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

MEMORANDUM

DATE: JAN 30 1998

TO : The Commission
Sadye E. Dunn, Secretary

Through: Jeffrey S. Bromme, General Counsel
Pamela Gilbert, Executive Director

FROM : Ronald L. Medford, Assistant Executive Director for Hazard Identification and Reduction
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SUBJECT: Follow-up Questions on Upholstered Furniture

Attached are staff responses to Commissioners' follow-up questions on upholstered furniture. A few of these questions were raised at the December 18, 1997 briefing, and are discussed separately; most were submitted in writing to the staff after the briefing. The staff will be prepared to discuss any of the questions at the upcoming Commission meeting.

Attachments

NOTE: This document has not been reviewed or accepted by the Commission.
Initial _____ Date 1/30/98

CPSA 6 (b)(1) Cleared
No Mfrs/PrvtLblrs or Products Identified
___ Excepted by _____
___ Firms Notified,
Comments Processed.

UPHOLSTERED FURNITURE

ADDITIONAL QUESTION FROM CHAIRMAN BROWN RAISED AT BRIEFING

Could you provide some additional information on whether the draft standard would have an impact on international trade, and what requirements would affect this issue?

Imports of products within the scope of a mandatory rule would have to comply. About 7% of the total value of upholstered furniture sales in the U.S. are imported products. For 1992-1996 more than 50% of wood frame upholstered furniture imports have been from Italy, followed by Canada, which has accounted for 11-14%. Mexico has been gaining importance as an exporter to the U.S. Much of the furniture imported from Italy has leather upholstery, which should not require FR treatments to comply with. the draft standard. Canadian firms (some of which are subsidiaries of U.S. companies) and Mexican firms should be able to use fabrics purchased from U.S. suppliers, or treatments could be done in those countries to enable them to manufacture complying products.

Exports of upholstered furniture would not be subject to a mandatory rule. Furniture exports only account for about 2% of the value of production of U.S. firms. Canada is the main destination for exported furniture, accounting for 72% of the total value of exports from 1992-19.96. Mexico was the second leading destination during this period, accounting for 6% of all exports. Depending on the importance of exports to particular firms, and the relative price increases of their products resulting from use of FR treated fabrics, many companies may choose to use the standard stock of FR treated fabrics on exported items.

U.S. firms would have the option of using non-FR treated fabrics:: on items labeled as being manufactured for export. Generally, manufacturers intending to export non-complying products would be required under the FFA to notify the Commission at least 30 days in advance. CPSC would then notify the appropriate foreign government agency of the anticipated shipment and the basis on which the goods did not comply with the U.S. rule,

The staff projects the overall impact of the standard on foreign trade to be minor. Additional information on this issue will be included in the preliminary regulatory impact assessment now being prepared.

FOLLOW-UP QUESTIONS FROM COMMISSIONER GALL

1. **What is the estimated rate of market penetration (or' diffusion) for flame-resistant furniture? In other words, how much of the existing furniture that would be subject to a flame-resistance standard is generally replaced every year?**

   All but 2-3 million of the 25-30 million units currently sold each year are replacements for existing furniture. Based on historical sales data, and the assumption that upholstered furniture has an expected life of about 14-15 years, up to about 25 million pieces of household upholstered furniture are discarded each year. This comprises about 6% of products in use. A small fraction of this discarded furniture may be comprised of items that are already small open flame resistant (e.g., leather), but most.. would be replaced with safer products.

2. **What information do we have on the average age of upholstered furniture typically involved in small open-flame and cigarette ignitions, versus the average age of upholstered furniture? Is there any significant difference?!**

   The median reported age of upholstered furniture involved in the small open flame fire investigation study was 5 years'. About 1/3 of the furniture involved in the investigated fires was less than 5 years old; about 2/3 was less than 10 years old. Only about 1/3 was reported **as** more than 15 years old or simply "old." The fire investigation study did not include cigarette ignitions of upholstered furniture. Based on historical sales data, CPSC's Product Population Model estimates (based on a 14 year expected product life for items produced in a given year) yield a calculated average age of furniture currently in use of 8.5 years.

   National fire data do not report the **age** of the upholstered furniture involved in fires. Therefore, the extent or statistical significance of any overall age difference between furniture involved in fires and the general population of furniture products is not calculable.

3. **What information does the staff have on the effect that: age and condition have on the propensity of upholstered furniture to burn?** Is **an old, dirty couch more likely to burn that a new clean one?**

The staff did not conduct tests to evaluate the effect of age, condition or cleanliness of furniture on ignition propensity or post-ignition behavior. Fabrics tested by the staff were temperature and humidity controlled but not soiled. The staff's testing shows that virtually all new fabrics will readily ignite and continue to burn when exposed to a typical small open flame source. The staff is aware of one tobacco industry-sponsored study of the cigarette ignition propensity of used **(i.e.**, older) fabrics; this study revealed no significant differences in cigarette ignition propensity between soiled and unsoiled fabrics. The staff intends to consider the effects of dirt on upholstered furniture flammability during the recommended 5-month information gathering period.

4. **One of the staff's interpretation of the observation that, while the number of fires attributed to smoking material or: small open-flame ignition of upholstered furniture have. decreased, deaths and injuries from those fires have not gone down is that the toxicity of the smoke has increased due to changes in upholstered furniture designed to reduce cigarette ignition.** Is **it possible that there have been shifts in the patterns of upholstered furniture fires towards groups that are less likely to have working smoke detectors, or who are more likely to live in large families/groups that make fires more likely to result in multiple fatalities?**

These risk factors relate chiefly to low-income households, which historically have higher fire death and injury rates. The staff has no evidence suggesting a significant shift in the incidence of upholstered furniture fires toward lower income households, relative to other kinds of fires,

NFPA data on smoke detector usage by major population groups show that all population groups increased the usage of smoke detectors between 1982 and 1991. Populations in this study' included apartment occupants, rural households, households headed by persons over 65 years, households with incomes below $7,500, non-white households, and smokers. The general trend has been toward more usage of smoke detectors in all categories. Households that have fires are, however, still much less likely than non-fire households to be equipped with smoke detectors at all. The incidence of fire deaths is also much higher in non-detector-equipped households, although there is no evidence that the death rate has actually increased in non-detector equipped homes.

5. **Has staff developed some sort of a regression analysis f-or the projected sales of new furniture, and adjusted that analysis to reflect the higher prices of flame resistant upholstered furniture?**

The staff found no evidence to suggest a significant impact of price increases on unit sales. Although the residential upholstered furniture market is highly price-competitive, the demand for furniture depends chiefly on general economic conditions, and on factors such as household formation. Furniture prices have not risen as much as those of consumer goods in general, and consumers' purchasing decisions are not expected to be affected significantly by the average estimated price increases of 3-4%. The aggregate cost impacts of the standard were calculated based on a range of annual unit sales volume. There is no reason to believe that sales under the standard would fall below the range on which these calculations are based.

6. **Can the staff's analysis be further adjusted for the possibly reduced aesthetics of furniture with flame-retardant properties, which has been the U.K.'s experience?**

The staff noted the possibility of adverse aesthetic effects even though it is not possible to monetize those potential costs. Recent advancements in FR technology have sharply reduced the likelihood of adverse aesthetic effects. Early production meeting the match test of the UK regulations did have aesthetic problems. Early production tended to have FR treatments that were over-applied, resulting in stiffer, less comfortable, less durable fabrics. These problems have been ascribed to the lack of sufficient time for the U.K. textile industry to develop complying products. For nearly all fabrics now used in the U.K., the industry reportedly has overcome these initial problems, and consumer acceptance of FR fabrics is now widespread.

7. **Are the benefits from the flame-resistance of upholstered furniture realized at the time of sale, or at some point during the service life of that furniture when it resists flame that would have ignited a non-flame-resistant piece of upholstered furniture?**

The analysis of potential economic costs and benefits of a standard or other action recognizes that costs to consumers are increased initially (i.e., at the time of sale) and that safety benefits are delivered in the future. For individual pieces of furniture, the benefits of FR treatments would be realized at the time that the items resist ignition, which can occur at any time during the life of the furniture.

8. **If the benefits of flame-resistant furniture are realized only at the time that it resists ignition that would have: ignited a non-flame-resistant piece of upholstered furniture, should not those benefits be discounted to the present value for the year in which the exposure to flame occurs?**

Yes. The stream of expected future benefits is discounted' to its present value. Upholstered furniture presents risks of fires throughout its lifetime. The hazard statistics and' test data show that most upholstered furniture can be ignited by open flames; there is a roughly constant likelihood that items will be involved in a small open flame fire each year. The staff's analysis considers the production of furniture in a year and the expected hazard costs to consumers over the many years that units from a production year remain in use. In accordance with OMB cost/benefit guidelines, the staff has discounted expected! hazard costs avoided in future years, i.e., the future benefits of a standard or other action, to express these benefits in their present value so they may be compared to the increased costs incurred at the time of purchase. by consumers.

9. **Shouldn't all estimates of property-loss savings from the proposed upholstered1 furniture flammability rule be measured* against the declining baseline of upholstered furniture fires revealed in the 1995 fire loss estimates compiled by NFIRS and NFPA?**

Projections of property loss savings, as well as savings in deaths and injuries, are based on recent national fire loss estimates that include 1995 data. Taken in the context of recent upholstered furniture fire loss trends, the 1995 data do not show significant changes: overall, small open flame ignition losses were relatively flat and cigarette ignition losses continued to decline.

Since the number of open flame deaths has not changed significantly in recent years, the staff's analysis of fire losses and potential benefits of a standard incorporates a 5-year average for open flame losses (property losses account for about 7% of the total estimated societal costs of small open flame fires). The cigarette fire loss baseline was adjusted downward to reflect the increased safety of newer products (see #10 below).

10. **Shouldn't all estimates of savings from the proposed upholstered furniture flammability rule be measured against a declining baseline of smoldering cigarette ignitions of upholstered furniture? If no, why not?**

The estimates of cigarette-related savings take into account the observed decline in smoking material fire losses. Upholstered furniture fires ignited by cigarettes have been declining for many years, although the rate of decline appears to have slowed in recent years. It is most appropriate to project potential benefits of a standard based on the risks presented by current production, rather than on the relatively greater hazard presented by (less cigarette ignition resistant) furniture in use. The projected benefits of reductions in cigarette ignitions are based on societal costs that are 25% lower than estimated for furniture in use in 1994 to reflect the improvements in. the cigarette ignition resistance of furniture currently being manufactured.

11. Do **the staff's calculations of economic costs and benefits take into account estimates of the likely compliance with. the rule? From the Commission's experience with mandatory regulations for cribs, toys and fireworks we know that compliance will not be 100%. Did the staff perform any sensitivity analysis with different estimates of compliance?:**

The level of compliance does not affect the overall outcome of the cost-benefit comparison. If firms did not comply with a standard, there would be neither costs nor benefits, and the overall effectiveness of the standard would be lower. The staff's analysis considered different levels of effectiveness, and used conservative levels--80% for small open flame losses and 50% for cigarette losses--in estimating potential benefits.

12. **Another source of potential noncompliance with an upholstered furniture flammability standard would be the use of customer-supplied material. Does the staff have any estimate on how widespread the practice of small manufacturers using material supplied by consumers to upholster or to reupholster furniture is?**

Although many firms report growing ‘Customers Own Material" (COM) sales, the size of this market for household furniture is difficult to estimate with current information. A complicating factor is the importance of COM orders by commercial end-users, such as those intended for business offices or hotels and motels, which would not be subject to the standard. Most of the household COM market involves

higher-priced upholstered items provided, for example, by interior decorators. The CPSC staff will seek more information on the size of the COM market, and potential difficulties of compliance with the standard that would be faced by the (mainly smaller) manufacturers that may derive a substantial part of their revenues from such items.

13. **Does the staff have data on how much furniture is slipcovered or reupholstered each year? Would a rule cover slipcovers or reupholstered furniture? If it would not, shouldn't the estimates of savings from fire prevention in such slipcovered or reupholstered furniture be subtracted from the overall estimates of savings?**

Estimated current sales of slipcover and throws are on the order of 3 million units. Slipcovers and throws sold as individual products, and furniture that is reupholstered as a service to its owner (rather than reupholstered for resale) are not within the scope of the ANPR or the draft standard. Slipcovering and reupholstering are typically performed late in the life of a relatively small percentage of a given year's furniture production. Thus, most of the. expected benefits of a standard would still accrue; any negative effect of slipcovering and reupholstering would not significantly reduce the total discounted benefits of a standard. Further, as more small open flame resistant fabrics come into widespread use in manufactured furniture, reupholsterers may also tend to use such fabrics, even if not required to do so by a standard.

14. **If the proposed rule covers only the seating area of upholstered furniture, isn't it possible that manufacturers will use flame-resistant material only for the seating area and cover other areas with non-flame-resistant material? Can the estimated savings be adjusted to reflect possible ignitions of complying furniture in areas where even complying furniture may not have flame-resistant coverings?'**

Manufacturers could use fabrics that do not pass the seating area test in areas that would not have to be tested, such as skirts, outside backs and arms. Some savings in fabric costs could be realized by manufacturers; it is possible that some producers could choose this strategy. However, this practice would involve carrying dual inventories of otherwise identical FR and non-FR fabrics, which could present difficulties regarding cutting, pattern and color matching, and other processes. The staff's assessment of the potential costs of the standard was based on the conclusion that manufacturers would minimize costs by not carrying treated and untreated stocks of fabric patterns,

If manufacturers could reduce costs by using both FR and non-FR fabrics, benefits may also be reduced. However, since most small open flame ignitions observed in the IDI study involved seating area locations (that would have to comply), any reduction in benefits associated with partial FR fabric usage would probably not be substantial. The staff recommended a single seating area test, in part, to reduce the compliance burden on manufacturers; fabrics used in other areas of furniture could be covered by this test if the Commission found such a requirement to be necessary.

15. **Page 43 of the briefing package estimates a cost of $29 per piece. Does this estimate account for the mark-ups that typically occur during the fabrication, manufacturing and distribution process (e.g., inventory costs, interest and insurance expense)?**

The estimates of 'increased costs to consumers (averaging $23 to $30 per piece for living room and family room items) are based on markups observed along the chain of manufacturing and distribution (the $29 figure on p.43 of the briefing package refers to a component of estimated benefits.)..

16. **Did the staff consider the costs involved for small. textile or upholstered furniture manufacturers companies to apply FR treatment to some, but not all, fabrics in the production process and keep these two types of fabric segregated (i.e., time lags, storage, etc.)?**

No. The staff's cost estimates assume that all manufacturers would, by the time of a standard's effective date, use only FR treated fabrics to minimize production costs. This assumption is based largely on information about the industry's! practices in meeting--and minimizing costs associated with--the U.K. Regulations. costs associated with producing FR treated cover fabrics or barriers are reflected in price increases passed on by fabric suppliers to purchasers of the fabric. Furniture manufacturers would purchase treated (or otherwise FR) fabrics, rather than treat fabrics themselves. If furniture manufacturers were to use both treated and untreated fabrics, they would incur additional expenses for inventory and control that are not considered in the cost estimates.

17. **How were the testing costs on page 44 of the briefing package calculated?**

Testing costs are discussed in the economic report at Tab H of the briefing package. Available information indicates that outside laboratories might charge $50 to $75 to conduct each seating area test. However, it is likely that most testing would be done at testing facilities of fabric manufacturing establishments. Testing costs would probably be lower for firms that conduct their own testing. Also, reliance on an outside testing facility could lengthen production schedules more than would result from on-site testing. Assuming that tests would be done, on average, every **1,000** linear yards of fabric produced or treated, the total annual number of seating area tests on fabric intended for upholstered furniture within the scope of the standard might range from 190,000 to 230,000. Total annual production run testing costs attributable to the draft standard could range from about $2 to $3 Million (including about $1 million in fabric costs), assuming company employees were responsible for testing. Average production run testing costs would be less than $.02 per linear yard of fabric. If testing were by outside laboratories at a cost of $50 to $75 per test, testing costs would range from $.05 to $.08 per linear yard, and could total about $11 million annually.

18. **The briefing package proposes to exclude commercial or institutional furniture from a proposed standard. What would prevent people from buying used, non-flame resistant furniture from "institutions" (hotels, motels, and offices) or second-hand stores that have purchased such furniture for resale?**

Fire losses involving ignitions of upholstered furniture in commercial and institutional occupancies are very low. Therefore, products intended solely or primarily for use in such occupancies are excluded from the scope of the staff's draft standard. There is no prohibition against the sale of used furniture (except for furniture that has been reupholstered for resale) that was not subject to the standard at the time of its manufacture. Therefore, consumers would, as always, be able to purchase used commercial/institutional or residential furniture. It should be noted that many commercial products may already be open flame resistant, since they are often produced to meet California's TB-133 requirements for large open flame ignition performance.

19. The briefing package (page 46) notes that the annual costs of a fire-resistance standard for upholstered furniture may range from $460 million to $720 million, a difference of 56%. Did the staff run sensitivity analysis at the high and low ends of the estimate to see how that affected the result? If so, what did the sensitivity analysis reveal?,

The estimated cost ranges presented in the briefing package-. reflect the staff's sensitivity analysis that considers the ranqe of estimated costs of FR treatments ($1.00 to $1.25 per-linear yard) and the range of annual shipments of household upholstered furniture (25 to 30 million units, of which an estimated 130% would require FR fabric treatment). The range of estimated benefits also varies with annual shipments. The high end of estimated costs yields estimated annual net benefits of over $200 million; the low end of costs (based on lower annual sales and lower FR treatment and testing costs) yields estimated annual net benefits of over $350 million.

20. What testing will be necessary to ensure topical cleaning agents will not interfere with FR treatments and subsequent: effects on bioavailability?

In upholstery fabrics the FR treatment is usually in a durable fabric backcoating, barrier or fiber matrix within. the fabric. FR chemical producers report that such treatments are designed to last the life of the fabric. For consumers to be exposed to FR chemicals, treatments in a polymer matrix backcoating on fabrics would have to migrate from the matrix through the fabric to the surface; treatments in barriers would have to migrate not only through the barrier itself but also through the cover fabric. Treatments on fibers would also have to migrate through to the surface of the fabric. Any resulting exposure does not necessarily mean that the chemicals would be bioavailable, i.e., able to be absorbed by the body. To evaluate potential exposure, chemical extractions were performed on 13 FR treated upholstery fabrics, using water, saline solution, n-hexane (to replicate cleaning fluid), and hydrochloric acid solvent solutions. Migration of FR chemicals from backcoated fabrics was minimal. Additional studies are planned for the 5-month information gathering period on any additional backcoated fabric samples received. The staff also plans to examine the effects on FR effectiveness of residues left from topical cleaning and soil-release agents

21. **The briefing package states that the textile manufacturers are small businesses (employ less than 500). Most of these textile companies do not produce FR fabrics at this time,. Did the staff take into account the costs that may be incurred by these small businessmen when they first introduce FR chemicals on their worksite? (i.e., handling and disposal requirements related** to **FR chemicals),**

Estimated costs related to FR treatments are largely based on the experience of U.K. establishments--many of which are small --in dealing with similar requirements. The necessary equipment to perform FR treatments is reportedly already owned by most textile firms (for non-FR backcoating or other operations). The staff is gathering additional information on the impacts on textile firms of using FR treatments, including information from OSHA and EPA on reporting, handling or disposal requirements for FR chemicals.

22. **Does the staff contend that all presently used FR chemicals* do not fall within "hazardous chemical" requirements for all federal and local regulations?**

The use and disposal of various chemicals found in FR treatments are subject to number of federal, state and local. statutes and regulations. The staff is in contact with other agencies to determine whether FR chemical use in upholstered furniture may subject businesses to any additional requirements. The staff understands, however, that the use of FR chemicals in upholstered furniture would not subject consumers to any federal or local requirements. EPA reports that household furnishings treated with FR chemicals would not require any special disposal methods.; such products would be treated the same as any other municipal solid waste. The staff will continue to gather additional information on waste disposal, occupational safety and other FR chemical safety issues.

23. **The staff is proposing a test protocol, and does not intend to rule on appropriate chemicals for FR treatment. Given all federal agency rules (DOT, EPA, OSHA, etc.) how does the staff propose to address any new chemical combination which is not presently used for FR purposes to ensure safety against acute or chronic hazards? (Le., it took 15 years to deal with TRIS)**

Under section 5 of the Toxic Substances Control Act (TSCA) new chemicals must be approved by the EPA before they can be manufactured or imported. Manufacturers and importers must submit all available data, including toxicity data, to EPA. for review. Scientists in the EPA New Chemicals Program

assess the potential for human and environmental exposure and risk. EPA has the authority to prohibit the new chemical, limit the conditions under which it is manufactured, or require additional toxicity data. After a new chemical enters commerce, EPA may limit new uses of the chemical.

Following EPA approval, any new chemical that is used in consumer products is subject to the FHSA, including the supplemental definition of chronic toxicity. If an existing, chemical or a new combination of existing chemicals not currently used for FR purposes is found to have FR properties and is subsequently used in consumer products, it would still be subject to TSCA and to the FHSA. TSCA (which was enacted in 1976), as well as the supplemental FHSA definition of toxic and CPSC's chronic hazard guidelines (issued in 1992) did not exist when TRIS was introduced,.

a. Even **though the IDIs collected by the staff for this package were not gathered from NEISS data and thus not statistically valid, staff considers them useful as a description of 'real life' occurrences,**

The data collected in the study provide useful information on upholstered furniture fires involving small open flames, the areas of upholstered furniture. first ignited, and fire scenarios. Although the 76 investigated fires were not from a random sample, the information contained in these investigations allows general observations to be made concerning small open flame upholstered furniture fires.

b. **Staff also stated that they expect their proposed standard would be 80% effective in preventing small open flame ignition fires on upholstered furniture.**

This estimate is largely based on the staff's lab testing experience, in which most existing and experimental FR fabrics exhibited greatly improved small open flame performance compared to non-FR fabrics. While it is not reasonable to expect a 100% elimination of fire losses, the use of upholstered furniture meeting the staff's draft standard would, substantially reduce small open flame fire losses.

c. **Staff also stated that the benefits were calculated solely on the 20 to 25 million pieces of upholstered furniture that are sold each year.**

A standard would apply to products manufactured or imported after the effective date. In recent years this comprises about 20-25 million units. The

estimated benefits of safer furniture are discounted over the life of the products.

24. Please describe again how the staff based their cost and benefit calculations given that the majority of furniture listed as 'old or very old' for all of the 76 IDIs included. in the study.

The age of furniture involved in the IDI's is not directly relevant to the calculation of costs and benefits, except that it illustrates the need to discount expected benefits over a period of years, as was done in the staff's analysis. The primary bases for the estimates of potential benefits are the national fire data (not the IDI's) and information from lab tests on currently manufactured furniture and the manufacturers survey.

Estimated annual benefits are based on projected reductions in the aggregate societal costs of upholstered furniture fire losses associated with a given year's production. Societal costs associated with current production were estimated by accounting for expected reductions in the- open. flame hazard resulting from the CPSC lighter standard, and by accounting for reductions in cigarette ignition losses because current production is less likely to ignite from cigarettes than furniture in households. Expected hazard costs in the absence of a standard were calculated over the. life of a year's production. Benefits were estimated by assuming that furniture produced after the standard would reduce expected hazard costs by 80% for small open flame ignitions and 50% for cigarette ignitions.

25. None of the child play with lighters was witnessed by an adult. The package states that human factors estimates a child will play with a lighter for up to 2 minutes. How can we assume that the child play (real life) incidents as described in the IDIs would have a flame exposed to the furniture for only 20 seconds since these children were alone without an adult in the room? What is the basis for staff to claim the proposed standard will prevent 80% of these typical cases, given some of the extreme circumstances? of children left alone in their homes, etc.?

The staff stated in the briefing package that young children would not be expected to hold a flame unintentionally in one place for more than several seconds at a time. This is based on conclusions drawn from a number of child fire behavior studies. It is true, however, that lighters are: capable of continuous burns of up to several minutes (there is no specific reference to 2 minutes in the package).

Candles may burn for much longer. Thus, the 20 second flame exposure time in the staff's draft standard certainly would not cover all conceivable small open flame ignition scenarios. The stafff considered longer flame times; however, lab tests show that most furniture items will ignite within about 20 seconds, and the available human factors information suggests that this relatively short flame exposure time would reduce the likelihood that the kinds of childplay ignition observed in the IDI's would occur. (see also page 29, response to Commissioner Moore's # VII) Considering the heat energy output of most small open flame ignition sources, including matches, lighters and candles, the staff conservatively estimates that substantial reductions of at least 80% would result from a standard.

26. Since many of the children's parents stated that the child had a history of playing with matches and lighters, is staff taking into account that most of these fires are set by more 'persistent' or 'aggressive' child play behavior. Is there a formula to weigh more aggressive/assertive child behavior against the typical? Do human factors studies take this more persistent behavior into account when performing, their estimates?

Although some of the ID1 childplay cases involved children with previous fireplay experience, most did not. Very persistent firestarters may be able to find a way to ignite. virtually any item of household furnishing, including upholstered furniture. Such persistent behavior--if the child had knowledge that playing with heat sources could have destructive consequences (as opposed to the child just experimenting with something new and fascinating due to curiosity) --would not generally be categorized in fire incident reports as "childplay." There is no method or formula to assess the likelihood of persistent fireplay. The staff concludes that deaths and injuries from the kinds of childplay fires observed in the IDI's could be greatly reduced by a standard. The effectiveness estimates reflect. this conclusion.

27. All of the candle incidents had a flame exposed to the upholstered furniture for more than 2 minutes. How can these 'typical' real life incidents be prevented by a protocol that allows for only a 20 second flame exposure? What is the basis for staff to claim that this standard will. prevent 80% of these incidents?

The staff's draft standard is intended to reduce (but not necessarily eliminate) small open flame ignition propensity, The great majority of the incidents in the field study

result from childplay with matches and cigarette lighters. Of the 76 cases investigated, 10 involved candles (See Table 7, Tab B.) Eight of these candle fires involved candles tipping over and falling on the furniture; two involved childplay.

When lighters or candles are the ignition source, flame exposure times are more likely to exceed 20 seconds. Thus, the draft standard is not intended to address 100% of all possible small open flame ignitions. Testing indicates that a 20 second exposure represents a demarcation point in fabrics which readily ignite and continue to burn from fabrics which resist sustained combustion. Some fabrics that pass a 20 second exposure also resist longer exposure times. One FR backcoated fabric that performed well at 20 seconds of exposure time was also tested (and resisted ignition) at small open flame exposures of up to 2 minutes-,.

The behavior expected in childplay or other inadvertent or accidental scenarios suggests that a 20 second flame exposure time would be reasonable to address most of the furniture incidents, including those involving typical childplay lighter fires and inadvertent candle tipovers.. The 80% estimate is an overall effectiveness estimate encompassing all kinds of small open flame losses.

28. **Of all the incidents;, matches are probably more readily addressed by the proposed standard since human factors states a child will play with a match for approximately 30 seconds. Though the! incidents contained in the package were not observed by an adult, those incidents caused by matches may be more within the reach** of **the proposed standard. What. was the basis for staff to assume 80% of these incidents would be prevented?**

The staff agrees that match ignited fires are probably the most readily addressable by a standard (the reference to 30 seconds in the package refers to maximum burn times of matches, not childplay behavior). Since most small flame ignitions are probably the result of relatively short flame exposures, however, and since lab tests show that most current fabrics ignite within about 20 seconds, improved small open flame performance would greatly reduce this risk,. While it is not realistic to expect 100% risk reduction for any standard, most of the samples of FR fabrics tested by the staff resisted small open flame ignition. For matches, the 80% average estimate may understate the true likely level of effectiveness. As noted in #27, above, the 80% effectiveness level is a composite estimate for all small open flame ignition sources.

29. **Why did staff include IDIs in their study that were totally out of the range of what is being considered, such as incidents involving::**
***a flare-gun (intense and large open flame);**
***fireworks**
***two incidents involving lighters which stay lit when dropped because top is still open, resulting in an extended.. flame exposure;**
***furniture stored in an outside shed on an abandoned property and another piece located on balcony, both of which are exposed to the elements;**
***deliberate fires started by older children who have a history of fireplay;:**
***furniture which was covered by a slip-cover or a throw, thus the furniture itself was not the first source of ignition?**

Not all of the cases in the study involved fires that would necessarily be addressed by a standard. They did, however, provide some information on the small open flame performance of the furniture involved. The ID1 study was, in part, an investigatory tool to help evaluate the need to cover different products (e.g., throws and slipcovers), occupancies (e.g., in a shed or on a balcony), ignition sources (e.g., a flare gun or a sparkler or other fireworks-, device), and ignition scenarios (e.g., non-arsonist juvenile fire starters or long flame exposures from a liquid fuel lighter). The observed range of situations was used to help focus the staff's draft standard on the most likely addressable fires.

An in-scope fire was a residential structure fire that involved ignition of upholstered furniture by a small open flame source. This included any fire occurring in a hotel, motel, dormitory, rooming house, or other conventional residence. The cases included were determined by the fire department to be small open flame ignitions of upholstered furniture meeting the criteria for a residential structure.

30. **Staff intends to include re-upholstered furniture in their proposed standard. How do they contemplate monitoring compliance with individuals who re-upholster furniture? Will all upholstery-type fabric produced by the textile manufacturers be required to be FR treated so that any individual who re-upholstered furniture will be in compliance?**

Most reupholstered furniture would not be subject to the provisions of the staff's draft standard. Reupholstered. furniture for resale would be covered, but not furniture. reupholstered by firms or individuals for owners as a

service. Only upholstery fabric used in products within the scope of the standard would be expected to comply with the seating area test. Other upholstery fabrics would not be required to comply, although many fabrics used by reupholsterers may eventually be FR.

31. **Staff stated that the test protocol would only include testing on the cushion, assuming that the remainder of the upholstered piece will be covered in the same material. However, there are upholstered pieces where the backs and sides are in fact different fabrics (not just the leather vs. vinyl styles). Since FR treatment will raise the costs of fabrics, does the staff foresee incidents where more pieces are manufactured with separate style non-FR fabrics to cut the cost?**

The estimated costs of the standard are based on the assumption that all upholstery fabric would comply with the seating area test. If manufacturers were to use non-FR fabrics on backs and sides, they may be able to reduce materials costs somewhat. This practice could be adopted by some manufacturers of lower priced furniture, who usually use fabrics costing under $5 per linear yard, and for whom the relative difference of FR treated and non-FR treated. fabrics would therefore be greatest. Such firms would, however, be faced with attendant problems in dual fabric inventory control, possible difficulties in merging the treated and untreated cut fabric pieces for production, and difficulties in matching colors and patterns. It is unlikely that most manufacturers would maintain dual inventories of fabrics; costs would probably be lower, on balance, using the same kinds of fabrics for all locations.

32. **Do many of the IDI's contained in the staff data indicate flaming beginning on the backs and sides of upholstered furniture? How would these statistics be taken into account to adjust the benefits projected by the staff since they do not have to have complying fabrics?**

The small open flame ID1 study reports, the outer back or out sides the first area ignited in 9 of 38 cases (24%) in which the ignition location was identified. Given the expected difficulties (see responses to #14 & 31 above), it is highly unlikely that the fabrics used by most furniture manufacturers on the backs and sides of upholstered furniture pieces would not comply with the seating area test of the standard, even in the absence of a requirement to do so. Further, the existing benefits estimate was derived using conservative assumptions about the degree of safety improvement. Thus, no adjustment to estimated benefits is necessary. The stafff will consider the merits of requiring that back and side fabrics be subject to a standard.

33. How would testing costs be affected if we required other upholstered areas of the furniture to be included, such as back, sides and skirts?

If requirements for backs and sides were included, there would be no need for additional testing (or accompanying costs) since the seating area test is virtually a vertical flame test and could be used to establish the performance of back and side materials. Since fabrics used on the backs, sides, and seating areas would probably all be the same, the staff has recommended only one test. Including a test for skirts presents additional costs, since these items are fabricated at the furniture plant using upholstery fabric, backing fabric, and stiffening materials. It is likely that skirt testing would, therefore, have to be performed by (or for) furniture manufacturers, rather than by fabric producers. This would significantly increase the overall testing burden. Total industry costs for skirt testing might be in the range of $25 to $60 million to qualify fabrics in the first year of the standard, and $8 to $30 million in subsequent years.

34. Since benefits are based on the sale of the 20-25 million pieces each year, when does the staff expect these pieces of furniture to find their way into lower income homes given the majority of 'real life' incidents indicate that the furniture was either purchased second hand or given to the families? How can staff estimate immediate benefits, given that the majority of families that are involved in these incidents are in the lower income level?

The staff estimated benefits expected over the life of the safer furniture, whether purchased new or obtained used. To account for the long period of time over which benefits may accrue, the staff discounted these benefits over the life of the furniture. In the ID1 study (which included a number of low income households), the majority of furniture involved in the reported fires was purchased new or received as a gift new. All families, including those with lower incomes, would experience reduced risk when complying furniture is placed in their homes. To the extent that low income families in general keep old furniture longer, or obtain used furniture, their risk reduction would be delayed. However, the staff has no information indicating that low income households would significantly delay purchasing furniture manufactured to the new standard. Further, the overall cost-effectiveness of the standard would not be adversely affected if some purchases were delayed.

35. **Staff stated that in Great Britain, furniture manufacturers; supplied incentives for purchasing new furniture which had higher prices as a result of the new British standard. Staff suggested that this could also be the case in the U.S. should their proposed standard become a rule. Did staff consider that 'incentives' are already utilized a great deal in U.S. furniture sales now just to encourage people to buy? Since retailers and manufacturers already offer deferred payments, deferred interest rates, purchases with no money. down, etc., what does the staff anticipate manufacturers and' retailers will devise next? At what market range (low or mid) are these sales incentives now aimed?**

The staff's statements about purchasing incentives were in response to inquiries about ways to mitigate the potential effect of higher average retail prices. Buyer incentives are more routinely used in the U.S. than in the U.K. Extended payment plans were offered in the U.K. at about the. same time as price increases from use of FR urethane foam and fabrics were reflected in the market. These and other promotional activities are also available to U.S. firms. To the extent that increases in prices of about **$20** to $30 per item can be spread out over several months, such incentives may prevent some consumers from delaying purchases of new furniture, especially for the lowest priced furniture.

36. **Staff stated that intumescent barrier fabrics do not release!, any fumes in the air. Would you explain again how this FR treatment works, and how there are no emissions as a result of their activation due to a flame.**

Intumescent barrier fabrics are placed between the back of the upholstery fabric and the filling material. These barrier fabrics are designed to swell when heated. In addition, when in contact with heat and flames, a vaporization of the FR coating occurs which can extinguish the flames. The vapors are released into and contained in the back of the upholstery fabric, which slows or stops the progression of the fire on the outside of the fabric.

ADDITIONAL QUESTIONS FROM COMMISSIONER GALL RAISED DURING BRIEFING

What types of matches were included in the study of match burn time?

The staff examined the burn times of 3 types of matches from 4 different manufacturers. Included in the study were 4 inch wooden matches, 5.5 inch wooden kitchen matches, and two different book matches. The matches were evaluated in a variety of test configurations designed to mimic possible ignition scenarios. Burn times for the matches ranged from 10-57 seconds, depending on test conditions and match orientation. This study did not consider the prevalence of different kinds of matches in household use, but illustrated; a range of possible flame exposure times.

What occupational risks may be associated with the use of FR chemicals to meet a CPSC standard?

The staff intends to study this issue as a part of its investigation into potential environmental effects of a proposed rule. The staff will solicit information on occupational exposure issues from OSHA and other available sources (see also #22).

FOLLOW-UP QUES'TIONS FROM COMMISSIONER MOORE

I. **Risk of Death or Injury**

A. During the briefing, and in the package as well, allusions were made to the belief held by many people in the fire community that thermoplastics can actually make a small open flame fire worse and that the use of these fabrics to fight cigarette ignition may be part of the reason for the increase in the risk of injury in small open flame fires. Does this belief rest on any hard data?

The concern expressed by many in the fire safety community about the increasing popularity of thermoplastic materials, especially polyurethane foam fillings that have largely replaced cotton batting, contributing to the severity of fires once the article of furniture is ignited, is generally supported by flammability tests conducted over the years. The relative flammability of predominantly thermoplastic vs. predominantly cellulosic materials has been studied extensively by CPSC, NIST, the California Bureau of Home Furnishings, and in Europe. Thermoplastic fabrics and fillings tend to ignite more readily from a small open flame (and less readily from a smoldering cigarette) than do many cellulosics. Further, thermoplastic fabrics tend to melt away from a flame quickly, exposing filling materials beneath. Filling materials comprise the primary fuel load in upholstered furniture fires; polyurethane foam fillings tend to produce high levels of carbon monoxide and other toxicants when burned. Cellulosic fabrics tend to form a char that helps resist open flame ignition; thermoplastic fabrics generally do not.

Given this combination of factors, it is likely that thermoplastic fabrics and fillings have greatly improved cigarette ignition resistance with no significant beneficial effect on open flame resistance, and with a possible adverse effect on the burning characteristics of items already ignited. This relative lack of open flame protection may account for **some** of the increase in open flame risk. It should be noted that virtually all conventional fabrics, whether thermoplastic or cellulosic, ignited from a small open flame source and continued to burn in the lab tests; observed differences were chiefly in the time to ignition.

B. Staff states that the risk of injury and death has increased in smoking material ignited upholstered furniture fires. Isn't it the case that the risk of injury and death has increased for all residential fires as a whole?

It is true that the risk of death and injury per fire increased for all fires. Between 1980 and 1995, total estimated residential structure fires decreased about 44 percent. Estimated deaths associated with these fires decreased about 33 percent and estimated injuries decreased by about 9 percent; thus, the rates of death and injury per fire increased. The rates of death and injury from smoking material related upholstered furniture fires generally reflects this trend: fires: declined by 74 percent, deaths decreased by 57 percent and injuries declined by 24 percent.

C. Is there any information from the fire fighting community as to why the number of fires has gone down faster than the number of injuries and deaths. Are we getting better as a nation in eliminating the small. fires that don't result in death or injury?

With increasing fire safety awareness, smoke detector and fire extinguisher use, fire service effectiveness, and emergency medical treatment, we may indeed be getting better as a nation at preventing or surviving all kinds of residential fires, and limiting the growth of small fires. However, "small" furniture fires ignited by a match or lighter can still grow to be fatal, as evidenced by the relatively steady death frequency in the national fire loss data. Virtually all upholstered furniture will ignite and continue to burn when exposed to a small open flame. Deaths from small open flame upholstered furniture fires have not decreased significantly since 1980.

There are some in the fire fighting community that might see the staff proposal as a continuation of the strategy to attack the small fires: that preventing ignition will reduce the number of fires, but only by preventing the big fires will you reduce the deaths and injuries. How do you respond to the suggestion that if CPSC has to pick either fabric or foam on which to focus its attentions, that it pick foam, as foam is the primary fuel load and once the fire really gets going it is much worse when the foam is involved; and it will be by attacking those fires that we will reduce deaths and injuries from small open flame fires.

The staff approach to address the risk of open flame ignition of upholstered furniture is to prevent ignitions before fires become large enough to produce enough heat and toxic combustion products to threaten life safety. This approach has proven to be effective in reducing deaths and injuries (e.g., mattresses). Upholstery fabrics are the primary determinant of small open flame ignition behavior. Conversely, test data indicate that foam filling material have no appreciable: effect on the ignition potential of furniture, Therefore, the test method in the draft standard; evaluates the fabric tested over a standard foam sample.

D. **On page 55 of the package there is a statement that staff identified some FR fabrics that self-extinguished and produced enough char to protect the filling materials underneath. Is the "some" a limiting factor in relying on the fabric alone to resist ignition. That is, are there FR fabrics which won't produce the requisite char to protect the filling material?**

Char formation is not dependent on the presence of FR treatments. All predominantly cellulosic fabrics, form some degree of protective char when ignited; in these fabrics, FR treatments act with this char formation to improve overall ignition resistance and to prevent filling material involvement. The FR fabrics meeting the test criteria all prevented the filling material from becoming involved in the fire during testing; the char-forming materials all worked as intended. It should be noted that there are several ways FR fabrics prevent filling material ignition, including forming sufficient char to protect the fillings. Other ways include resisting ignition due to fabric weight, inherent flame resistant properties of the fibers, limiting the area of foam exposed to the flame, and swelling or vaporization of the FR chemical into the. back of the upholstery fabric upon exposure to heat.

The FR fabrics tested represent 5 different methods of achieving flame retardancy: 1) FR backcoating; 2) FR immersion treatment; 3) intumescent barriers; 4) laminated fire blocking backing fabric; and 5) non-treated, inherently flame resistant fabric. Many of these methods not only provide protection for filling materials, but also resist fabric ignition.

II. Effectiveness of Proposed Standard

A. During the briefing, the statement was made that the 80% effective rate for the proposed standard was based on laboratory testing of fabrics and how they reacted to the 20 second flame. Is that the only factor that was taken into account in determining how effective the proposed standard would be?

The lab testing results were the primary factor in establishing the effectiveness estimates. Almost all of the FR fabrics tested resisted small open flame ignition or self-extinguished. Thus, a substantial majority of small open flame fire losses may be averted by a standard.

B. What percentage of the small open flame fires started by candles are you expecting to eliminate with the proposed standard?

An estimated 20 of the 100 small open flame related deaths occurring each year involve candle ignitions. Many of these could probably be avoided by the staff's, draft standard. The 80% overall effectiveness estimate for the draft standard is a composite applied to all small open flame fire losses; the precise extent of benefits related to any individual ignition source may be higher or lower. The level of effectiveness at reducing match ignited fires likely exceeds 80%, for example, while the level may be somewhat lower for candles. Candles have a similar average heat energy output to matches and lighters, even though the ID1 study suggests that the duration of flame exposure may be longer for candles. Momentary candle exposures would certainly be addressed; one tested FR fabric also resisted ignition for up to 2 minutes (the upper limit of exposure time in the tests). Thus, even some longer exposures, from either lighters, matches or candles, **may** be addressed by the draft standard. (See also Commissioner Gall's #27)

III. Customer's Own Materials

Manufacturers who deal in the COM trade would have to make arrangements to test and FR treat fairly small amounts of material for each customer. That could add a fair amount to the cost of a COM. Do we have an estimate of those costs? For example, do we know how much extra material a customer would have to supply to provide enough for testing?

Additional testing costs for COM orders would depend on whether the customer has received certification of passing results from the fabric manufacturer or supplier, which might be relied upon by the furniture manufacturer. If separate testing is done by or for the furniture manufacturer, the additional costs could be $50 to $75 per fabric, if done by an outside laboratory, in addition to the cost of about one yard of fabric. The staff will seek additional information on the potential impacts of the standard on COM orders. (see also Commissioner Gall's #12)

IV. Our Testing of the 27 Chairs (9 UK, 9 UFAC, 9 CAL.)

On page 188 of the package it states that filling materials, of the UK chairs were tested to BS 5852 and that all nine UK chairs failed to meet the requirements of that standard. When I asked at the briefing why all the UK chairs failed the UK tests there was a suggestion that they were subjected to was somewhat different than what they would actually be subjected to in Britain. Can you explain that a bit more and also why we wouldn't have tested them to the test they-were designed to meet?

The U.K. chairs provided to the staff were made with fire-blocking barriers (or "interliners") rather than with FR fabrics. Certain fabrics with greater than 75% natural fiber content may be used with approved barriers in the U.K.; this provision was incorporated into the 1988 U.K. Regulations in response to concerns at the time about manufacturers' ability to make certain cellulosic fiber fabrics "match resistant." These interliners protected interior filling materials but did not prevent--and were not intended to prevent---fabric ignitions. No FR fabric chairs were available to CI?SC for the staff's testing. Subsequent tests of FR fabric mockups demonstrate that such fabrics can resist small open flame ignition or self-extinguish in a short period of time. The staff concluded from these subsequent tests that FR fabrics would perform acceptably. Most U.K. furniture is reportedly made with FR treated fabrics (about 70% backcoating plus 10% immersion treated).

For CPSC's tests, composite mockups were constructed using the fabrics, filling materials, interliners, and interior fabrics found in the nine U.K. chairs. These composite mockups were tested to the "match test" in British Standard (BS) 5852. The ignition source was a small butane flame applied for 20 seconds to the crevice of the mockup. The U.K. Regulations reference the test procedure, ignition source and mockup test frame in BS 5852. The U.K. Regulations also specify component tests: upholstery fabric. is tested over a standard (non-FR treated) polyurethane foam and filling material is tested with a standard (FR) polyester fabric. The predominantly natural fiber fabrics in most of the chairs supplied to CPSC would not be required to meet the U.K. match test if used with a complying interliner.

All of the UK chairs: we tested had interliners. Since we are focusing on the fabric in the proposed draft standard, am I correct in assuming that an interliner would not be an option for meeting the standard under our proposal?

The staff's draft performance standard would not limit the. use of any technology that provides adequate small open flame protection. However, the types of interliners used in: the tested UK chairs (which prevented ignition of filling materials rather than fabrics) would not be an option for meeting the staff's draft standard.

In the full scale seating area tests, we stopped the tests on the UK chairs once the flames reached a predetermined mark on the back or side of the chair. During the briefing the statement was made that "if ignition had been allowed to continue, the whole chair would have been involved in the fire". If this is the case (and a majority of the UK chairs ignited in 15 seconds), just how effective is the UK standard in reducing small open flame fires? And in that regard, how exactly does our proposed test differ from the British test?

CPSC's tests of U.K. fabrics confirm that the kinds of FR fabric treatments used in the U.K. are highly effective at reducing small open flame ignited fires. Chairs with interliners (like those provided to the staff for testing) provide protection against filling material involvement but are not effective at preventing ignition or limiting flame spread on upholstery cover fabrics.

In the U.K., all foam and upholstery fabrics used in furniture must be "match resistant" when tested. As noted' above, however, there are some exceptions to this requirement: fabrics with at least 75% by weight of cotton.,

flax, viscose, modal, silk, or wool can have a fire resistant interliner between the upholstery fabric and. filling material. The staff considers this exception unnecessary, since suitable FR technology exists for virtually all fabrics.

The staff's test method differs from the U.K. test in several ways. The test in BS 5852 is a composite test using the actual components found in the seating area of an item of furniture; these components are placed on a seat mockup. The U.K. Regulations require individual components (fabrics and filling materials) be tested with FR treated standard materials on the same seat mockup. The staff's test uses a standard foam with upholstery fabrics on the seat mockup and also includes a dust cover test. BS 5852 and the U.K. Regulations specify a 35mm butane flame be applied for 20 seconds, as does the staff's test. In the staff's test, however, the flame is delivered by an automated test fixture. All three methods have a 2 minute observation period.

V. Small Open Flame Versus Cigarette Ignition

A basic tenet of the staff's technical work (and any standard we might propose on small open flames) is that we not increase the risk of cigarette ignited fires. Staff has: acknowledged that more study and more information has to be done in this area. What additional testing or information gathering is the staff proposing to do and when would it be done?

The laboratory's test plan for the 5-month information gathering period includes evaluations of:

1. Physical characteristics of fabrics that affect cigarette and open flame ignition;

2. Effects on flammability of coating/ treatments using selected fabrics;

3. Additional FR treated and non-FR treated upholstery fabrics for cigarette/open flame ignition;

4. Amounts of FR treatments on upholstery fabrics as a function of cigarette/open flame ignition resistance;

5. Effects of seat/back geometry, and the application of. non-attached FFL barriers in different test configurations;

6. Other filling materials (other than standard foam used. in most LS tests) for effects on fabric flammability; and

7. Effects on flammability of clean vs. soiled fabrics, water soaking, washing or dry cleaning.

VI. Dust Cover Requirements

On page 37, the package notes that the most popular and least expensive dust cover material in use is already ignition resistant and "may be acceptable in constructions without ignitable materials immediately above the dust cover". The assumption is then made that, even though not many fires are actually attributed to this location, the low cost of the dust cover performance provisions would make it. reasonable to include it in the standard. Do we know much about why certain chairs or sofas are constructed to have: the dust cover in contact with materials underneath? Are there certain styles; or **types of furniture where this is necessary** or **desirable?**

Chair constructions in which the bottom of the frame is close to the floor normally would have supporting structure for the seat cushioning that is well above the bottom of the frame, where the dust cover would be attached. The types of chairs that are less: likely to have **a** gap between the dust cover and other materials are high-legged styles, such as Queen Anne furniture. Information on the exact percentage of production that would not facilitate a gap between nonwoven dust covers and materials above them is not available; however, industry representatives report that the percentage is relatively low. The assumption made for the purposes of estimating costs was that 5–10% of furniture items would be these styles.

VII. Child Play

Have any studies been done on children's fireplay which would indicate how long a child typically holds a cigarette lighter or a match or what their precise goals are in putting flame to furniture? Do we know if they are striving to achieve ignition?

The staff identified no studies that specifically indicate how long a child would typically hold an ignited lighter or match to furniture. Research indicates that children who play with fire do so out of curiosity rather than an attempt to destroy life or property (Grolnick, 1990; IAFC, 1988; Lerner, 1988). There is an almost universal interest in and

fascination with fire starting around 2 to 3 years of age. The bright color and movement of the flame are very appealing to these children and they want to know how fire feels, looks, and burns (IAFC, 1988; Lerner, 1988). Although many preschoolers may understand that striking a match or manipulating a lighter creates a flame they may not necessarily understand that the resulting flame can catch other things on fire, and they are too young to understand: the destructive consequences of fire (Hall, 1989; Lerner, 1988, NFPA, 1991). Actions having an effect on the environment, such as striking a match or lighting a lighter to create a flame, may also be inherently motivating and attractive to children since they provide a sense of effectiveness and competence (Lerner, 1988). Therefore,. many children who ignite upholstered furniture may do so 'intentionally,' in that they intended to ignite the furniture, but not necessarily in an attempt to destroy the furniture or other property, as would an arsonist.

VIII. **Cost/Benefit**

A. **Just to clarify a statement made at the briefing.. When we came up with the estimated increase cost for FR treating furniture (the $23-$30 per unit increase) does. that take into account a markup of those costs at the retail level and what markup did staff utilize?**

The average estimated costs of $23-30 per unit are the estimated average costs to consumers, in the form of increases in retail prices. The estimates were derived by applying markups observed at each level of the chain of manufacturing and distribution. (see also Commissioner Gall's #15)

B. **In a couple of places staff talks about the benefits of one year's worth of production under the proposed standard. One place is on page 13 of the briefing handout where it states that one year's production would avoid about 60 deaths from small open flames. Since only approx. 90 to 100 people die in any given year from small open flames, I assume what you are looking at is the number of deaths over the life of all of the units and not the number of lives saved in one year, is that correct? Similarly on page 487 of the package, it is speculated that one year's production would yield total societal benefits of $224 million, but since the total costs in any one year from small open flame fires are only $470 million, the estimated benefits must be taking into account the life of the chairs and not their benefit in just one year? Is that correct?**

The 60 small open flame fire deaths projected to be avoided (noted on slide 13 of the briefing handout) are the number of deaths expected to be avoided over the years in which items of furniture from one year's production are still in use. This is also the method used to estimate the total societal benefits of $224 million (at an assumed small open flame effectiveness of 70% in the example cited). The expected benefits in. future years were discounted so that they could be expressed in their present value.

C. Please explain the analysis which is set out on pages 660 to 661, which comes to the conclusion that 95% of the expected cigarette ignition hazard costs are attributable to the 31% of the furniture covered predominantly with cellulosic fabrics. If current production is only 69% non-cellulosic, why did staff find that 83% of the currently manufactured furniture. could be expected to resist cigarette ignition? Wasn't-. the 83% figure weighted by fabric usage?

The staff estimate that 83% of furniture now being made-: would resist ignition from cigarettes was weighted by fabric yardage (as found in the staff's 1995 survey of manufacturers). Although nearly all of the cigarette; ignition hazard from current production involves the estimated 31 percent of items covered with predominantly cellulosic fabrics, some items covered with such fabrics would be expected to resist ignition. Therefore, the estimated percentage of items that would ignite (about 17%) is smaller than the estimated total percentage of items covered with predominantly cellulosic fabrics.

D. The state fire marshals' petition notes an article by J.F. Krasny that seems to indicate that cellulosic fabrics can be made more cigarette ignition resistant by rinsing out contaminants. Does the article indeed present a simple, cost effective way of reducing cigarette fires caused by cellulosic fabrics?

Upholstery fabrics with high cellulosic fiber contents are less resistant to cigarette (smoldering) ignition. This is due in part to the presence of contaminants such as alkali metal ions (sodium and potassium) on cellulosic fabrics. These ions can be deposited during different fabric processing steps. Laboratory tests by Krasny and others suggest that many fabrics rinsed in water are less susceptible to cigarette ignitions. This issue was also investigated as part of the staff's

work under the Cigarette Safety Act of 1984. Rinsing may be a solution for some cellulosic fabrics; however,, rinsing may not be suitable for all fabrics. Further, redeposit of salts may occur from cleaning procedures or consumer use.

E. Most of the benefits of the proposed standard are derived from the reduction of fires due to cigarette ignition. Is there a less burdensome alternative to achieving the cigarette ignition fire reduction results than requiring FR treatment?

The staff is not aware of any less burdensome alternative that achieves the benefits of the draft small open flame standard. In typical modern furniture constructions, most fabrics made from predominantly thermoplastic fibers, and some made from predominantly cellulosic fibers, are cigarette ignition resistant without FR treatments. The UFAC voluntary program promotes the use of such cigarette ignition resistant materials. The available survey data and lab test results suggest that a relatively small percentage of currently-manufactured products accounts for relatively, large cigarette fire losses.

It is likely that many heavier weight cellulosic fabrics would require FR treatments or FR barriers to pass a cigarette ignition test (conventional, non-FR barriers would probably be inadequate). Such fabrics still ignite from cigarettes over the most common substrate used that complies with UFAC's barrier test method for Class II fabrics. Although it is possible that materials could be developed (such as heat-conducting interliners) to allow such fabrics to pass a test without FR treatments, those materials would present their own effects on costs and aesthetics.. A likely result of a cigarette ignition resistance standard would be increased use of thermoplastic fibers, alone, or in combination with cellulosic fibers. This change would not reduce hazards of furniture fires started by small open flames or other ignition sources, and could worsen post-ignition fire performance. To the extent that FR treatment were used on otherwise cigarette-ignitable cellulosic fabrics, such fabrics would also provide a higher level of small open flame protection.

IX. Ways to Reduce Manufacturing Costs

I know staff stated at the briefing that they thought it was unlikely that manufacturers would only use FR treatments on the seating area and dust cover and use untreated fabrics elsewhere, but I direct you attention to page 492 of the package, where this is proffered as a cost cutting measure,. Given that the side and back of the furniture is the second. most likely place for a fire to start, isn't this a large loophole in the proposal?

The staff incorporated a number of burden-reducing features (e.g., mockup testing, limiting the scope of coverage, eliminating skirt testing) into the draft standard that would lower costs but not significantly affect potential benefits. Costs may be reduced further in some firms if non-FR fabrics were used in areas of furniture not subject to testing, but in the staff's judgment, this practice is unlikely.

As drafted, fabrics used on the backs and sides of furniture. items would not be subject to the standard. The estimated, costs of the standard are based on the assumption that all. upholstery fabric would comply with the seating area test. If manufacturers were to use non-FR fabrics on backs and sides, they could save the $1.00-$1.25 in costs per linear yard of fabric (perhaps 2-3 yards for sofas and about 2. yards for chairs). However, they would be faced with attendant problems in dual fabric inventory control, possible difficulties in merging the treated and untreated cut fabric pieces for production, and difficulties in matching colors and patterns. It is unlikely that most manufacturers would maintain such dual fabric inventories.