring product labeling that warns consumers about the flammability hazards; alternative effective dates; and the alternative of taking no regulatory action by the CPSC. The CPSC staff plans to evaluate other alternatives that may be identified during the rulemaking proceeding.

8.1. Adoption of the Draft Small Open Flame Ignition Standard

As an alternative to the staff's proposed draft standard, the Commission could adopt the standard drafted by CPSC staff in 2001 that focused on small open flame ignition of upholstered furniture. That draft standard was the subject of a staff briefing package submitted to the Commission in October 2001. Compliance with the draft small open flame standard would require the use of upholstery cover materials that do not sustain combustion following exposure to a small flame for 20 seconds, or, alternatively, the use of materials that would pass a barrier test. The staff estimated that most fabrics would fail the 20-second flame test unless they would be treated with FR chemicals. Although the FR treatments under that standard specifically addressed small open flame ignition hazards, CPSC testing data also showed substantial improvement in cigarette ignition resistance. In fact, most of the estimated benefits of the small open flame standard were projected to result from reductions in societal losses from cigarette ignitions.

Based on estimated costs of compliance and estimated reductions in both small open flame and cigarette ignition hazards, adoption of the 2001 draft small open flame standard would result in estimated aggregate benefits totaling \$1,031 million and aggregate costs of about \$282 million from annual production of about 31.5 million pieces of upholstered furniture.⁹⁸ Therefore, estimated aggregate net benefits of the small open flame standard would be \$749 million. This compares with estimated net benefits of \$751.8 million for the current proposed draft standard.⁹⁹

While the estimated net benefits of the CPSC staff's current draft proposed standard are about the same as the alternative open flame standard, the costs associated with the current draft proposal are substantially less. In fact, the estimated costs of the draft proposal (\$184 million) are about 35 percent lower than the costs of the alternative draft small open flame standard (\$282 million). The difference is related, in large part, to the reduced level of treatment of upholstery fabric with FR chemicals. Unlike the

⁹⁸ Smith, Charles, *op. cit.* Based on "Best Estimates" of reductions in ignition propensity and midpoints of estimated increases in manufacturing costs; as with the current analysis, distribution costs are estimated to be an additional 10 percent. The best estimate for cigarette ignition reduction involving cellulosic fabrics is 75%, based on 2003 estimates made by Mark Levenson, EPA, CPSC.

⁹⁹ The higher net benefits of the staff's current draft proposal may also be underestimated. The difference does not take into account the likely heavier (and hence more costly) loadings of FR chemicals that would be needed to meet the 20-second open flame test of the alternative open flame standard. (For purposes of comparison, the FR treatment costs between these two alternatives were assumed to be the same.) Nor does it take into account the likelihood that, under the staff's current draft proposal, some manufacturers are likely to choose a lower cost option of simply substituting a complying fabric or modifying the fiber content of the fabric slightly to comply with the smoldering test, rather than treat fabrics with FR chemicals or barriers. This is less likely under the alternative open flame standard because almost all fabrics would have to be treated to meet the 20-second open flame test.

current draft standard, which would result in the treatment of roughly 6 percent or less of upholstery fabric coverings, nearly 66 percent of the upholstery covers would likely receive FR treatments to pass the 20-second open flame test of the CPSC staff's 2001 draft standard.

It should also be noted that retail price impacts of the staff's current draft proposed standard, reflecting the lower underlying costs, would also be substantially lower than under the alternative open flame standard. Increases in the retail price of furniture may have some negative impact on sales. Higher prices may lead some consumers to delay the purchase of new furniture or lead them to buy it less frequently, and could potentially result in secondary impacts on the sales of furniture components and industry employment; such effects are likely to be more pronounced in the short run. While the impact of these price increases cannot be predicted with any certainty, the higher costs of the alternative open flame standard would likely have more pronounced effects. Additionally, while the retail price impact of the current draft proposed standard will fall most heavily on more expensive furniture items (*i.e.*, those with the more expensive cellulosic fabrics), the alternative open flame standard would fall disproportionately on the more inexpensive furniture with thermoplastic fabrics, the fabrics less prone to cigarette ignition.

Finally, while the volume of FR chemicals used under the two alternative standards may be similar, the usage patterns would be different. The alternative open flame standard could have resulted in about 50 million pounds of FR chemicals being used annually to treat upholstery cover fabric. Under the current draft proposal, however, an estimated 1 to 8 million pounds of FR chemicals would be used to treat cover fabric; the remainder would be used to treat filling materials.¹⁰⁰ This change in resulting FR chemical use addresses some industry concerns that the use of FR treated-fabrics could reduce the aesthetic quality of upholstery fabrics. It will also reduce the potential for human exposure to FR-treated cover fabrics.

8.2. Adoption of Requirements Proposed by the Furniture Industry Association as a Mandatory Rule

In a May 13, 2004, letter to the CPSC, the American Furniture Manufacturers Association (which has since changed its name to the American Home Furnishings Alliance) proposed a set of provisions as a basis for a mandatory flammability standard for furniture. This proposal ("the industry proposal") was supported by representatives of organizations representing manufacturers of furniture, bedding, fabrics, filling materials, and FR chemicals in a July 12, 2004, letter. The proposal recommended that upholstery cover fabrics tested on a 45 degree test fixture be required to resist ignition or self-extinguish after exposure to a small open flame for 5

¹⁰⁰ Franklin, Robert. *Preliminary Environmental Assessment of a Draft Proposed Flammability Standard for Residential Upholstered Furniture*. November 2004.

seconds; or, if ignition occurs, the time until the flaming progresses to the ends of the fabric samples shall be longer than 30 seconds. Failing fabrics could only be used with appropriate cigarette and open flame resistant barrier materials (which would comply with a barrier test to be determined by the CPSC).

The industry proposal also specified ignition testing criteria based on other flammability standards that would apply to filling materials. For example, the cigarette and open flame provisions of the February 2002 draft revision to the California standard for upholstered furniture flammability (TB 117) would apply to urethane foam and other seat cushion core materials; polyester fiberfill used in seat cushion wraps or toppers would comply with the open flame provisions of the UK furniture standard (BS5852); and cotton batting and polyester batting used in arms would comply with the cigarette ignition resistance provisions of ASTM E 1353.

Costs of a standard based on the industry proposal likely would be much lower than those estimated for the staff's current draft proposed standard. Based on a limited survey of fabric producers by the Directorate for Economic Analysis in 1998, a very high percentage of fabrics that could require FR treatments to pass the fabric test proposed by the industry already might be backcoated for purposes other than fire resistance, such as dimensional stability, crease resistance, and strength of the fabrics. Therefore, most fabrics that would be treated with FR chemicals probably would have the chemicals incorporated in the backcoating formulations that are now intended for other purposes. Relatively small amounts of FR chemicals might be required in backcoating formulations to bring failing fabrics into compliance with the fabric test requirement of the industry proposal.¹⁰¹ If formulating backcoatings with FR chemicals to meet the industry proposal's fabric test results in backcoatings that are about the same weight as typical backcoatings applied for non-FR purposes, the impact on production may be minimal, and the incremental cost for backcoating could be small.

The Directorate for Laboratory Sciences tested 34 non-FR upholstery fabrics using the test method proposed by the industry.¹⁰² Those tests showed that 100 percent cellulosic fabrics heavier than 7 ounces per square yard, and wool, leather and vinyl fabrics are likely to pass without modifications. Varying results were found for other fabrics, including those made from blends of cellulosic and thermoplastic fibers. Based on this limited testing, if we assume that no more than 40 percent of upholstery cover materials were to include FR chemicals in existing backcoating formulations, up to 130 million linear yards could be affected annually by a standard based on the industry proposal.¹⁰³ Based on earlier estimates of the costs of non-FR backcoating (\$.05 to \$.30

¹⁰¹ Based on comments by David Pettey (Quaker Fabric Corp.) that the total weight of FR-formulation backcoatings to meet the industry's proposed test is approximately the same as that of backcoatings normally used on fabrics for non-flammability purposes. October 2004 Public Meeting.

¹⁰² Tao, Weiyang. Division of Electrical and Flammability Engineering, Directorate for Laboratory Sciences, CPSC. Memorandum to Dale Ray, CPSC Upholstered Furniture Project Manager, "Assessment of Fabric Open Flame Test Methodology," May 9, 2005.

¹⁰³ About 40% of fabrics would fail the fabric test if most of the approximately 43% of fabric yardage that is

per linear yard), the FR backcoating formulations might add roughly \$.10 to \$.20 per linear yard, and annual costs for FR treatments may total \$13 million to \$26 million. Costs of including FR in backcoating formulations could average \$.41 to \$.83 per item of furniture produced (although average costs would be about \$1.00 to \$2.00 per affected item).¹⁰⁴

Although the industry proposal includes a provision allowing the use of barrier materials with fabrics that fail the 5-second fabric test, the percentage of furniture items that would be made with barriers probably would be very small, since testing has shown that fabrics with high cellulosic fiber content and weight (which tend to be the most cigarette-ignition-prone fabrics) are more likely to pass the test.¹⁰⁵ Therefore, most of the relatively more expensive decorative fabrics (for which a barrier alternative to the 2001 draft standard was requested) could potentially be used without any modifications under the industry proposal.

Manufacturers would also incur lower costs for some filling materials under the industry proposal, compared to the staff's current draft proposed standard. Urethane foam cost increases should be similar to those estimated for the staff's current draft proposed standard, averaging about \$3.41 per item of furniture, with total annual costs of about \$107 million.¹⁰⁶ However, the industry proposal lacks any requirement for polyester fiber used in back cushions, and the cost impact of the proposal on polyester cushioning materials used in seat cushions could be negligible since the quantity of polyester fiber material used on seat cushions, in terms of weight and volume, is relatively small; industry representatives report that non-siliconized polyester would be acceptable for such uses at minimal (if any) cost to the manufacturers. As with the staff's current draft proposed standard, cotton batting currently used by the furniture industry is expected to comply with the industry proposal without modification. The performance of this material may be subjected to closer scrutiny as part of a large scale testing program that is planned for the fall of 2005.

To summarize information on expected costs, it appears that a mandatory rule based on the industry proposal would have lower costs than estimated for the current draft proposed standard. Preliminary estimated annual costs of a standard based on the industry proposal range from about \$139 million to \$153 million, with a midpoint of

predominantly thermoplastic fails and a relatively small percentage of cellulosic fabrics fail. If a greater percentage of fabric yardage requires FR treatment under the industry proposal, associated costs will increase proportionately.

¹⁰⁴ \$13 to \$26 million annually would average \$.41 to \$.83 per unit for the approximately 31.5 million units produced in a year. However, for the nearly 13 million units that would be made with FR-treated fabrics (40% of the total) per unit costs would range from \$1.03 to \$2.06.

¹⁰⁵ Culp Fabric Corporation, March 1, 2004, comments.

¹⁰⁶ Total estimated costs for FR urethane foam under the staff's draft proposed standard are about \$71 million. These costs are lower than estimated for the industry proposal because of provisions that allow the use of non-complying urethane foam if acceptable barriers are used, including upholstery cover materials that qualify as barriers. As outlined by the industry association in its proposal, all urethane foam used in the production of furniture would require formulation with FR chemicals.

about \$146 million.¹⁰⁷ This is \$38 million less than the midpoint of the estimated range of costs of the current draft proposed standard (about \$184 million annually).

The expected benefits of the industry proposal are considerably less than estimated for the staff's draft standard. In its assessment of the classification test method proposed by the industry, the CPSC's Directorate for Laboratory Sciences determined that some fabrics which passed the industry test on the basis of slower burn rates produced larger flames than some fabrics that failed the test.¹⁰⁸ The Directorate for Laboratory Sciences concludes from its testing results that, in addition to fabric burn rates, burning intensity and heat generated from the ignited fabric are important factors that affect upholstered furniture flammability and these other factors are not accounted for in the 45 degree fabric test. Further, the Directorate for Laboratory Sciences concludes that a fabric-only flammability test, such as the 45 degree test proposed by the industry, does not represent the flammability behavior of the upholstery fabric when it is covering upholstery filling materials.

Based on the inadequacy of the fabric test in the industry proposal, complying fabrics (including fabrics with FR treatments) are unlikely to contribute substantial benefits in the form of reductions in deaths, injuries, and property damage from furniture fires started by small open flames. The improvement in cigarette ignition performance for treated fabrics is also uncertain, since the FR loadings necessary to pass the 45 degree, 5-second open flame test reportedly are small. Further, since most heavier cellulosic fabrics may pass the proposed industry fabric test without difficulty, the ignition characteristics of fabrics generally shown to present the greatest risk of cigarette-ignited fires would largely not be addressed, since there is no smoldering ignition requirement for fabrics in the industry proposal.¹⁰⁹

Some benefits could be expected from improved performance of urethane foam used in furniture (the industry proposal recommended that all urethane foam comply with the small open flame requirements of the 2002 draft revision to California TB 117) and polyester fiber used in seat cushions. However, the benefits associated with filling materials are likely to be less than those that would be derived from the staff's current draft standard because the industry proposal lacks requirements for polyester filling materials used in furniture back cushions.

Although there is not sufficient information to estimate the gross benefits of the industry proposal, an evaluation of one class of furniture (items covered with severely

¹⁰⁷ In addition to fabric treatment costs of \$13 to \$26 million and FR urethane costs of \$107 million, total estimated costs include about \$6 million for compliance verification and \$13 to \$14 million in distribution costs.

¹⁰⁸ Weiyang Tao, Ph.D. "Assessment of fabric Open Flame Test Methodology." Division of Electrical and Flammability Engineering, Directorate for Laboratory Sciences, U.S. Consumer Product Safety Commission. April 14, 2005.

¹⁰⁹ Although the UFAC voluntary program might remain in effect under the industry proposal, the cigarette ignition test for fabric specified by the UFAC program is currently intended to identify fabrics that could not be used over non-FR urethane foam. Since the industry proposal includes a provision that would require FR-treatment of urethane foam, the UFAC fabric test likely would be of no consequence under a standard based on that proposal.

cigarette-ignition-prone cellulosic fabrics) strongly suggests that the net benefits of the staff's current draft standard would be substantially higher. As shown in Table 2 and Table 4, about 58 percent (\$540.5 million) of the total estimated cigarette and open flame ignition benefits of the staff's current draft proposed standard are expected to result primarily from FR treatment of severely ignition-prone cellulosic fabrics, or the use of acceptable barrier materials. Under the industry proposal, however, FR treatments or barriers would probably not be necessary for such fabrics, and the changes to cushioning materials under the industry proposal would likely yield a small fraction of the benefits that would result from the CPSC staff's current draft proposed standard for furniture made with these fabrics. Even if improved ignition resistance of urethane foam and other cushion core materials were to achieve 50 percent of the benefits estimated from the staff's current draft proposed standard for furniture made with severely ignition-prone cellulosic fabrics (an estimate that seems unreasonably high in view of the smoldering propensity of these fabrics), total estimated annual benefits would be \$270 million lower than the staff's current draft standard.

Just considering the lower expected benefits from furniture made with those fabrics, the estimated net benefits of the staff's current draft standard would be \$232 million (*i.e.*, \$270 million - \$38 million) more per year's production than a standard based on the industry proposal. Additionally, based on the assumptions described below in Section 8.6., eliminating the loose fill requirements for furniture covered with lower-and-moderately-cigarette ignition-prone cellulosic fabrics and thermoplastic fabrics could further reduce benefits by about \$52 million from annual production of furniture. In total, expected benefits from a standard based on the industry proposal might be \$322 million or more lower than estimated for the CPSC staff's draft standard (\$614 million or less for the industry proposal vs. an estimated \$936 million for the CPSC staff's draft standard). Estimated net benefits of the industry proposal would, therefore, be about \$468 million or less from annual production, or at least \$284 million less than the \$752 million in net benefits estimated for the staff's draft standard.

In summary, although it appears that a standard based on the industry proposal outlined in a May 13, 2004, letter to the CPSC could involve annual costs that are about \$38 million less than would be necessary to comply with the CPSC staff's current draft proposed standard, the requirements of the staff's draft standard would more effectively address cigarette and small open flame ignition hazards of upholstered furniture. Preliminary analysis shows that the CPSC staff's current draft proposed standard would result in greater net benefits to society.

8.3. Adoption of the Revised Draft Provisions of California Technical Bulletin 117 as a Mandatory Furniture Standard

8.3.1. Description of the California Revised Draft Technical Bulletin 117 and the Expected Means of Compliance

In February 2002, California's Bureau of Home Furnishings published draft revisions to the state's Technical Bulletin (TB117) that contains mandatory requirements for materials used in the manufacture of upholstered furniture sold in the state. As is the case with the CPSC staff's draft standard, the revised California draft standard specifies open flame and smoldering ignition tests for filling materials (including urethane foam and loose filling materials). However, unlike the staff's draft, the filling materials requirements apply to all furniture items, including those covered in ignition resistant fabrics such as leather, wool and vinyl.

In addition, the revised draft TB117 specifies a small open flame test for upholstery fabrics. The open flame test requires the 20 second application of a small open-flame to the crevice of a seat/back mock-up assembly of fabric over a standard flame-retardant polyurethane foam pad. The specimen fails if (1) weight loss exceeds 4 percent in the first 10 minutes, or (2) the specimen burns progressively before 10 minutes.

In the view of the Directorate for Engineering Sciences (ES), the open flame fabric test is less stringent than the open flame test for fabrics that was part of the CPSC staff's 2001 draft standard.¹¹⁰ Nevertheless, ES believes that the great majority of fabrics currently used by the furniture industry would require modification in order to comply with the draft TB 117 test. This judgment is shared by the California Bureau of Home furnishings personnel, based on their testing experience.¹¹¹

Based on testing by California's Bureau of Home Furnishings and the CPSC laboratory, it is reasonable to assume that the majority of cover materials are likely to fail the revised draft TB117 open flame test, with the exception of ignition resistant cover materials (such as leather, wool, and vinyl-coated coverings) and some of the heavier-weight cellulosic fabrics. Consequently, for purposes of evaluating the costs and benefits of this alternative, we assume that two-thirds of the approximately 10 percent of cover materials that are severely ignition prone cellulosic fabrics (which cover about 2.2 million units of furniture annually, or about 7 percent of all fabric coverings) would pass the draft TB117 open flame fabric test. The remaining severely ignition prone cellulosic fabrics (covering about 1.05 million furniture items) will be assumed to fail the test and therefore require FR treatment. An additional assumption

¹¹⁰ The 2001 CPSC draft standard required that there be no continuing combustion 15 minutes after a 20-second small flame application to a composite consisting of the fabric to be tested and non-FR urethane foam.

¹¹¹ Said Nurbakhsh, Ph.D., California Bureau of Home Furnishings, in a November 14, 2005, e-mail to Charles Smith, Directorate for Economic Analysis, CPSC.

is that all of the moderate- and lower-ignition prone cellulose and thermoplastic cover materials (covering about 18.7 million furniture items annually, or about 60 percent of all furniture items produced) would fail the open flame fabric test and have to be treated. Thus, a total of about 19.75 million units of furniture would be covered in fabrics that would have to be treated in order to comply with the revised draft TB117.

8.3.2. Estimated Costs of the Revised Draft TB117

The primary costs of the revised draft TB117 would be the costs of treating the filling materials (*e.g.*, urethane foam and loose fill) and the cover fabrics that fail the open flame test. The per-unit costs of treating urethane foam and the loose fill could be similar to those estimated for the standard drafted by the CPSC staff. Consequently, the filling materials costs per item of furniture might amount to about \$5.85 per unit (*see, e.g.*, cost estimates from Table 5). Since the TB117 filling materials requirements would apply to all furniture items produced (including items using ignition resistant cover fabrics), the total filling materials costs would amount to about \$184 million (\$5.85 per unit x 31.5 million units). It is possible that additional costs would be required to treat fibrous filling materials under the revised draft TB117, since the open flame test for that material could be more stringent than that drafted by the CPSC staff.

Based on the assumptions described above, approximately 19.75 million units of furniture would be covered in fabrics that fail the open flame fabric test and would therefore have to be treated. The estimated costs of FR treatments based on the 2001 CPSC staff draft open flame standard ranged from about \$6.61 to \$11.28 per average unit of furniture, with a midpoint of about \$8.95 per item. If we assume that the incremental costs of FR-treated fabrics under TB117 amount to about 75 to 100 percent of the costs estimated for the 2001 draft open flame standard, the midpoint of the resulting range of costs would be about \$7.83 per item of furniture. Therefore, the aggregate costs of the FR treatment of fabrics might amount to about \$155 million (\$7.83 per item x 19.75 million items).

In summary, the costs of treating the filling materials and fabrics under TB117 could amount to about \$339 million annually or more (\$184 million for filling materials and \$155 million for fabrics). The associated compliance and distribution costs could bring the total up to about \$380 million annually. This would be more than double the estimated costs of the CPSC staff's 2005 draft standard, estimated at about \$184 million.

8.3.3. Estimated Benefits of the Revised Draft TB117

The likely benefits that would result from adoption of the revised draft of TB117 as a mandatory standard vary by cover material type. First consider the furniture covered by severely cigarette ignition-prone cellulose fabrics (3.25 million units). Based on the assumptions described above, 1.05 million of these furniture items will fail the open flame fabric test of the revised draft TB117 and have to be treated. Since these

furniture items will have fabric treatments as well as complying filling materials, it may be reasonable to assume that the benefits under the revised draft TB117 would be comparable to those of the CPSC staff's 2005 draft standard (which will also have treated filling materials), about \$166 per unit (see Table 6). Thus, the benefits from these items would amount to about \$175 million ($\$166.29 \text{ per item} \times 1.05 \text{ million items}$). Additionally, for the remaining 2.2 million units covered with severely cigarette ignition prone fabrics that are not treated, the benefits would probably be no more than about half of the benefits associated with the treated units, or about \$83 per unit. Thus, the benefits associated with these 2.2 million units with untreated fabrics might amount to about \$183 million ($\$88.15 \text{ per unit} \times 2.2 \text{ million units}$). Therefore, the total estimated benefits resulting from annual production of complying furniture upholstered with severely cigarette ignition prone cellulosic fabrics would be about \$358 million ($\$175 \text{ million} + 183 \text{ million}$).

Now consider the 18.7 million units of furniture covered in moderately- and lower-ignition prone cellulosic fabrics and thermoplastic fabrics that will likely fail the open flame fabric test of the revised draft TB117 and have to be treated. Under the staff's current draft proposed standard, these furniture items would have treated filling materials but not treated fabric coverings. For purposes of this analysis, we will assume that the benefits associated with the filling materials tests of the revised draft TB117 are similar to those of the CPSC staff's draft proposed standard. Consequently, the estimated benefits associated with the revised draft TB117 would be greater because the cover fabrics would also be treated. In other words, unlike the 2005 CPSC staff's draft proposed standard, the benefits of treated filling materials would be augmented by the use of FR-treated fabrics under the revised draft TB117. Since the estimated benefits for these furniture items under the staff's current proposed draft amount to about \$395 million (based on the results shown in Table 6), the gross benefits associated with the revised draft TB117 would be greater than \$395 million. We cannot say how much higher the benefits of the revised draft TB117 would be. However, if we assume that the fabric treatments would reduce the remaining societal costs by about 50 percent, then the gross benefits for these 18.7 million units might amount to about \$523 million ($\$395 \text{ million} + 0.5 \times (\$650 \text{ million} - \$395 \text{ million})$).¹¹²

Based on this analysis, the total benefits associated with the revised draft TB117 might amount to about \$881 million ($\358 million from furniture covered with severely ignition prone fabrics and $\$523 \text{ million}$ from furniture covered with other fabrics). These estimated benefits are slightly less than those associated with the CPSC staff's 2005 draft standard ($\$936 \text{ million}$).

¹¹² Based on estimates from tables 2, 4, and 6.

8.3.4. Summary

In summary, the estimated annual costs associated with the revised draft TB117 may amount to about \$380 million, and the estimated benefits may amount to about \$881 million. Therefore, the estimated net benefits of this regulatory alternative are about \$501 million. This compares to about \$752 million in net benefits estimated to result from the CPSC staff's draft standard.

8.4. Adding Open Flame Performance Testing Requirements for Upholstery Fabrics to the Draft Standard

The CPSC staff's current draft standard includes cigarette-ignition performance testing requirements for upholstery fabrics, cigarette and small open flame testing requirements for certain filling materials, and optional cigarette and small open flame testing requirements for barrier materials. Also, open flame ignition performance is tested under the alternative requirements for "Type IV upholstered furniture" under the staff's draft standard. The CPSC staff explored the possibility of also developing an open flame test for upholstery fabrics. A test drafted by the staff could subject upholstery fabric covering FR urethane foam to an open flame source for 10 seconds and require the fabric and foam tested in this manner to sustain less than 20 percent mass loss after five minutes. Ideally, the provision would identify fabrics presenting the greatest small open flame fire hazards, and their continued use in the manufacture of furniture would require modifications leading to improved performance or the use of acceptable barrier materials.

In limited testing of 20 different upholstery fabrics, the Directorate for Laboratory Sciences found that a fairly wide range of fabrics resulted in greater than 20 percent mass loss within 5 minutes.¹¹³ Fabrics resulting in failures of the staff's draft fabric test included lighter weight cellulosic fabrics, heavier cellulosic and polyester blends, and olefin fabrics. Passing results were found for four medium-weight cotton fabrics and one nylon fabric.

Open flame testing of these 20 upholstery fabrics, although limited, indicates that a wide variety of fabrics could fail a test based on mass loss. Failing fabrics could include many fabrics that are expected to perform well when subjected to the staff's draft standard's cigarette ignition test for fabrics, including lighter-weight cellulosic fabrics and fabrics made with blends of cellulosic and thermoplastic fibers. With the possible exception of nylon, most of the fabric yardage made with thermoplastic fibers such as polyester and olefin might fail an open flame fabric test based on mass loss. It appears that many of the heavier 100% cotton fabrics that would be classified as

¹¹³ Fansler, Linda. Memorandum to Dale Ray, CPSC Project Manager for Upholstered Furniture: "Assessment of Classification Schemes, Performance Criteria, and Standard Materials for the CPSC Staff Draft Upholstered Furniture Flammability Standard." Directorate for Laboratory Sciences, CPSC. May 16, 2005.

moderately and severely cigarette-ignition-prone fabrics could pass the open flame test without modification.

The open flame ignition hazard presented by many of these materials would already be reduced by FR backcoating or incorporation of barrier materials that address the cigarette ignition hazard presented by the fabrics. Furthermore, upholstery cover materials made of leather, wool, and vinyl-coated fabrics generally are inherently resistant to ignition from small open flames, and these materials are also expected to pass the draft open flame fabric test without changes. Therefore, perhaps 50 percent of total upholstery cover yardage would fail the draft open flame upholstery fabric test, based on the limited testing. These fabrics are likely to fall into the material categories of "Moderately Cigarette-Ignition-Prone Cellulosics," "Less Cigarette-Ignition-Prone Cellulosics," and "Thermoplastics." Combined, these categories account for about 59 percent of all cover material yardage used. The estimated 50 percent of fabrics that might fail the draft open flame fabric test would account for 84 percent of all fabric yardage in these three groups. The total remaining societal costs for these fabric groups that might be addressed by an open flame test for upholstery fabrics is \$121.7 million.¹¹⁴ If the fabrics that would fail the draft open flame fabric test account for 90 percent of the total remaining open flame ignition societal costs for these fabric groups, the average lifetime open flame societal costs that would be addressed by the test would be about \$6.95 per unit ((90% x \$121.7 million)/15.75 million units).

A likely means of compliance with the open flame test would be FR treatment of fabrics. Since the draft fabric test is apparently less severe than that specified in the open flame standard drafted by the CPSC staff in 2001, the required amount of FR treatment per yard of fabric should be lower (for those fabrics that are treated). While the precise cost of such treatment is unknown, we might assume that the average incremental FR treatment costs would be about 50 percent to 75 percent of the costs estimated for the 2001 draft open flame standard, or about \$5.00 to \$7.50 per furniture unit.¹¹⁵ On an aggregate basis, these costs would amount to about \$79 million to \$118 million annually (\$5.00 to \$7.50 per unit x 15.75 million units).

Given the above estimate of the per unit lifetime societal costs addressed by the open flame fabric test (\$6.95 per unit of furniture) and the estimated FR treatment costs ranging from \$5.00 to \$7.50 per unit, it is uncertain that the addition of an open flame fabric test provision to the CPSC staff's draft standard would result in an increase in the net benefits of the standard. Even if it adds only \$5 to the costs of treating these fabrics, the additional requirement would have to be more than 70 percent effective at reducing

¹¹⁴ This estimate was derived from information shown in Table 4, and is based on the summation of remaining societal costs of about \$10 million from items covered with "Moderately Cigarette Ignition-Prone Cellulosics," \$23.4 million from items covered with "Less Cigarette Ignition-Prone Cellulosic," and \$88.3 million from items covered with "Thermoplastics."

¹¹⁵ Calculated as 50 to 75 percent of the midpoint of the range of estimated FR fabric treatment costs (\$6.61 to \$11.28) plus associated costs of compliance and distribution.

the addressable open flame hazard for the benefits to be greater than or equal to the costs.

It should be noted that the inclusion of this provision might result in an increase of about 20 million pounds of FR chemicals being used annually to treat upholstery cover fabric.¹¹⁶ Thus, relative to the CPSC staff's current draft proposed standard, this provision would increase substantially the more direct human contact with FR chemicals that would result from its inclusion in cover fabrics.

8.5. Adopting Only the Requirements of the Proposed Draft Standard that Test Smoldering Ignition Performance

After the staff's current draft standard was presented publicly in May 2005, some industry participants suggested that the standard be limited to the smoldering test requirements. These commenters reasoned that, since the open flame tests for some filling materials present greater difficulties and the cigarette ignition hazard remains the much larger hazard, the open flame test requirements for filling materials should be delayed or eliminated altogether. The purpose of this section is to assess the likely impacts of such an alternative. It should be noted, however, that the smoldering ignition tests of the current draft proposed standard were written under the assumption that the open flame filling materials tests would play a key role in addressing cigarette ignition hazards. Without these open flame tests, more stringent smoldering tests might have been proposed by the staff.

8.5.1. Costs

Based on testing results obtained by the CPSC's Directorate for Laboratory Sciences, commonly-used filling materials such as urethane foam, polyester fiberfill, and boric acid-treated cotton batting are expected to pass the draft smoldering ignition tests.¹¹⁷ Consequently, the costs associated with the filling material modifications necessary to meet the open flame tests for about two-thirds of furniture production would be eliminated under a smoldering-only alternative.¹¹⁸ Based on the Section 6.2 and 6.3 results, the costs associated with urethane foam and fibrous filling materials would be reduced by about \$136 million.¹¹⁹

¹¹⁶ This estimate is based on the assumption that FR chemical loadings required would be about 50 percent of the average required under the 2001 draft standard, and 50 percent (rather than 70 percent) of upholstery yardage would require treatment.

¹¹⁷ Fansler, Linda and Scott, Lisa L., Division of Electrical and Flammability Engineering, Directorate for Laboratory Sciences, CPSC, memorandum to Dale R. Ray, CPSC Upholstered Furniture Project Manager, "Performance Criteria, and Standard Materials for the CPSC Staff Draft Upholstered Furniture Flammability Standard," May 18, 2005. Also, Scott, Lisa L., memorandum to Dale R. Ray, "Smoldering and Small Open Flame Ignition Performance of Upholstered Furniture Loose Fill Materials," May 31, 2005.

¹¹⁸ The only items assumed to require no filling material modifications under the staff's draft proposed standard are those made with complying barrier materials or those covered with upholstery materials that would pass the cover material barrier test.

¹¹⁹ Comprised of estimated annual urethane costs of \$71 million; fiberfill costs of 50 million; and associated compliance and distribution costs of \$15 million.

The remaining costs of a standard based on the smoldering requirements would mainly be those related to FR-treatment and use of acceptable barrier materials, which have an estimated range of \$33.6 million to \$50.7 million, with a midpoint of \$42.1 million. The only other costs would be those related to compliance verification and distribution, which might amount to about \$6 million.¹²⁰ Therefore, the total estimated costs of the draft standard without provisions related to open flame performance of filling materials would be about \$48 million.

8.5.2. Benefits

As noted earlier, existing filling materials already comply with the requirements of the smoldering tests for filling materials. Consequently, without the open flame filling materials tests, the standard would yield no benefits from furniture items covered in fabrics that are neither FR-treated nor used over complying barriers (*i.e.*, fabrics other than “severely cigarette ignition-prone” cellulosic fabrics), since, for these furniture items, filling materials provide the improvement in fire safety under the staff’s draft standard.

The expected benefits associated with the use of barrier materials for furniture covered with severely ignition prone cellulosic fabrics will be the same as under the staff’s current draft standard, since complying filling materials are not needed for these items under either regulatory alternative. Consequently, the expected lifetime benefits should amount to about \$217.2 million.¹²¹

Benefits will also be derived from furniture items covered with fabrics that are FR-treated to comply with the fabric test of the draft standard. However, the hazard reduction (and, hence, benefits) associated with the use of FR-treated fabric will be somewhat less than under the staff’s current draft since the items would not be receiving the contribution of more ignition-resistant filling materials to the overall ignition resistance of the items. Based on the results shown in Table 2, cigarette ignition benefits might amount to about \$74 per unit.¹²² Additionally, if open flame ignition hazard reduction of about 50 percent results from FR-fabric treatments, per unit open flame benefits would be about \$6.43 per unit (see Table 4). In the aggregate, these benefits would amount to about \$157.4 million.¹²³

¹²⁰ About \$4.9 million of these costs are for the 3.25 million units made with FR treated fabrics or barriers and \$4.1 million are for furniture covered with other fabrics and materials.

¹²¹ For the estimated 1.3 million units that will be made with barrier materials under severely ignition prone fabrics, cigarette ignition benefits are assumed to be \$155.48 per unit (\$202.2 million aggregate benefits) and open flame ignition hazard reduction is assumed to be 90% (\$11.57 per unit benefits - - \$15 million aggregate benefits).

¹²² Since “moderately cigarette ignition-prone cellulose” pass the staff’s draft fabric test, FR-treatments of “severely ignition-prone fabrics” might result in similar expected societal costs per unit. Therefore, as shown in Table 2, lifetime societal costs for FR-treated fabrics are expected to fall from \$194.76 to \$120.44, a reduction of \$74.32 per unit.

¹²³ Based on 1.95 million units made with FR-treated fabric resulting in about \$12.5 million aggregate lifetime open flame ignition benefits (1.95 million x \$6.43) and \$144.9 million in lifetime cigarette benefits (1.95 million units x \$74.32)

Total benefits resulting from FR-treated fabrics and fabrics used over complying barrier materials under a standard that omits open flame testing requirements for filling materials would be about \$375 million.

8.5.3. Summary

Based on estimated costs of the draft standard without open flame testing provisions for filling materials of about \$48 million, and estimated aggregate benefits of about \$375 million, net benefits would be about \$327 million. This is about \$425 million lower than net benefits estimated for the current draft standard (about \$752 million).

8.6. Adopting Requirements of the Proposed Draft Standard without the Open Flame Provision for Loose Filling Materials

Loose polyester fiberfill (“loose fill”) is a common filling material used in loose back cushions of upholstered furniture. It is used in about half of all upholstered furniture items produced; when used, it accounts for roughly 40 percent of the aggregate filling material in the seating area, by weight. While conventional loose fill passes the draft standard’s loose fill smoldering test, it does not pass the open flame test without modification. The modification needed to pass the open flame test would likely involve the inclusion of FR fibers or encasement of the loose fill in FR interliners, changes that could, according to some furniture manufacturers, substantially increase the costs of producing and assembling upholstered furniture. The purpose of this section is to evaluate the option of excluding the open flame tests for loose fill from the staff’s draft standard.

8.6.1. Costs of the Loose Fill Requirements

As described in section 6.3, the added manufacturing costs associated with the loose fill requirements average an estimated \$4.88 per furniture item affected. Additionally, taking into account the possible added distribution costs (which, as described in Section 6.5, were assumed to be proportional to the added manufacturing costs), the estimated average costs of the loose fill requirements might add about \$5.37 per affected item. Given that about half of the furniture items with treated filling materials would be produced with loose fill, about 10.3 million furniture units might be affected, at an aggregate cost of about \$55.3 million ($\5.37×10.3 million units).

8.6.2. Benefits of the Loose Fill Requirements

The benefits of treating the loose fill¹²⁴ would result from the safety enhancement associated with treating all of the filling materials included in furniture items. These

¹²⁴ Either by the inclusion of FR fibers in the loose fill or by encasing the loose fill in FR interliners.

benefits could result from retarding fire growth in cases in which the inside back cushion is the initial ignition location, and also from the contribution of the treated loose fill in reducing fire growth when ignition first occurs at other locations.

Estimating the benefits of the loose fill open flame test requirements is difficult because of the lack of data demonstrating the fire-safety contribution of complying filling materials used in specific locations of the furniture items, such as in back cushions where the loose fill is located. However, with regard to open flame ignitions, the available evidence suggests that many serious open flame fires involve back cushions. According to the Directorate for Epidemiology's 1999 analysis, "Small Open Flame Ignitions of Upholstered Furniture," about 63 percent of fires were ignited in the seating area location (which could directly affect the back cushion).¹²⁵ Based on this information, it is not unreasonable to assume that the proportion of open flame benefits derived from treated loose fill is equal to the percent (by weight) of the loose fill in the filling materials.¹²⁶ As already noted, loose fill is used in about 50 percent of all upholstered furniture items produced, and accounts for about 40 percent of the seating area filling material weight in items in which it is used. Hence, for open flame fires, treating loose fill may account for about 20 percent (*i.e.*, 50% of 40%) of aggregate open flame benefits from furniture items covered with moderately- and less-ignition prone cellulosic and thermoplastic materials (*i.e.*, those without FR treated cover fabrics or barriers), or about \$24.4 million (*i.e.*, 0.2 x \$121.7 million of the Table 4, column 7, benefits). Additional benefits would be derived from furniture items covered with FR-treated cellulosic fabrics (about 2 million units produced with severely cigarette ignition prone cellulosic cover materials), which could bring the total estimated open flame ignition benefits to about \$26.9 million.

While the loose fill requirements directly address open flame ignition performance, they will also provide some additional protection against furniture fires started by cigarette ignition. For example, if other materials used in the furniture allow cigarette ignition to progress to open flame combustion, the presence of treated loose fill in back cushions could retard the growth of the fire. Additionally, treated loose fill could prevent fire ignition from smoldering fabrics that reached the back cushions.

Since the cigarette benefits of treated loose fill are less clear than the open flame benefits, we assume that the proportion of cigarette benefits derived from treated loose fill is equal to half the percent of the loose fill in the filling materials.¹²⁷ Based on this assumption, the cigarette benefits of treating loose fill would amount to about 10 percent of the aggregate cigarette benefits from furniture items covered with the

¹²⁵ Ault, Kimberly, Ph.D., "Small Open Flame Ignitions of Upholstered Furniture." Division of Hazard Analysis, Directorate for Epidemiology, CPSC, December 6, 1999.

¹²⁶ That is, if loose fill accounts for 40% of the treated filling material in a furniture item, then 40% of the open-flame ignition benefits associated with treating all of the filling materials will be assumed to be attributable to the loose fill.

¹²⁷ That is, if loose fill accounts for 40% of the treated filling material in furniture items, then 20% of the cigarette-ignition benefits associated with treating all of the filling materials in the furniture items will be assumed to be attributable to the loose fill.

moderately- or less-ignition prone cellulosic or thermoplastic fabrics, or about \$27.4 million (*i.e.*, 0.1 x \$273.8 million in the Table 2, column 7, benefits). Some additional benefits would also be derived from furniture items covered with FR-treated cellulosic fabrics having loose fill in backs (an estimated 975,000 units annually). These added benefits could amount to \$15.8 million,¹²⁸ and increase the cigarette-related benefits associated with treating the loose fill to \$43.2 million (\$27.4 million + \$15.8 million).

8.6.3. Summary

In summary, the estimated costs associated with the loose fill requirements of the staff's draft proposal amount to about \$55.3 million, and the estimated benefits amount to about \$70.1 million (\$26.9 million in open flame benefits and \$43.2 million in cigarette benefits). Consequently, *excluding the loose fill open flame requirements* from the standard would reduce both its costs by \$55.3 million and its benefits by \$70.1 million; net benefits would be reduced by about \$14.8 million (\$70.1 million - \$55.3 million). Overall, the net benefits of the staff's draft proposal, without the loose fill open flame requirements would be about \$737 million annually. This compares to estimated annual net benefits of about \$752 million under the staff's full draft proposal.

Finally, it should be noted that the loose fill cost estimates described in section 6.3. were intended to represent what it would cost today for manufacturers to comply with the loose fill provisions of the standard, given existing materials and existing methods of production and assembly. We believe these costs are likely to come down. The staff is already aware of at least one promising substitute for the conventional loose fill that would be substantially less costly than the treated loose fill evaluated in this section. Hence, we believe that our cost estimates are probably high, especially over the medium and longer term as manufacturers focus on the least cost solution in addressing the loose fill requirements.

8.7. Adoption of a Labeling Rule

A rule requiring hazard information to be presented on labels could be adopted by the Commission in addition to, 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 and estimates provided by a manufacturer). However, the impacts of such labeling on product safety are likely to be minimal. Labeling that warns of cigarette ignition hazards is unlikely to be effective, because labels are unlikely to be seen by consumers when the upholstered item is in use, and because there already is general public awareness of these hazards. Additionally, a warning label would not

¹²⁸ This estimate assumes that FR treatment of the severely ignition prone fabrics, without the treatment of filling materials, would reduce the cigarette ignition societal costs to a level equal to that of furniture covered with moderately ignition prone fabrics; complying filling materials would result in a further reduction to a level equal to that of furniture covered with less ignition prone cellulose. Under the loose fill effectiveness assumption described above, the benefits associated with complying loose fill would be an average of 10 percent of the incremental benefits ascribed to all complying filling materials.

be likely to prevent fires started by children playing with lighters and matches, who are unlikely to read the statements provided.

8.8. Effective Date

Section 4 of the Flammable Fabrics Act states that standards or regulations shall become effective 12 months from the date of promulgation, unless the Commission finds that a different effective date is in the public interest. Because of the need for FR treatment of some fabrics used in the manufacture of furniture and the fact that furniture manufacturers carry stocks of fabrics, a longer period before the rule becomes effective, such as 18 months, could provide some firms additional time to use inventories of fabrics that would not pass the staff's draft standard's fabric test without FR treatment. However, given the small percentage of fabrics that will need to be treated (under 10 percent), it seems unlikely that limiting the effective date to 12 months will substantially burden firms.

Additionally, 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 could use FR barrier materials beneath the untreated fabric, as allowed by that alternative method of compliance with the staff's draft standard. Also, they might sell the fabric to jobbers who would market it to furniture manufacturers that use FR barriers with untreated upholstery fabrics and for other end-uses that are not within the scope of the regulation. In view of the relatively small percentage of fabrics estimated to require FR treatments or other modifications, and other options available to furniture manufacturers, an effective date longer than 12 months from the date of promulgation might not be in the public interest.

Compliance with the staff's draft proposed standard would also require manufacturers and suppliers of urethane foam, polyester fiberfill, cotton batting, and other materials to provide materials that meet the relevant smoldering and open flame material tests so that they would be available for use by furniture manufacturers within 12 months of the date of promulgation of the rule. Current processes and capacities used by the manufacturers of urethane foam and cotton batting to meet mandatory flammability requirements of California and other jurisdictions, and voluntary standards such as the UFAC program, are expected to be adequate to produce sufficient quantities of urethane foam and cotton batting for use by the furniture industry under the staff's draft standard. Additionally, we assume that suppliers of polyester cushioning materials and furniture manufacturers will be able to develop products and processes that will enable the use of polyester-based cushioning materials within that period.

8.9. No Action

The Commission could determine that no rule is reasonably necessary to reduce the risk of fires associated with cigarette and small open-flame ignitions of upholstered furniture. Under this alternative, future societal losses would be determined by factors that affect the likelihood that ignition sources come in contact with upholstery and the ignition resistance of upholstery materials used by furniture manufacturers. For example, the apparently increasing use of ignition-resistant upholstery materials, such as leather, could reduce fires over time. Also, the state of California might adopt the draft revisions to its mandatory standard for upholstered furniture. Those revisions could result in reduced fire losses in that state, which accounts for perhaps 15 percent of the furniture market. Some furniture manufacturers might use materials that comply with some or all provisions of the California revised standard for all of their furniture production, which could reduce fire losses in other areas. Additionally, other political jurisdictions could impose requirements that would reduce future losses from furniture fires.

Factors other than furniture materials will also determine fire losses in the future. Some of these will tend to increase future losses (such as projected annual increases of about 1 percent in population and households) and others might decrease future losses (such as continued reductions in rates of smoking and alcohol consumption, increasing smoke alarm operability, information and education efforts, and installation of sprinkler systems in new construction). Particularly noteworthy might be the availability of cigarettes that reduce the probability of igniting upholstered furniture. Effective on June 28, 2004, the State of New York required all cigarettes sold in the state to self-extinguish if they are left unattended. Such cigarettes are expected to reduce, but not eliminate, residential fires started by cigarettes. Similar legislation has been adopted by Vermont and California (to become effective in 2006 and 2007, respectively). There has also been legislative activity in this area by other states, although legislation has only been enacted by New York, Vermont, and California. We are not aware of plans by the cigarette industry to expand significantly their marketing of self-extinguishing cigarettes to other areas of the country.

If the Commission does not adopt a mandatory rule to address furniture flammability from both smoldering and open flame ignition sources it is possible that a voluntary standard (perhaps through modifications to the existing UFAC Voluntary Action Program) could be developed based on the CPSC staff's draft standard or based on other provisions, such as those outlined in the May 13, 2004, industry proposal, to address these hazards. However, no such voluntary standard currently exists. Moreover, the effort begun in 1996 through ASTM to establish a voluntary standard is currently inactive. Furthermore, comments submitted in response to the October 23, 2003, ANPR representing all segments of the affected industries supported mandatory federal regulation to address upholstered furniture flammability.

Thus, while furniture fires might decline with no CPSC action, there is no reason to believe that the decline would approach the proportion of fire losses that could be prevented with the staff's draft proposed standard, or the other performance standard alternatives described in this analysis.

Draft Standard on Upholstered Furniture Flammability
Initial Regulatory Flexibility Analysis

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U.S. Consumer Product Safety Commission
December 2005

1. Introduction

The U.S. Consumer Product Safety Commission (CPSC) is considering regulation to address ignitions of residential upholstered furniture from smoldering cigarettes and small open flames. The Commission published an Advance Notice of Proposed Rulemaking (ANPR) initiating a regulatory proceeding on June 15, 1994, addressing the risk of small open flame ignitions of upholstered furniture. On October 23, 2003, the Commission issued an ANPR which reflected the Commission's decision to expand its proceeding to explicitly address the risk of cigarettes ignitions as well. If a standard is proposed by the Commission to address these hazards, the rule would be under the principal authority of the Flammable Fabrics Act (FFA), and would apply to upholstered furniture sold in the U.S.

The Regulatory Flexibility Act (RFA) requires that rules proposed by the Commission be reviewed for the potential economic impact on small entities, including small businesses. Section 603 of the RFA requires the Commission to prepare and make available for public comment an Initial Regulatory Flexibility Analysis describing the impact of the proposed rule on small entities and identifying impact-reducing alternatives. The Initial Regulatory Flexibility Analysis is to contain:

- 1) a description of the reasons why the action is being considered;
- 2) a succinct statement of the objectives of, and legal basis for, the proposed rule;
- 3) a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
- 4) a description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the types of professional skills necessary for the preparation of the report or record; and
- 5) an identification, to the extent possible, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule.

In addition, the Initial Regulatory Flexibility Analysis must contain a description of any significant alternatives to the proposed rule that would minimize any significant economic impact of the proposed rule on small entities. Suggested alternatives for discussion include: different compliance or reporting requirements for small entities; classification, consolidation, or simplification of compliance or reporting requirements for small entities; the use of performance rather than design standards; and partial or total exemptions from coverage for small entities. A draft standard that would address ignitions of residential upholstered furniture from smoldering cigarettes and small open flames has been prepared by the CPSC staff. Although the Commission has not

approved the draft standard, this analysis presents information on likely impacts of the standard, and alternatives available for consideration by the Commission.

2. Reasons the Commission is Considering Action

The CPSC staff's draft standard on upholstered furniture addresses the risks of death, injury, and property damage associated with upholstered furniture fires started by smoldering ignition sources (principally cigarettes) and small open flame ignition sources (such as lighters, matches, and candles). The most recent fire loss data are from 1999 through 2002. During that time period, there were an average of about 360 deaths, 740 injuries, and \$150 million in property losses annually from fires started by either smoldering ignition sources (such as cigarettes) or small open flame ignition sources (*e.g.*, lighters, matches, and candles) in which upholstered furniture was the first item ignited, and which could be addressable by a mandatory flammability standard. About 83 percent of these deaths, 65 percent of the injuries, and 68 percent of the property damage resulted from fires started from cigarette ignition. The remainder started from small open flames (*e.g.*, lighters, matches, candles). Based on these data, the Directorate for Economic Analysis estimates that the societal costs from cigarette and small open flame ignitions expected over the useful lives of furniture produced in one year, based on materials currently used to manufacture furniture, total more than \$1.3 billion.¹

3. Objectives of, and Legal Basis for, a Rule Based on the Draft Standard

In 1993 the National Association of State Fire Marshals (NASFM) petitioned the 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. NASFM suggested adopting the State of California's existing flammability regulations (known as Technical Bulletins). The Commission determined that ignitions of upholstered furniture by small open flames might constitute an unreasonable risk to the public and granted that part of the petition (while reserving judgment on the technical merits of the California regulations). In 1994 the Commission commenced a regulatory proceeding under the Flammable Fabrics Act (FFA) to address the risk of fire from small open flame sources. By an ANPR issued on October 23, 2003, the Commission expanded the regulatory proceeding to also explicitly address cigarette ignitions of upholstered furniture.

The purpose of the draft standard would be to reduce the risk of fires, deaths, and injuries from upholstered furniture fires started by cigarettes and small open flames. If adopted by the Commission, the rule would be expected to substantially

¹ Smith, Charles L. "Preliminary Regulatory Analysis of a Draft Proposed Rule to Address Cigarette and Small Open Flame Ignitions of Upholstered Furniture." Directorate for Economic Analysis, U.S. Consumer Product Safety Commission. December 2005.

reduce fire losses associated with the ignition of upholstered furniture. The rule would be proposed under Section 4 of the FFA. This section requires the agency to consider economic effects of proposed safety regulations on industry and consumers, and alternatives to the proposed regulation that might reduce its burden.

4. Requirements of the Draft Standard

The draft standard specifies tests to determine the ability of upholstered furniture to resist ignition when subjected to a burning cigarette or small open-flame source (*e.g.*, match, cigarette lighter, or candle). As drafted, the standard would apply to “moveable products that are primarily intended for seating use, and that contain a textile or other soft cover materials and cushions or other soft interior filling materials.” The draft standard applies to finished or ready-to-assemble articles of upholstered furniture (such as upholstered sofas, loveseats, sofa beds, rockers, recliners, and other chairs) that are:

primarily intended for indoor use in residences;

constructed with an upholstered seating area, comprised of a contiguous upholstered seat and back, or seat and side; and,

manufactured or imported after the effective date of the standard.

The draft standard limits the fire hazard by means of a series of performance tests for the major upholstery materials in furniture constructions that contribute significantly to fire behavior. The upholstery materials involved in the performance tests include:

Cover fabrics/materials, the outermost layer of upholstery;

Resilient foam filling materials, such as polyurethane or latex cushion cores;

Fibrous filling materials, such as cushion wraps made of polyester fiberfill or cotton batting; and

Loose filling materials, such as blown polyester fiber, shredded foam, down, etc.

The draft standard offers manufacturers alternative methods to produce complying furniture. Furniture items can comply with the draft standard by being made with filling materials that pass specified tests for smoldering ignition resistance and small open flame ignition resistance and upholstery cover materials that pass the cover material cigarette ignition test (such furniture is designated as “Type III

upholstered furniture" in the draft standard). In lieu of using complying loose filling materials, manufacturers may encase such materials with fabrics that pass loose filling interliner fabric ignition tests of the draft standard.

Alternatively, manufacturers may comply with the draft standard by using a barrier material under the upholstery fabric that passes the draft standard's applicable barrier tests ("Type I upholstered furniture"). This option allows manufacturers to use noncomplying upholstery fabrics and filling materials. The draft standard also specifies optional performance requirements for cover materials that qualify them as barriers, which would also allow the use of noncomplying filling materials ("Type II upholstered furniture"). Finally, the draft standard allows manufacturers the option of qualifying combinations of upholstery materials for use in production furniture based on the results of end-product smoldering and open flame ignition resistance testing ("Type IV upholstered furniture").

Each material test is conducted using a seating mockup of fabric and filling. For each of the materials evaluated in the draft standard, the goal is to limit the mass loss from combustion (smoldering, melting, or flaming) of the mockup's interior filling materials. Pass / fail criteria are based on maximum acceptable mass loss percentages over the specified duration of the test. Complying materials are more difficult to ignite and burn more slowly if ignited; thus, each material contributes to preventing or greatly delaying full involvement of the article of furniture in a fire.

While the various complying materials in upholstered furniture may have to pass as many as seven individual performance tests, the draft standard employs two basic sets of similar tests - one set for smoldering ignition performance and another set for small open flame ignition performance. Fire barriers need only pass two barrier tests - one for smoldering and one for open flame.

In addition to flammability performance requirements, the staff's draft standard contains provisions relating to certification and recordkeeping, testing to support guaranties issued by material suppliers, and labeling of finished articles of upholstered furniture. These quality assurance and quality control-related requirements are intended to help manufacturers, importers and suppliers ensure that their products comply, and to help the CPSC staff to enforce the draft performance standard. These provisions are contained in Subpart B of the draft standard.

Certification & Recordkeeping

Manufacturers and importers would certify that their finished articles of upholstered furniture comply with the draft standard. Manufacturers and importers would be required to retain records demonstrating compliance, including test records or other information to support guaranties from material suppliers, as well as model or

stock keeping unit identification. These records must be retained for as long as the finished article or material is produced or imported, and for three years thereafter.

Testing to Support Guaranties

To certify compliance for finished articles of upholstered furniture, manufacturers and importers may rely on guaranties of compliance issued by material suppliers under the Flammable Fabric Act. These guaranties must be supported by reasonable and representative tests sufficient to establish that production units of materials meet the applicable tests. There are no specific sampling or production testing requirements in the draft standard.

Labeling

The staff's draft standard provides that finished articles of upholstered furniture must carry a permanent label containing the manufacturer or importer name and location; month and year of manufacture; model identification; and type identification indicating the means of compliance (*i.e.*, "Type I," "Type II," "Type III," "Type IIIB," "Type IV"). This information must be separate from other label information. The label would help retailers and consumers identify products and materials, *e.g.*, in the event of a recall or other corrective action.

In summary, all manufacturers and importers of upholstered furniture would be subject to the draft standard if it is adopted as a rule by the Commission. However, it is likely that the great majority of testing would be done by or for fabric and filling material suppliers. These results would then be used to support guaranties of compliance that will be provided to furniture manufacturers. Records would be prepared by those conducting tests (fabric and filling material manufacturer personnel or outside testing facilities); copies of reports and records would be maintained by upholstered furniture manufacturers and furniture importers. No special skills that are not already available to manufacturers and importers would be required to establish or verify compliance with the draft proposed rule.

5. Firms Subject to the Draft Standard and Possible Impacts

Firms Subject to the Draft Standard

As drafted, the standard would apply to manufacturers and importers of upholstered furniture intended for sale to consumers. Manufacturers of household upholstered furniture are classified in code 337121 of the North American Industrial Classification System (NAICS). According to the Census Bureau's 2002 *Economic Census*, 1,686 U.S. companies (with 1,946 establishments) manufactured upholstered

household furniture or dual-purpose sleep furniture as their primary product.² Many other firms may also produce upholstered furniture as secondary products, and a large number of firms, including major retailers, import upholstered furniture subject to the draft proposed regulation.

The top four upholstered furniture manufacturers accounted for nearly 32 percent of the total value of upholstered furniture shipments in 1997 (the most recent year for such information), and the 50 largest companies accounted for 69 percent.³ 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. However, the industry also includes many small companies/establishments. The 2002 *Economic Census* reports that only 29 percent of upholstered furniture establishments (564 of 1,946) had 20 or more employees, and only 10 percent (200 establishments) had 100 or more.⁴ By some measures, such as the U.S. Small Business Administration's (SBA's) definition for qualification for small business loans, a furniture manufacturing company is considered to be "small" if it has fewer than 500 employees (at all of its establishments). This definition encompassed more than 97 percent of firms in the industry in 2002.⁵

The draft rule will also affect manufacturers and finishers of upholstery fabrics used in the production of furniture. Although their products are not directly regulated by the draft proposed standard, it is expected that they will provide guaranties to furniture manufacturers regarding fabric ignition resistance. It is expected that perhaps 10 percent of upholstery cover fabric yardage will require changes in production, such as the incorporation of flame retardant (FR) chemicals or changes in fibers, in order to pass the fabric test of the draft proposed standard. As noted above, noncomplying fabrics could still be used with complying barrier materials.

Textile mills that make upholstery fabrics as their primary product are included in the NAICS code 313210. Of 663 firms in NAICS 313210 in 2002, only 63 (about 10 percent) had more than 500 employees. About 65 percent of the firms had fewer than 20 employees.⁶ The SBA considers fabric manufacturing firms with fewer than 1,000 employees to be small businesses for the purposes of programs administered by the agency. Although these data are indicative of the sizes of firms involved in the

² U.S. Census Bureau, U.S. Department of Commerce, 2002 Economic Census, *Upholstered Household Furniture Manufacturing: 2002*, EC02-311-337121. September 2004.

³ U.S. Census Bureau, U.S. Department of Commerce, 1997 Economic Census, report EC97M31S-CR, *Concentration Ratios in Manufacturing*. June 2001.

⁴ U.S. Census Bureau, U.S. Department of Commerce, 2002 Economic Census, *Upholstered Household Furniture Manufacturing: 2002*, EC02-311-337121. September 2004.

⁵ Based on 2002 firm size data compiled by the United States Small Business Administration's Office of Advocacy which is available online at <http://www.sba.gov/advo/research/data.html>.

⁶ *Ibid.*

production of furniture upholstery fabrics, NAICS 313210 encompasses many firms that produce fabrics for end-uses other than furniture upholstery. Nevertheless, it is likely that the great majority of manufacturers of upholstery fabrics could be considered small businesses under SBA guidelines.

Fabric finishers also tend to be small. Finishers are firms that receive unfinished fabrics ("greige goods") and perform additional manufacturing operations (e.g., printing, dyeing, backcoating, and stain-guarding). Fabrics may be purchased by the finishers, or finished under contract to other firms that supply the fabrics. Fabric finishers are classified in NAICS code 313311. Of 1,016 broadwoven fabric finishing firms in 2002, only 30 (3 percent) had more than 500 employees.⁷ As is the case with manufacturers of broadwoven fabrics, fabric finishing firms with fewer than 1,000 employees are considered to be small businesses under SBA guidelines. Thus, it is likely that nearly all fabric finishing firms that would be affected by the draft standard would be small businesses. However, we note that only a few of the firms that are classified in NAICS code 313311 currently apply FR treatments to upholstery fabrics.

The draft rule also requires furniture manufacturers to use cushioning materials that comply with specific smoldering and open flame flammability performance requirements, unless materials complying with alternative barrier material tests are used. As with upholstery fabric manufacturers, we expect manufacturers of urethane foam cushioning, polyester fiber, and cotton fiber cushioning materials to provide guaranties under the FFA to the furniture manufacturers that use their products. Many of these firms already test their products to market them as complying with voluntary flammability standards, and mandatory standards in effect in California and some other jurisdictions.

Based on information provided by officials of urethane foam manufacturers contacted by the Directorate for Economic Analysis, about 20 U.S. firms manufacture flexible urethane foam for use in upholstered furniture. These firms operate perhaps 80 to 90 plants. According to 2002 *Economic Census* data for all manufacturers of urethane foam (NAICS 32615), including those manufacturing foam for uses other than furniture, most of these firms probably are small businesses under SBA guidelines.⁸ Although about 20 firms reportedly manufacture flexible urethane foam for furniture, the top four were said to account for perhaps 60 to 65 percent of foam cushioning used by the upholstered furniture industry. These and other firms fabricate cushions that are

⁷ *Ibid.*

⁸ *Ibid.* About 8 percent of all firms that manufactured urethane and other foam products (33 of 409 firms) in 2002 would be classified as small businesses (fewer than 500 employees at all establishments owned by the company).

marketed to the upholstered furniture industry. One major trade publication for the furniture industry lists 59 sources of urethane foam cushioning or furniture.⁹

The draft rule also applies to manufacturers and suppliers of fibrous filling materials, such as polyester and cotton batting, and loose polyester fiberfill. A major trade publication lists about 40 suppliers of these materials to the furniture industry. Many suppliers of cotton batting also provide polyester batting and fiberfill. Some also are listed as suppliers of urethane foam cushioning. According to the *2002 Economic Census*, 57 establishments produced “Paddings and upholstery filling, batting, and wadding” in 2002, with a value of shipments of \$490 million.¹⁰ According to the Census report for upholstered furniture, the delivered cost of these materials for the production of furniture was about \$254 million. Census data indicate that nearly all suppliers of fibrous filling materials to the furniture industry are small businesses according to SBA guidelines (*i.e.*, with fewer than 500 employees).¹¹

Possible Impacts of the Draft Standard on Small Businesses

The usual means of compliance with the draft standard will be the use of fabrics that do not need additional FR treatments (or barriers) combined with filling materials that either pass the applicable materials tests of the standard without modifications, or pass through incorporation of FR chemicals. Sixty percent or more of all upholstered furniture items made under the draft standard would be made with such materials. For these items estimated average increased costs of materials, labor and distribution total about \$6.65 per unit.¹² For those units that comply as a result of FR treatment of fabrics or the use of barriers, estimated costs are higher, but are only estimated to involve 10 percent or less of total production. The increased resource costs associated with furniture using treated FR fabrics (*i.e.*, the costs associated with materials, labor, and distribution) are expected to average about \$16.50 per item of furniture, including costs of complying cushioning materials; the increased costs associated with the use of barriers may amount to about \$21 per unit. For the estimated 30 percent of furniture produced with ignition resistant cover materials that would likely qualify as barriers under the draft standard, only minor costs per unit would result from the standard.

The cost impacts faced by firms using treated materials, including smaller manufacturers, would be proportionate to the amounts of treated cushioning materials used, and yardage of treated upholstery fabrics or barrier materials used. Therefore,

⁹ *Upholstery Design & Management (udm)*, May 2004, p.39.

¹⁰ U.S. Census Bureau, 2002 Economic Census, *All Other Miscellaneous Textile Product Mills: 2002*, EC02-311-314999. August 2004.

¹¹ SBA Office of Advocacy, *op. cit.* (2,178 of 2,226 firms in NAICS 314999, or 98%, had fewer than 500 employees in 2002.)

¹² Cost estimates are weighted based on shipment data of larger items such as sofas and sofasets (with higher costs) and smaller items such as chairs (with lower costs).

the costs of these methods of compliance are not expected to be borne disproportionately by smaller manufacturers of furniture. Small businesses that manufacture relatively inexpensive furniture that will require only treated cushioning materials should face only modest increases in costs of materials and labor, estimated to average \$6.65 per unit.¹³ In addition, they should be able to pass at least some of these increased costs on to residential consumers. For these reasons, it seems unlikely that the rule would have a significant impact on these small furniture manufacturers.

Many of the fabrics used by small furniture manufacturers that would fail the fabric test of the draft rule are likely to be relatively expensive decorative fabrics. The draft standard's option of using FR barrier materials would be a likely means of compliance for furniture made with such fabrics, and this option was requested by the segment of the industry using the more expensive decorative fabrics when the CPSC staff was drafting an open flame standard in 2001. Other fabrics used by these small furniture manufacturers could be brought into compliance with FR treatments at somewhat lower per unit costs, if their aesthetic qualities would not be significantly degraded by the processes. These alternative means of compliance would allow decorative fabrics to remain available to the upholstered furniture industry and the consuming public. Since the prices of fabrics that would be treated or used with barriers, and the furniture made with them, are likely to be considerably higher than average, the relative increases in per unit costs would be moderated for the small furniture manufacturers that use them. Additionally, discussions with upholstered furniture manufacturers producing the more expensive furniture using decorative fabrics suggest that the barrier option will substantially address their concerns with likely adverse aesthetic effects of FR treatments for many of these fabrics.

The estimated per unit costs of the draft standard discussed above include relatively modest costs for recordkeeping (averaging about \$.11 per item of furniture). The draft standard would require furniture manufacturers to maintain records for a period of three years after items are produced. The records will include identification and description of the furniture items and materials used in their manufacture, contact information for material suppliers, and results of relevant material tests. Smaller firms with limited product lines are expected to bear lower costs than larger firms with broad product lines. In summary, the Directorate for Economic Analysis does not believe that the recordkeeping requirements of the draft proposed rule place a substantial burden on small businesses.

¹³ Smith, *op. cit.* Note that the \$6.65 per unit includes cost increases for cushioning materials associated with the draft proposed rule. Thus, the analysis implicitly assumes that firms that manufacture cushioning materials fully pass on regulatory costs to furniture manufacturers. To the extent that they only partially pass through regulatory costs (*i.e.*, to the extent that cushioning and furniture manufacturers "share" the regulatory burden), the \$6.65 per unit cost increase incurred by furniture manufacturers represents an overestimate. Under a scenario of regulatory cost sharing, the impact of the draft proposed rule on small furniture manufacturers will be even less significant.

The draft proposed rule was also designed to minimize testing costs that would be imposed on small furniture manufacturers. Since they may rely on guaranties provided by material suppliers, the draft rule does not require firms to test composites of their fabrics and cushioning materials. Such testing would significantly increase costs of the draft proposed standard, and would likely disproportionately affect small manufacturers of upholstered furniture. Nor does the draft standard include a requirement for a small open flame test of cover fabrics. An open flame test requirement similar to the 2001 CPSC staff draft furniture flammability standard would have added substantially to costs faced by small furniture manufacturers.

Many of the fabrics that would fail the fabric test of the draft rule are likely to be more expensive decorative fabrics. Based on information provided by the Decorative Fabrics Association, its members are generally among the smaller establishments that will be affected by the draft proposed rule. Partially in response to comments received from this segment of the industry, the CPSC staff included the provision for use of acceptable barrier materials as an alternative means of compliance. This alternative was sought by the industry because of concerns that aesthetic qualities of many decorative fabrics would be adversely affected by FR treatments. This alternative allows all upholstery fabrics manufactured by small textile firms to be used under the draft standard, and is expected to substantially mitigate the impact of the draft standard on their businesses.

The estimated costs per unit discussed above that would be incurred by small furniture manufacturers include increased costs for cushioning materials, such as flexible urethane foam, polyester fiberfill, and cotton batting. The Directorate for Economic Analysis believes that increased urethane foam costs would be similar to those reported by industry contacts for foam that complies with the revised draft California Technical Bulletin 117. Estimated polyester filling cost increases are based on a wide range of possible cost impacts for this material. Cotton batting currently marketed to the furniture industry is not expected to incur significant cost increases under the draft proposed standard. These estimated costs are discussed in detail in the *Preliminary Regulatory Analysis of a Draft Proposed Rule to Address Cigarette and Small Open Flame Ignitions of Upholstered Furniture*.¹⁴ The Directorate for Economic Analysis believes that processes and materials will be readily available to small businesses that manufacture cushioning materials for the furniture industry. Consequently, since at least some of the cost increases are likely to be passed on to the furniture manufacturers that purchase the materials, a rule based on the draft standard would probably not have a significant impact on a substantial number of small businesses that manufacture cushioning materials subject to the rule.

¹⁴ Smith, *op. cit.*

Under the draft standard, manufacturers of fabrics and cushioning materials are required to conduct reasonable and representative tests to support initial guaranties of compliance for their materials. However, the costs associated with these requirements are expected to be minimal since many of these costs are now incurred for products marketed for use as complying with voluntary standards or mandatory standards enforced by California and other jurisdictions. Manufacturers of upholstery fabrics already classify their fabrics using the UFAC fabric classification test, which is similar to the fabric test of the draft proposed standard. Also, manufacturers of urethane foam, polyester fiberfill, and cotton batting that supply materials for use in furniture intended for sale in California now assure furniture manufacturers that their products comply with that state's Technical Bulletin 117 material tests. Additionally, suppliers of cotton batting to the furniture industry certify that their products comply with the relevant material test of the UFAC voluntary program. Cotton batting manufacturers that are members of the National Cotton Batting Institute (NCBI) have their products tested and certified by Underwriters Laboratories as a fire retardant filling that meets safety standards.

Thus, small manufacturers of fabrics and filling materials should only face minor incremental costs for testing under the draft standard, compared to current industry practices. Furthermore, small manufacturers should be able to pass at least some of the additional costs of testing to furniture producers and jobbers that purchase their products. This information suggests that the testing necessary to provide guaranties of compliance by small manufacturers of fabrics and filling materials will not result in a substantial impact on such firms.

6. Other Federal Rules

No Federal rules are known to exist which may duplicate, overlap, or conflict with a rule that would reflect the staff's draft standard.

7. Alternatives to the Staff's Draft Standard

The staff has provided an analysis of three alternative standards available for consideration by the Commission: a standard based on the 2001 draft small open flame test developed by the CPSC staff, a standard based on a set of requirements proposed by the furniture industry association, and a standard based on the 2002 revised draft California furniture regulation (TB117). The option of including a small open flame testing requirement for upholstery cover materials as part of the CPSC staff's 2005 draft standard also is available, although this provision would increase the potential burden on small businesses. Other regulatory options are available that might lessen the potential burden on industry, including small firms. These regulatory alternatives include the issuance of only those requirements of the draft standard that are based on

smoldering ignition tests; the omission of the open flame testing provisions for loose filling materials; extending the effective date beyond 12 months after promulgation, and adoption of warning label requirements. Another alternative for consideration is the reliance on a voluntary standard or taking no action.

7.1. The 2001 CPSC Staff Draft Small Open Flame Ignition Standard

As an alternative to the proposed draft standard, the Commission could adopt the standard drafted by the CPSC staff in 2001 that focused on small open flame ignition of upholstered furniture. That draft standard was the subject of a staff briefing package submitted to the Commission in October 2001. Compliance with the small open flame standard would require the use of upholstery cover materials that do not sustain combustion (over standard urethane foam) following exposure to a small flame for 20 seconds, or, alternatively, the use of materials that would pass a barrier test. Although the FR treatments under that standard would specifically address small open flame ignition hazards, CPSC testing data also showed substantial improvement in cigarette ignition resistance of treated fabrics. In fact, most of the estimated benefits of the small open flame standard were projected to result from reductions in societal losses from cigarette ignitions.

Based on current market data, the 2001 draft small open flame standard probably would require FR treatments for about 70 percent of all upholstery cover materials, or the use of acceptable barrier materials, compared with about 10 percent of cover materials requiring such modifications under the staff's current draft proposed standard. Although the estimated net benefits of the 2001 draft small open flame standard are substantial, they are somewhat lower than total net benefits estimated for the staff's current draft standard. Moreover, the estimated costs of the alternative small open flame standard (\$282 million) are about 53 percent higher than the staff's current draft proposal (\$184 million). The higher estimated costs of compliance of the draft small open flame standard would place greater burdens on all manufacturers, including smaller firms.

Unlike the staff's current draft proposal, the small open flame draft standard would require substantial production testing, which could disproportionately affect small upholstered furniture manufacturers with smaller production runs. Additionally, since up to 70 percent of upholstery fabric yardage could require FR treatments under the small open flame standard, there would be greater competition for the available fabric backcoating capacity. Smaller furniture and fabric producers, with smaller lots of fabrics to be treated, reportedly would be faced with difficulties in competing with larger firms for timely access to fabric finishing services for necessary FR treatments.

The higher manufacturing costs associated with the small open flame standard could also result in substantially higher average retail price increases for consumers

than would result from the staff's current draft proposal. The greater increases in retail prices that might result from the small open flame standard could lead some consumers to delay the purchase of new furniture or lead them to buy less frequently, and could potentially result in secondary impacts on the sales of furniture components and industry employment. Such effects are likely to be more pronounced in the short run. While the impact of these price increases cannot be predicted with any certainty, the higher costs of the small open flame standard would likely have more pronounced effects.

In summary, the small open flame standard probably would have a more substantial and more disproportionate impact on small businesses than the current draft standard.

7.2. A Standard Based on Requirements Proposed by the Furniture Industry Association

An alternative standard based on a set of provisions proposed by the major furniture industry association is also available for consideration by the Commission as a basis for a mandatory flammability standard for furniture.¹⁵ Presented in a May 13, 2004, letter to the CPSC, the proposal recommended that upholstery cover fabrics tested on a 45 degree test fixture be required to resist ignition or self-extinguish after exposure to a small open flame for 5 seconds; or, if ignition occurs, the time until the flaming progresses to the ends of the fabric samples shall be longer than 30 seconds. Failing fabrics could be used with an appropriate barrier system (which would comply with a barrier test to be determined by the CPSC). The industry proposal also specified ignition testing criteria that filling materials (*e.g.*, urethane foam and fibrous filling materials) would have to meet if they are to be used in the production of furniture. This proposal ("the industry proposal") was supported by representatives of organizations representing manufacturers of furniture, bedding, fabrics, filling materials, and FR chemicals in a July 12, 2004, letter.

Fabrics that would be treated with FR chemicals reportedly would have the chemicals incorporated in backcoating formulations for fabrics that are backcoated for other purposes, such as dimensional stability. Relatively small amounts of FR chemicals might be required in backcoating formulations to bring failing fabrics into compliance with the fabric test requirement of the industry proposal.¹⁶ If FR backcoatings to meet the industry's proposed fabric test are the same weight as

¹⁵ Since submitting the proposal as the "American Furniture Manufacturers Association," the association has changed its name to the American Home Furnishings Alliance (AHFA).

¹⁶ Based on comments by David Pettey, Quaker Fabric Corp., that the total weight of FR-formulation backcoatings is the same as that of backcoatings normally used on fabrics for non-flammability purposes. October 2004 Public Meeting.

standard backcoatings, the impact on production may be minimal, and the incremental costs for backcoating could be small. The FR backcoating formulations might add roughly \$.10 to \$.20 per linear yard of fabric, and annual costs for FR treatments may total \$13 million to \$26 million. Costs of including FR in backcoating formulations could average \$.41 to \$.83 per item of furniture produced (although average costs would be about \$1.00 to \$2.00 per affected item).¹⁷ Although the estimated per unit costs of FR fabric treatments under the industry proposal are well below the estimated costs of FR treatments under the CPSC staff's draft standard, aggregate estimated costs are comparable, since perhaps 40 percent of fabric yardage would be treated under the industry proposal vs. about 6 percent of yardage under the CPSC staff's draft standard.

Although the industry proposal includes a provision allowing the use of barrier materials with fabrics that fail the 5-second fabric test the percentage of furniture items that would be made with barriers might be very small. Testing has shown that fabrics with greater cellulosic fiber contents are more likely to pass the test.¹⁸ Therefore, most of the relatively more expensive decorative fabrics, for which a barrier alternative to the 2001 draft standard was requested, could potentially be used without any modifications under the industry proposal.

Compared to the draft proposed standard, manufacturers would incur lower costs for some filling materials under the industry proposal and higher costs for others. While the urethane foam cost increases per unit affected should be similar to those estimated for the draft proposed standard, aggregate costs to the industry may be higher, since, as outlined in its May 13, 2004, letter to the CPSC, all urethane foam used in the production of furniture would require formulation with FR chemicals costs for polyester cushioning materials should be minor. Under the CPSC staff's draft proposed standard, manufacturers would not be required to use complying filling materials (including urethane foam) if acceptable barriers are used, including upholstery covering materials and fabrics that qualify as barriers. Thus, the annual estimated aggregate cost increase for urethane foam under the industry proposal is about \$107 million, compared to about \$71 million under the CPSC staff's draft standard. Unlike the CPSC staff's draft standard, the industry proposal does not have open flame requirements for loose filling materials used in backs. Therefore, the estimated annual costs totaling about \$55 million under the CPSC staff's draft standard would not be incurred under the industry proposal. The cost impact of the industry proposal on polyester cushioning materials used in seat cushions would be negligible. As with the draft proposed standard, cotton batting currently used by the furniture industry is expected to comply with the industry proposal without modification.

¹⁷ \$13 to \$26 million annually would average \$.41 to \$.83 per unit for the approximately 31.5 million units produced in a year. However, for the nearly 13 million units that would be made with FR-treated fabrics (40% of the total) per unit costs would range from \$1.03 to \$2.06.

¹⁸ Culp Fabric Corporation, March 1, 2004, comments.

To summarize information on expected costs, it appears that a mandatory rule based on the industry proposal would have lower costs than estimated for the current draft proposed standard. Preliminary estimated annual costs of a standard based on the industry proposal range from about \$139 million to \$153 million, with a midpoint of about \$146 million.¹⁹ This is \$38 million less than the midpoint of the estimated range of costs of the current draft proposed standard (about \$184 million annually).

In its assessment of the classification test method proposed by the industry, the CPSC's Directorate for Laboratory Sciences determined that some fabrics which passed the industry test on the basis of slower burn rates produced larger flames than some fabrics that failed the test.²⁰ The Directorate for Laboratory Sciences concludes from its testing results that, in addition to fabric burn rates, burning intensity and heat generated from the ignited fabric are important factors that affect upholstered furniture flammability and these other factors are not accounted for in the 45 degree fabric test. Further, the Directorate for Laboratory Sciences concludes that a fabric-only flammability test, such as the 45 degree test proposed by the industry, does not represent the flammability behavior of the upholstery fabric when it is covering upholstery filling materials. Therefore, it appears that fabrics used under the industry proposal (including fabrics with FR treatments) are unlikely to contribute to substantial benefits in the form of reductions in deaths, injuries, and property damage from furniture fires started by small open flames. The improvement in cigarette ignition performance for treated fabrics is also uncertain, since the FR loadings necessary to pass the 5-second open flame test reportedly are small. Further, since most of the heavier cellulosic fabrics may pass the industry's proposed fabric test without difficulty, the ignition characteristics of fabrics shown to present the greatest risk of cigarette-ignited fires would largely not be addressed by the proposal. Therefore, much lower cigarette ignition benefits would be expected from requirements of the industry proposal compared to the CPSC staff's draft proposed standard.

Some benefits could be expected from improved performance of urethane foam used in furniture (the industry recommends that all urethane foam comply with the requirements of the 2002 draft revision of California Technical Bulletin 117) and polyester used in seat cushions. The industry proposal would not realize benefits of more ignition-resistant loose filling materials used in furniture backs, since, unlike the draft proposed standard, the proposal does not include open flame testing requirements for uses of such materials.

In summary, it appears that a standard based on the industry proposal outlined in a May 13, 2004, letter to the CPSC could involve annual costs that are about \$38

¹⁹ In addition to fabric treatment costs of \$13 to \$26 million and FR urethane costs of \$107 million, total estimated costs include about \$6 million for compliance verification and \$13 to \$14 million in distribution costs.

²⁰ Weiyang Tao, Ph.D. "Assessment of fabric Open Flame Test Methodology." Division of Electrical and Flammability Engineering, Directorate for Laboratory Sciences, U.S. Consumer Product Safety Commission. April 14, 2005.

million less than would be necessary to comply with the CPSC staff's current draft proposed standard. Consequently, it might have a marginally smaller impact on small businesses. However, the requirements of the staff's draft standard would more effectively address cigarette and small open flame ignition hazards of upholstered furniture. Preliminary analysis shows that the CPSC staff's current draft proposed standard would result in substantially greater net benefits to society.

7.3. A Standard Based on the 2002 Proposed Draft Revisions to the California Furniture Regulation (TB117)

In February 2002, California's Bureau of Home Furnishings published draft revisions to the state's Technical Bulletin (TB117) that contains mandatory requirements for materials used in the manufacture of upholstered furniture sold in the state. As is the case with the CPSC staff's draft standard, the revised California draft standard specifies open flame and smoldering ignition tests for filling materials (including urethane foam and loose filling materials). However, unlike the staff's draft, the filling materials requirements apply to all furniture items, including those covered in ignition-resistant fabrics such as leather, wool and vinyl.

In addition tests for filling materials, the revised draft TB117 specifies a small open flame test for upholstery fabrics. The open flame test requires the 20 second application of a small open-flame to the crevice of a seat/back mock-up assembly of fabric over a standard flame-retardant polyurethane foam pad. The specimen fails if (1) weight loss exceeds 4 percent in the first 10 minutes, or (2) the specimen burns progressively before 10 minutes. The great majority of fabrics currently used by the furniture industry probably would require modification in order to comply with the draft TB 117 test. For purposes of evaluating the costs and benefits of this alternative, the Directorate for Economic Analysis assumes that about 60 percent of all furniture items produced would be covered in fabrics that would have to be treated in order to pass the fabric test specified in the revised draft TB117. Non-complying fabrics are assumed to include one-third of the severely ignition prone cellulosic fabrics (covering about 1.05 million furniture items) in addition to all of the moderate- and lower-ignition prone cellulose and thermoplastic cover materials (covering about 18.7 million furniture items annually). Thus, a total of about 19.75 million units of furniture could require FR treatment under the revised draft of TB117. The midpoint of the estimated range of fabric treatment costs is about \$7.83 per item of furniture. Therefore, the aggregate costs of the FR treatment of fabrics might amount to about \$155 million under the alternative (\$7.83 per item x 19.75 million items).

The per-unit costs of treating urethane foam and loose filling materials could be similar to those estimated for the standard drafted by the CPSC staff. Consequently, the filling materials costs per item of furniture might amount to about \$5.85 per unit. Since the filling materials requirements of the revised draft TB117 would apply to all

furniture items produced (including items using ignition resistant cover fabrics, the total filling materials costs would amount to about \$184 million (\$5.85 per unit x 31.5 million units). It is also possible that additional costs would be required to treat fibrous filling materials under the revised draft TB117, since the open flame test for that material could be more stringent than that drafted by the CPSC staff.

Based on the assumptions described above, approximately 19.75 million units of furniture would be covered in fabrics that fail the open flame fabric test and would therefore have to be treated. The midpoint of the range of costs estimated by the Directorate for Economic Analysis is about \$7.83 per item of furniture. Therefore, the aggregate costs of the FR treatment of fabrics might amount to about \$155 million (\$7.83 per item x 19.75 million items).

The combined costs of treating the filling materials and fabrics under the revised draft TB117 could amount to about \$339 million annually or more (\$184 million or more for filling materials and \$155 million for fabrics). The associated compliance and distribution costs could bring the total up to about \$380 million annually. This would be more than double the estimated costs of the CPSC staff's 2005 draft standard, estimated at about \$184 million. The higher estimated costs of compliance of a standard based on the revised draft TB117 regulation would place greater burdens on all manufacturers, including smaller firms.

Additionally, since about 60 percent of upholstery fabric yardage could require FR treatments in order to comply with the open flame fabric test of the revised draft TB117, there would be greater competition for the available fabric backcoating capacity. As was reported to be likely with the 2001 CPSC draft open flame standard, smaller furniture and fabric producers, with smaller lots of fabrics to be treated, could be faced with difficulties in competing with larger firms for timely access to fabric finishing services for necessary FR treatments.

The higher estimated manufacturing costs associated with the revised draft TB117 could also result in substantially higher average retail price increases for consumers than would result from the staff's current draft proposal. The greater increases in retail prices that might result from a standard based on the revised draft TB117 could lead some consumers to delay the purchase of new furniture or lead them to buy less frequently, and could potentially result in secondary impacts on the sales of furniture components and industry employment. Such effects are likely to be more pronounced in the short run. While the impact of these price increases cannot be predicted with any certainty, the higher costs of a standard based on the revised draft California furniture regulation would likely have more pronounced effects.

In summary, a standard based on the revised draft California furniture flammability regulation, TB117, probably would have a more substantial and more

disproportionate impact on small businesses than the current draft standard. The Directorate for Economic Analysis estimates that the greater burden would not result in higher benefits than the CPSC draft standard, and estimated net benefits from one year's production of upholstered furniture under the regulatory alternative are more than \$200 million lower than the net benefits estimated to result from the CPSC staff's draft standard.

7.4. Including Open Flame Testing Requirements for Upholstery Fabrics as Part of the Draft Standard

The draft standard includes cigarette-ignition performance testing requirements for upholstery fabrics, cigarette and small open flame testing requirements for certain filling materials, and optional cigarette and small open flame testing requirements for barrier materials. Also, open flame ignition performance is tested under the alternative requirements for "Type IV upholstered furniture" under the draft standard. The CPSC staff explored the possibility of an open flame test for upholstery fabrics. A test developed by the staff (but not included as part of the draft standard) could subject upholstery fabric covering FR urethane foam to an open flame source for 10 seconds and require the fabric and foam tested in this manner to sustain less than 20 percent mass loss after five minutes. Ideally, the provision would identify fabrics presenting the greatest small open flame fire hazards, and their continued use in the manufacture of furniture would require modifications leading to improved performance or the use of acceptable barrier materials.

Open flame testing of 20 upholstery fabrics by the Directorate for Laboratory Sciences indicates that a wide variety of fabrics could fail a test based on mass loss. Failing fabrics could include many fabrics that are expected to perform well when subjected to the draft standard's cigarette ignition test for fabrics, including lighter-weight cellulosic fabrics and fabrics made with blends of cellulosic and thermoplastic fibers. Perhaps 50 percent of total upholstery cover yardage, affecting about 15.75 million items of upholstered furniture annually, would fail such an open flame upholstery fabric test. These fabrics are likely to fall into the material categories of "Moderately Cigarette-Ignition-Prone Cellulosics," "Less Cigarette-Ignition-Prone Cellulosics," and "Thermoplastics." Combined, these categories account for about 59 percent of all cover material yardage used. The estimated 50 percent of fabrics that might fail the draft open flame fabric test would account for 84 percent of all fabric yardage in these three groups. The total remaining societal costs for these fabric groups that might be addressed by an open flame test for upholstery fabrics is \$121.7 million.²¹

²¹ Smith, *op. cit.* This estimate was derived from information shown in Table 4 of the *Preliminary Regulatory Analysis*, and is based on the summation of remaining societal costs of about \$10 million from items covered with "Moderately Cigarette Ignition-Prone Cellulosics," \$23.4 million from items covered with "Less Cigarette Ignition-Prone Cellulosic," and \$88.3 million from items covered with "Thermoplastics."

If the fabrics that would fail the draft open flame fabric test account for 90 percent of the total remaining open flame ignition societal costs for these fabric groups, the average lifetime open flame societal costs that would be addressed by the test would be about \$6.95 per unit ((90% x \$121.7 million)/15.75 million units).

A likely means of compliance with the open flame test would be FR treatment of fabrics. Since the draft fabric test is apparently less severe than that specified in the open flame standard drafted by the CPSC staff in 2001, the required amount of FR treatment per yard of fabric should be lower (for those fabrics that are treated). While the precise cost of such treatment is unknown, we might assume that the average incremental FR treatment costs would be about 50 percent to 75 percent of the costs estimated for the 2001 draft open flame standard, or about \$5.00 to \$7.50 per furniture unit.²² On an aggregate basis, these costs would amount to about \$79 million to \$118 million annually (\$5.00 to \$7.50 per unit x 15.75 million units).

Given the above estimate of the per unit lifetime societal costs addressed by the open flame fabric test (\$6.95 per unit of furniture) and the estimated FR treatment costs ranging from \$5.00 to \$7.50 per unit, it is uncertain that the addition of an open flame fabric test provision to the CPSC staff's draft standard would result in an increase in the net benefits of the standard. Even if it adds only \$5 to the costs of treating these fabrics, the additional requirement would have to be more than 70 percent effective at reducing the addressable open flame hazard for the benefits to be greater than or equal to the costs.

Although the estimated per unit costs of the draft open flame test for fabrics developed by the staff in 2005 should be less than estimated for the 2001 draft open flame ignition standard, it still would result in an increase in regulatory burden for small manufacturers of furniture and upholstery fabric. Additionally, it should be noted that the inclusion of this provision might result in an increase of about 20 million pounds of FR chemicals being used annually to treat upholstery cover fabric. Thus, relative to the current draft proposal, the inclusion of this provision would increase substantially the more direct human contact with FR chemicals.

In summary, the inclusion of a small open flame testing provision for cover fabrics probably would have a more substantial impact on small businesses than the draft standard without increasing the net benefits of the standard to society.

²² Calculated as 50 to 75 percent of the midpoint of the range of estimated FR fabric treatment costs (\$6.61 to \$11.28) plus associated costs of compliance and distribution.

7.5. Adoption of Only Those Provisions of the Draft Standard Relating to Smoldering Ignition Resistance

As discussed in Section 2, the estimated societal costs associated with addressable smoldering ignitions are substantially greater than the societal costs associated with small open flame ignitions. As an alternative to the CPSC staff draft standard, the Commission could limit the standard to the provisions that address ignition from smoldering ignition sources such as cigarettes (and hence eliminate the open flame requirements). It should be noted, however, that alternative smoldering provisions could be considered and evaluated at a later date.

Under a regulatory alternative limited to the smoldering ignition resistance provisions of the CPSC staff's draft proposed standard, nearly all of the estimated increase in manufacturing costs would be related to the use of barrier materials or the FR-treatment of cover fabrics for the "Severely Cigarette Ignition-Prone Cellulosic" fabrics, which comprise about 10 percent of total fabric yardage. Testing done by the CPSC Directorate for Laboratory Sciences indicates that filling materials currently used in the manufacture of upholstered furniture would pass the applicable smoldering ignition material tests of the draft standard without modification. Hence, filling materials would not need to be treated with FR chemicals if open flame ignition resistance tests are eliminated from the draft standard. The remaining costs of a standard based on the smoldering requirements would mainly be those related to FR-treatment and use of acceptable barrier materials, which have an estimated range of \$33.6 million to \$50.7 million, with a midpoint of \$42.1 million. The only other costs would be those related to compliance verification and distribution, which might amount to about \$6 million.²³ Therefore, the total estimated costs of the draft standard without provisions related to open flame performance of filling materials would be about \$48 million. This is approximately \$136 million lower than the mean of the range of costs estimated for the draft standard (\$184.2 million). Therefore, a standard based solely on the smoldering testing provisions would result in significantly lower costs for most small businesses, with the exception of those small firms that specialize in the use of fabrics that would require FR treatments or barriers.

As noted earlier, existing filling materials already comply with the requirements of the smoldering tests for filling materials. Consequently, without the open flame filling materials tests, the standard would yield no benefits from furniture items covered in fabrics that are neither FR-treated nor used over complying barriers (*i.e.*, fabrics other than "severely cigarette ignition-prone" cellulosic fabrics), since, for these furniture items, filling materials provide the improvement in fire safety under the staff's draft standard.

²³ About \$4.9 million of these costs are for the 3.25 million units made with FR treated fabrics or barriers and \$4.1 million are for furniture covered with other fabrics and materials.

The expected benefits associated with the use of barrier materials for furniture covered with severely ignition prone cellulosic fabrics will be the same as under the staff's current draft standard, since complying filling materials are not needed for these items under either regulatory alternative. Consequently, the expected lifetime benefits should amount to about \$217.2 million.²⁴

Benefits will also be derived from furniture items covered with fabrics that are FR-treated to comply with the fabric test of the draft standard. However, the hazard reduction (and, hence, benefits) associated with the use of FR-treated fabric will be somewhat less than under the staff's current draft since the items would not be receiving the contribution of more ignition-resistant filling materials to the overall ignition resistance of the items. Based on the results shown in Table 2, cigarette ignition benefits might amount to about \$74 per unit.²⁵ Additionally, if open flame ignition hazard reduction of about 50 percent results from FR-fabric treatments, per unit open flame benefits would be about \$6.43 per unit (see Table 4). In the aggregate, these benefits would amount to about \$157.4 million.²⁶

Total benefits resulting from FR-treated fabrics and fabrics used over complying barrier materials under a standard that omits open flame testing requirements for filling materials would be \$375 million.

Based on estimated costs of the draft standard without open flame testing provisions for filling materials of about \$48 million, and estimated aggregate benefits of \$375 million, net benefits would be about \$327 million. This is about \$425 million lower than net benefits estimated for the current draft standard (about \$752 million). Thus, while this alternative would reduce impacts on small businesses, it would have substantially lower estimated net benefits than the draft standard.

It is possible that alternative smoldering provisions that retain much of the estimated open flame and cigarette benefits estimated for the draft standard could be developed with further laboratory testing. If such alternatives are identified, the cost and benefit implications will be evaluated by the staff.

²⁴ For the estimated 1.3 million units that will be made with barrier materials under severely ignition prone fabrics, cigarette ignition benefits are assumed to be \$155.48 per unit (\$202.2 million aggregate benefits) and open flame ignition hazard reduction is assumed to be 90% (\$11.57 per unit benefits - \$15 million aggregate benefits).

²⁵ Since "moderately cigarette ignition-prone cellulose" pass the staff's draft fabric test, FR-treatments of "severely ignition-prone fabrics" might result in similar expected societal costs per unit. Therefore, as shown in Table 2, lifetime societal costs for FR-treated fabrics are expected to fall from \$259.03 to \$160.13, a reduction of \$98.90 per unit.

²⁶ Based on 1.95 million units made with FR-treated fabric resulting in about \$12.5 million aggregate lifetime open flame ignition benefits (1.95 million x \$6.43) and \$144.9 million in lifetime cigarette benefits (1.95 million units x \$74.32)

7.6. Adopting Requirements of the Proposed Draft Standard without the Open Flame Provision for Loose Filling Materials

Loose polyester fiberfill (“loose fill”) is a common filling material used in loose back cushions of upholstered furniture. It is used in about half of all upholstered furniture items produced; when used, it accounts for roughly 40 percent of the aggregate filling material in the seating area, by weight. While conventional loose fill passes the draft standard’s loose fill smoldering test, it does not pass the open flame test without modification. The modification needed to pass the open flame test would likely involve the inclusion of FR fibers or encasement of the loose fill in FR interliners, changes that could, according to some furniture manufacturers, substantially increase the costs of producing and assembling upholstered furniture. One regulatory alternative available for consideration by the Commission is the adoption of the requirements of the staff’s draft standard without the open flame tests for loose fill.

The added manufacturing costs associated with the loose fill requirements average an estimated \$4.88 per furniture item affected. Additionally, taking into account the possible added distribution costs (which are assumed to be proportional to the added manufacturing costs), the estimated average costs of the loose fill requirements might add about \$5.37 per affected item. Given that about half of the furniture items with treated filling materials would be produced with loose fill, about 10.3 million furniture units might be affected, at an aggregate cost of about \$55.3 million ($\5.37×10.3 million units). The industry would not incur these costs under this regulatory alternative. Therefore, adopting requirements of the draft standard without the open flame testing provision for loose filling materials would reduce the impact of the standard on small businesses.

The benefits of treating the loose fill²⁷ would result from the safety enhancement associated with treating all of the filling materials included in furniture items. These benefits could result from retarding fire growth in cases in which the inside back cushion is the initial ignition location, and also from the contribution of the treated loose fill in reducing fire growth when ignition first occurs at other locations.

Estimating the benefits of the loose fill open flame test requirements is difficult because of the lack of data demonstrating the fire-safety contribution of complying filling materials used in specific locations of the furniture items, such as in back cushions where the loose fill is located. However, with regard to open flame ignitions, the available evidence suggests that many serious open flame fires involve back cushions. It is not unreasonable to assume that the proportion of open flame benefits derived from treated loose fill is equal to the percent (by weight) of the loose fill in the

²⁷ Either by the inclusion of FR fibers in the loose fill or by encasing the loose fill in FR interliners.

filling materials.²⁸ As already noted, loose fill is used in about 50 percent of all upholstered furniture items produced, and accounts for about 40 percent of the seating area filling material weight in items in which it is used. Hence, for open flame fires, treating loose fill may account for about 20 percent (*i.e.*, 50% of 40%) of aggregate open flame benefits from furniture items covered with moderately- and less-ignition prone cellulosic and thermoplastic materials (*i.e.*, those without FR treated cover fabrics or barriers), or about \$24.4 million (*i.e.*, $0.2 \times \$121.7$ million in estimated open flame benefits involving furniture items covered with those fabrics). Additional benefits would be derived from furniture items covered with FR-treated cellulosic fabrics (about 2 million units produced with severely cigarette ignition prone cellulosic cover materials), which could bring the total in estimated open flame ignition benefits to about \$26.9 million.

While the loose fill requirements directly address open flame ignition performance, they will also provide some additional protection against furniture fires started by cigarette ignition. For example, if other materials used in the furniture allow cigarette ignition to progress to open flame combustion, the presence of treated loose fill in back cushions could retard the growth of the fire. Additionally, treated loose fill could prevent fire ignition from smoldering fabrics that reached the back cushions.

Since the cigarette benefits of treated loose fill are less clear than the open flame benefits, we assume that the proportion of cigarette benefits derived from treated loose fill is equal to half the percent of the loose fill in the filling materials.²⁹ Based on this assumption, the cigarette benefits of treating loose fill would amount to about 10 percent of the aggregate cigarette benefits from furniture items covered with the moderately- or less-ignition prone cellulosic or thermoplastic fabrics, or about \$27.4 million (*i.e.*, $0.1 \times \$273.8$ million in cigarette benefits involving furniture covered with these fabrics). Some additional benefits would also be derived from furniture items covered with FR-treated cellulosic fabrics having loose fill in backs (an estimated 975,000 units annually). These added benefits could amount to \$15.8 million,³⁰ and increase the cigarette-related benefits associated with treating the loose fill to \$43.2 million (\$27.4 million + \$15.8 million).

²⁸ That is, if loose fill accounts for 40% of the treated filling material in a furniture item, then 40% of the open-flame ignition benefits associated with treating all of the filling materials will be assumed to be attributable to the loose fill.

²⁹ That is, if loose fill accounts for 40% of the treated filling material in furniture items, then 20% of the cigarette-ignition benefits associated with treating all of the filling materials in the furniture items will be assumed to be attributable to the loose fill.

³⁰ This estimate assumes that FR treatment of the severely ignition prone fabrics, without the treatment of filling materials, would reduce the cigarette ignition societal costs to a level equal to that of furniture covered with moderately ignition prone fabrics; complying filling materials would result in a further reduction to a level equal to that of furniture covered with less ignition prone cellulose. Under the loose fill effectiveness assumption described above, the benefits associated with complying loose fill would be an average of 10 percent of the incremental benefits ascribed to all complying filling materials.

In summary, the estimated costs associated with the loose fill requirements of the staff's draft proposal amount to about \$55.3 million. Since much of these costs would be borne by small businesses, the impact of the regulatory alternative on such firms would generally be lower than that imposed by the draft standard. The estimated benefits resulting from the loose fill requirements amount to about \$70.1 million (\$26.9 million in open flame benefits and \$43.2 million in cigarette benefits). Consequently, *excluding the loose fill open flame requirements* from the standard would reduce both its costs by \$55.3 million and its benefits by \$70.1 million. Net benefits would be reduced by about \$14.8 million (\$70.1 million - \$55.3 million). Overall, the net benefits of the staff's draft proposal without the loose fill open flame requirements would be about \$737 million annually. This compares to estimated annual net benefits of about \$752 million under the staff's full draft proposal.

7.7. Alternative Effective Date

Section 4 of the Flammable Fabrics Act states that standards or regulations shall become effective twelve months from the date of promulgation, unless the Commission finds that a different effective date is in the public interest. Because of the need for FR treatment of some fabrics used in the manufacture of furniture and the fact that furniture manufacturers carry stocks of fabrics, a longer period before the rule becomes effective, such as 18 months, could provide some firms (including smaller firms) additional time to use inventories of fabrics that would not pass the draft standard's fabric test without FR treatment. However, given the small percentage of fabrics that will need to be treated (under 10 percent), it seems unlikely that setting an effective date of 12 months from the date of promulgation will substantially burden firms.

Additionally, several options might be available to furniture manufacturers (including smaller firms) 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 could use FR barrier materials beneath the untreated fabric, as allowed by that alternative method of compliance with the standard. Also, they might sell the fabric to jobbers who would market it to furniture manufacturers that use FR barriers with untreated upholstery fabrics and for other end-uses that are not within the scope of the regulation.

Compliance with the draft proposed standard would also require manufacturers and suppliers of urethane foam, polyester fiberfill, cotton batting, and other materials to provide materials that meet the relevant smoldering and open flame material tests so that they would be available for use by furniture manufacturers within 12 months of the date of promulgation of the rule. Current processes and capacities used by the manufacturers of urethane foam and cotton batting to meet mandatory flammability requirements of California and other jurisdictions, and voluntary standards such as the

UFAC program, are expected to be adequate to produce sufficient quantities of urethane foam and cotton batting for use by the furniture industry under the proposed rule. Additionally, it seems likely that suppliers of polyester cushioning materials and furniture manufacturers will be able to develop products and processes that will enable the use of polyester-based cushioning materials within that period.³¹

In summary, smaller businesses are not expected to face significant impacts attributable to an effective date of 12 months after the date of promulgation.

7.8. Adoption of a Labeling Rule

The Commission could also require hazard information to be presented on labels in addition to, 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 and estimates provided by a manufacturer), and thus, should not present significant costs to small furniture manufacturers. However, the impacts of such labeling on product safety are likely to be minimal. Labeling that warns of cigarette ignition hazards probably would not be effective, because labels are unlikely to be seen by consumers when the upholstered item is in use, and because there already is public awareness of these hazards. Additionally, a warning label would not be likely to prevent fires started by children playing with lighters and matches, who are unlikely to read, or be affected by, the statements provided.

7.9. Relying on a Voluntary Standard

If the Commission does not adopt a mandatory rule to address furniture flammability from both smoldering and open flame ignition sources it is possible that a voluntary standard (perhaps through modifications to the existing Ufac Voluntary Action Program) could be developed based on the CPSC draft standard or based on other provisions, such as the industry recommendations, to address these hazards. However, no such voluntary standard currently exists. Moreover, the effort begun in 1996 through ASTM to establish a voluntary standard is currently inactive. Furthermore, comments submitted in response to the October 23, 2003, ANPR representing all segments of the affected industries supported mandatory federal regulation to address upholstered furniture flammability.

7.10. Taking No Action

The Commission could determine that no rule is reasonably necessary to reduce the risk of fires associated with cigarette and small open-flame ignitions of upholstered

³¹ Options that should be available to manufacturers include blending FR fibers with polyester, using alternative fiber treatments, and using fire resistant interliner materials to encase loose filling materials.

furniture. Under this alternative, future societal losses would be determined by factors that affect the likelihood that ignition sources come in contact with upholstery and the ignition resistance of upholstery materials used by furniture manufacturers. For example, the apparently increasing use of ignition-resistant upholstery materials, such as leather, could reduce fires over time. Also, the state of California might adopt the draft revisions to its mandatory standard for upholstered furniture. Those revisions could result in reduced fire losses in that state, which accounts for perhaps 15 percent of the furniture market. Some furniture manufacturers might use materials that comply with some or all provisions of the California revised standard for all of their furniture production, which could reduce fire losses in other areas. Additionally, other political jurisdictions could impose requirements that would reduce future losses from furniture fires.

Factors other than furniture materials will also determine fire losses in the future. Some of these will tend to increase future losses (such as projected annual increases of about 1 percent in population and households) and others might decrease future losses (such as continued reductions in rates of smoking and alcohol consumption, increasing smoke alarm operability, information and education efforts, and installation of sprinkler systems in new construction). Particularly noteworthy might be the availability of cigarettes that reduce the probability of igniting upholstered furniture. Effective on June 28, 2004, the State of New York required all cigarettes sold in the state to self-extinguish if they are left unattended. Such cigarettes are expected to reduce, but not eliminate, residential fires started by cigarettes. Similar legislation has been adopted by Vermont and California (to become effective in 2006 and 2007, respectively). There has also been legislative activity in this area by other states, although legislation has only been enacted by New York, Vermont, and California. We are not aware of plans by the cigarette industry to expand significantly their marketing of self-extinguishing cigarettes to other areas of the country.

While furniture fires might decline with no CPSC action, there is no reason to believe that the decline would approach the large proportion of fire losses that could be prevented with the staff's draft proposed standard.