Effectiveness of the Furniture and Furnishings (Fire) (Safety) Regulations 1988

GOVERNMENT CONSUMER SAFETY RESEARCH

dti
Department of Trade and Industry

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EXECUTIVE SUMMARY

SUMMARY

The Department of Trade and Industry introduced the Furniture and Furnishings (Fire)(Safety) Regulations in 1988. This was as a result of a rising number of house fires and deaths resulting from polyurethane foam filled furniture. At that time, furniture caused 7.5% of all house fires but resulted in 35% of all deaths in fire. These Regulations specify that the fillings and coverings of all furniture should pass stringent flammability tests. These tests are stricter than any used in continental Europe.

With the benefit of almost ten years of fire statistics since the introduction of these Regulations the Department commissioned the University of Surrey to evaluate if the number of lives lost due to furniture fires had indeed reduced and also to see if the overall benefits of the Regulations outweigh the costs to industry. The result of this evaluation is given in this report.

The findings are extremely good news. Looking just at simple statistics for fires started in upholstered furniture in the home, it can be seen that in 1992, 4 years after the introduction of the Regulations, there were at least 65 fewer deaths than in 1988. In 1997 there were 138 fewer deaths than in 1988 and by 1997, as a conservative estimate, the Regulations had saved at least 710 lives following their introduction.

These 710 lives have probably been saved because upholstered furniture complying with the Regulations did not catch fire. In addition where a fire started in another item but involved upholstered furniture in the house, furniture complying with the Regulations will not catch fire as quickly as non-compliant furniture, thus allowing occupants more time to escape from a fire. This is particularly relevant where smoke alarms detect the fire early. These additional benefits could mean that the actual number of lives saved could be as high as 1860 in the period from 1988 to 1997.

The Furniture Regulations have also resulted in a decrease in the growing number of injuries in fires that have occurred over the last 30 years. There were 526 fewer recorded injuries from fires started in upholstered furniture in 1992 compared to the trend that existed in 1988 and there were 1,126 fewer in 1997. This means that at least 5,770 fewer people were injured in fires as a result of the Regulations.

This report also looks at experiences in the USA which does not have stringent Furniture Regulations as in the UK. The USA has seen a small and progressive reduction in the number of residential fire deaths since 1978. However, the USA has not seen a significant drop in fatalities from fires started in upholstered furniture despite the fact that smoke alarms detected at least 50% of all residential fires. Smoke alarms have played a role in reducing deaths in the UK and when alarms are operating correctly the risk of death in a fire detected by a smoke alarm can be as low as 4 per 1000 fires compared to 9 per 1000 fires where an alarm is not present. This report concludes that further gains can be made by better use of smoke detectors. The conclusion to be drawn from this is that gains from the Furniture Regulations could be even larger if smoke alarms are present and effectively operating during a fire.

This report considers the cost of these regulations to industry and those who buy furniture. The cost is between £15 and £20 per item of furniture which is a total cost of £22 million to £30 million a year. Based on insurance industry loss-adjusted estimates of the cost of serious fires in 1997, the annual cost saving arising from upholstered furniture meeting the Regulations was estimated to be £53 million. However, using previous DTI commissioned work on the value of a statistical life of £3 million, the actual economic benefit in 1997 is about £1.1 billion (excluding injury and indirect costs of fire) and this gives a benefit to cost ratio close to 40:1.

Since 1988 it has not been possible to buy new upholstered furniture in the UK which does not comply with the stringent flammability tests required by the Furniture Regulations. However, some households still have furniture that they obtained before the introduction of the Regulations. The possible full benefits of these Regulations have not been realised to date. Manufacturers estimate that their upholstered furniture lasts between 8 and 15 years and future potential savings based on this lifetime range are given in the report.

The benefits of the Regulations are likely to be realised most by those people who experience the highest incidence of fires such as the financially challenged who would tend to buy cheaper lower quality furniture and young children between 1 and 4 years of age and the elderly, both of whom may be more involved in starting fires and who are also the most vulnerable when escaping from fire.

1 BACKGROUND AND SCOPE

In 1988 the UK Government introduced regulations to improve the fire performance of furniture and furnishings and related products (the Furniture and Furnishing Fire Regulations, (HMG, 1988, 1989)). This followed a series of major home fires involving furniture that led to a statistically disproportionate loss of life for these consumer products in the period before the introduction of the regulations.

The Polymer Research Centre was commissioned by the Department of Trade and Industry to carry out a study to assess the current and future potential benefits arising from the introduction of the Furniture and Furnishing Fire Regulations (FFRs). This followed earlier PRC work, which critically reviewed the risks and benefits of flame retardant use in consumer products (Stevens and Mann, 1999).

The objectives for the study were to:

1. Examine pre- and post-regulation trends in UK Fire Statistics and the British Crime Survey to construct a retrospective analysis of pre-regulation trends and a prospective analysis of post-regulation, current and future trends.
2. Account for the potential contribution to the statistics arising from the installation of smoke detectors and alarms in UK dwellings using British Crime Survey information.
3. Construct a model to account for the consumer-use lifetime of pre- and post-regulation furniture and bedding in the UK economy using data obtained from the furniture and bedding manufacturers, their retailers and trade bodies.
4. Account for contributions arising from UK demographic trends in the size of the population, the number of households and other factors that could influence the volume of pre- and post-regulation furniture and bedding stored within dwellings in the economy.
5. Draw direct comparisons with trends in another country where such regulations have not existed and where the quality of fire statistics would support a reasonable retrospective and prospective analysis. It was decided that the United States would be a good candidate.

In carrying out this study the authors would like to acknowledge the assistance of several organisations. These are listed in Appendix 1.

2 THE REGULATIONS IN PERSPECTIVE

In their original form the regulations sought to address the fire resistance of upholstered furniture. This was extended to include indoor and outdoor furniture and coverings and upholstery on bedding (HMG 1988, 1989). Further information on the regulations can be found in a DTI guide (DTI, 1996).

Whilst the regulations were introduced in November 1988, they came into force progressively. From 1 November 1988 all fabric and polyurethane (PU) foams used in the construction of furniture were required to be of a fire resistant type. Requirements on the fire resistance of other filling materials applied from the 1 March 1989. Finally, second hand furniture for retail sale was required to meet the regulations on 1 March 1993. Recent work for DTI suggests that very little second hand furniture is being sold that does not meet the regulations.

In the case of mattresses, including cot mattresses, the controls are slightly different. In this case the filling materials were required to meet the regulations for PU foams (NB: now known as combustion modified types). However, the regulations did not specify fire resistant requirements for the cover fabric of mattresses; these are governed by voluntary standards and come under General Product Safety regulations.

Discussions with organisations representing the furniture and furniture fabric industries (see Appendix 1) suggest that designers and manufacturers were able to respond well to the rapid introduction of the UK regulations. This occurred as a result of development and standardisation/testing work taking place in the decade or more leading up to the introduction of the regulations and the willingness of the industry collectively to seek improvements in fire resistance.

In all cases the regulations do not stipulate the means by which the fire resistance standards are to be met; they are therefore performance centred and manufacturers can elect to meet them in whatever ways are appropriate.

In summary, the regulations affect the following consumer products:

(i) all indoor and outdoor upholstered furniture, foam and loose fillings, permanent and other covering fabrics

(ii) mattress foam fillings

(iii) all second hand upholstered furniture for retail sale

These are expected to meet fire resistant ignitability tests according to various British Standards including BS 5852, part 1, (1979), BS 5852: Part 2 (1982) or BS7177 which in turn makes reference to BS6807 which requires cigarette and match ignition resistance. These are specified in a DTI guide to the Furniture Regulations. In the main these requirements appear to be met by the use of chemical flame retardant systems included in combustion modified foams and in back-coating for covering fabrics.

3 SOURCES OF INFORMATION

3.1 UK Fire and Demographic Statistics

UK fire statistics were taken from the Home Office, Fire Statistics Reports; individual reports back to 1966 were consulted. UK population statistics were taken from the 1961, 1971, 1981 and 1991 decennial census reports. Inter-census estimates of population were provided by the Office for National Statistics. Data on the number and occupancy of households, including forecasts to 2016, were provided by the Department of the Environment, Regions and Transport (DETR) HDS Division.

The UK demographic data and raw fire statistics data are discussed in Appendix 2.

3.2 UK Furniture and Bedding Production

Production and sales data were provided by Business and Research Associates in their reports on The UK Market for Upholstered Furniture (September 1997) and The UK Market for Beds and Bedding (July 1997). Older data is also available in a FIRA report (FIRA, 1993).

3.3 UK Economic Impacts

Economic impacts were assessed using a variety of sources. Data on costs associated with insurance industry calculated loss-adjusted fire claims was provided by the Fire Protection Association. More general data on direct fire costs in the home environment was obtained from the 1995 British Crime Survey results (Home Office, 1997). Account was also taken of the costs associated with loss of a statistical life; this was set using recent work for the DTI on this subject (Ball et al, 1998).

We have been unable to find any accepted method for calculating the cost of fatal and non-fatal injuries and indirect costs and externalities associated with fires in dwellings. We have therefore attempted to assess this using the available loss-adjusted data combined with UK fire statistics and the DTI Consumer Safety Unit's adopted value of a statistical life to obtain an estimate of the likely range of possible cost savings associated with the impact of the regulations.

3.4 US Fire and Demographic Statistics

US fire statistics were provided by the Directorate for Economic Analysis, US Consumer Product Safety Commission in Washington D.C. US population and household statistics were obtained from US Government Census Office web pages and updated using the same web addresses. These sources are summarised in Appendix 3. Information on US smoke detector experience was obtained from the US National Fire Protection Association (NFPA, 1997).

4 STATISTICAL TRENDS IN UK HOUSEHOLD FIRES

Detailed UK dwelling fire statistical trend data are given in Appendices 2 and 4. Here we discuss some of the more important key findings. In all cases the fire statistics data are corrected for demographic changes by expressing the number of fatalities and injuries in terms of per million of the population to remove variations in total population. This data is also corrected for the number of smoke alarms in dwellings; in this case the parameter of interest is multiplied by (1 + fs) where fs = fractional proportion of fires detected by smoke detectors; so, if 25% were detected the data would be multiplied by 1.25. In the case of UK data these corrections are small while for US data they are more significant.

4.1 Fatal Injuries

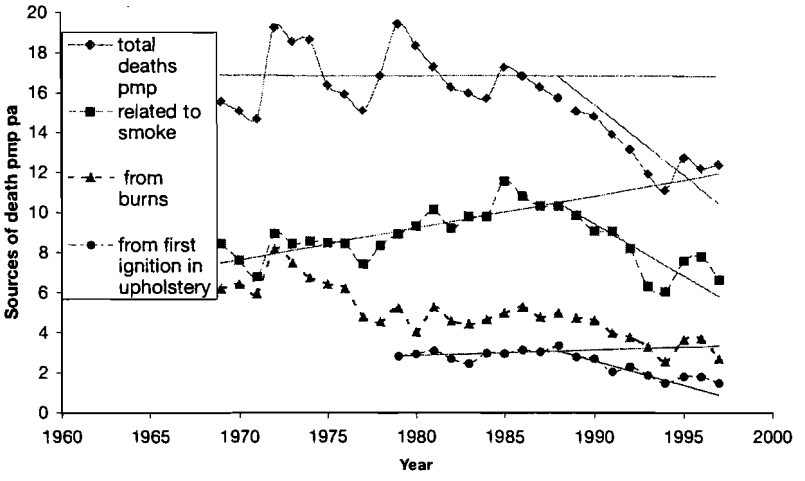
Using the demographic data in Appendix 2 and correcting for the effects of smoke alarms, some of the more important trends in fatal injuries in UK dwelling fires are shown in figure 1.

Against a background where the total number of UK dwelling fires and injuries have continued to increase, the total number of deaths per million of the population (pmp) before 1988 appear to be generally constant within the large statistical fluctuations of the data. After 1988 there is a very clear and significant downward trend. In contrast, the number of fatal injuries pmp related to smoke inhalation increase prior to 1988, a trend which is opposite to that for the number of fatal injuries caused by burns which show a steady decrease. Indeed, these last two trends appear to account for the level trend in the total number of fatalities pmp.

Significantly, the number of fatal injuries caused by smoke inhalation show a clear downward trend after 1988 whereas the pre-1988 downward trend in the number of fatal injuries caused by burns appears to be unaffected by the introduction of the regulations.

If we focus on the number of fatal injuries pmp associated with upholstered furniture being the first item ignited, we see a trend change similar to that of the total number of fatal injuries. This trend is not repeated for bedding as discussed in Appendix 4. This suggests that the post-1988 trends in the total number of deaths and injuries related to smoke is largely influenced by upholstered furniture either acting as first item ignited or as a fuel source following some other cause of the fire.

Figure 1 Pre- and post 1988 UK trends in fatal fire injuries.



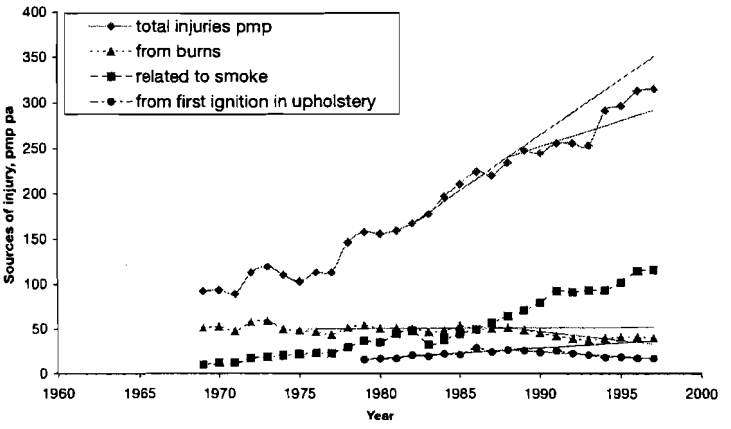
It is also clear that the absence of a change in the trend for fatal injuries caused by burns indicates that most of the post 1988 reduction in fatalities is related to smoke and toxic gas inhalation.

The linear fits to the data are produced using least square fitting and the post-1988 fit is pinned to an intercept of zero with the pre-1988 trend. This approach is clearly acceptable for the data for smoke-related deaths and those arising from upholstery as the first item ignited. It appears to be less acceptable for the data on total number of dwelling deaths however we have sustained this to maintain consistency recognising that fluctuations in the statistics could accommodate the differences that exist.

4.2 Non-Fatal Injuries

Demographic and smoke alarm corrected trends in the number of non-fatal injuries across the introduction of the regulations are shown in Figure 2.

Figure 2 Pre- and post 1988 UK trends in the number of non-fatal fire injuries.



Against a background of a constantly increasing total number of non-fatal injuries pmp, Figure 2 shows clear reductions in the rate of growth post-1988 with similar trends shown by the number of non-fatal injuries related to burns and due to upholstery being the first item ignited.

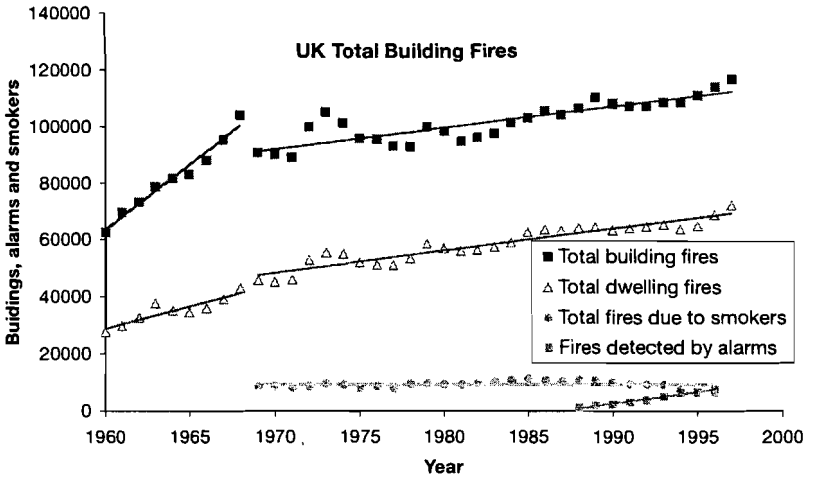
Interestingly no such change is seen in the case of non-fatal injuries arising from smoke inhalation in dwelling fires; this shows an uninterrupted progressive increase. We believe this reflects the precautionary trend in the UK for the fire authorities to refer people who are exposed to fire atmospheres to hospital for check ups and that most of these casualties will be considered to be suffering from the affects of smoke inhalation. This is to be contrasted with the change in trend for fatal injuries (figure 1) where death is a much more definitive indicator of effect.

4.3 The Influence of Smoke Detectors and Alarms

The effects of smoke detectors and alarms on fire statistics were first reported in 1988. The post-1988 increase in the number of dwelling fires detected by smoke alarms is shown in figure 3 in the context of other statistical trends. It is clear that in the UK the impact of smoke alarms has been small and the number of fires detected by alarms is currently only around 1 – 2% of the total (Stevens and Mann, 1999) and about 10% -12% of the number of dwelling fires in 1997.

Figure 3 shows the number of fires detected by alarms increasing from 1,100 in 1988 to 6,600 in 1995. Other information indicates that detection times of less than 5 minutes currently apply to only around 68% of dwelling fires (Home Office 1997a). However this is very small in comparison with the estimated 750,000 fire incidents and the more than 65,000 serious dwelling fires reported in 1995.

Figure 3 UK dwelling fires discovered by fire alarms from 1988 to 1995 (Home Office, 1997a) compared to the total numbers of fires



Further analysis of the statistics indicates that alarms have a beneficial effect on reducing fire fatalities with a death rate of 4 per 1000 fires when fires are detected by alarms in comparison with 9 per 1000 fires when fires are not discovered by alarms. This should be compared with the 1995 UK average of 8.7 deaths per 1000 fires.

However in 1995 only 11% of dwelling fires were detected by smoke alarms despite a MORI poll survey of the general UK public in January 1997 showing that 79% of households owned an alarm and 73 % of households had them installed. This compared with ownership levels of 70% in 1996 and 45% in 1994. This disparity in detection versus ownership of smoke alarms is explained by the high number of alarms that were fitted but unable to detect the fire due to poor or inappropriate positioning or because they simply were not working. UK statistics indicate that 66% of fitted alarms did not respond to fires for these reasons (1997 Fire Statistics Bulletin).

Hence the clear potential benefit of smoke detectors and alarms as a fire-risk reduction measure is currently not being fully realised because of the low numbers of fully functioning alarm installations in dwellings. We would expect a similar finding for other European countries.

4.4 Statistical Trends With Age

The effect of age on the frequency of fatalities and non-fatal injuries is shown in figures 4 and 5 respectively. In the case of fatalities the 5 yearly trend data shows that the greatest impact is on the older adults (60+ years old) and young children (from 1 to 4 years of age). In the case of fatalities both age groups have experienced a reduction in the number of fatalities per annum whilst other age groups have remained largely unchanged with time. This clearly shows that

the most vulnerable groups in domestic fires are the elderly and young children. This is probably a consequence of these age groups being responsible for causing more fires and for being less able to escape from fires without assistance.

Figure 4 Trend in the number of fatalities in household fires in the UK including the effect of age.

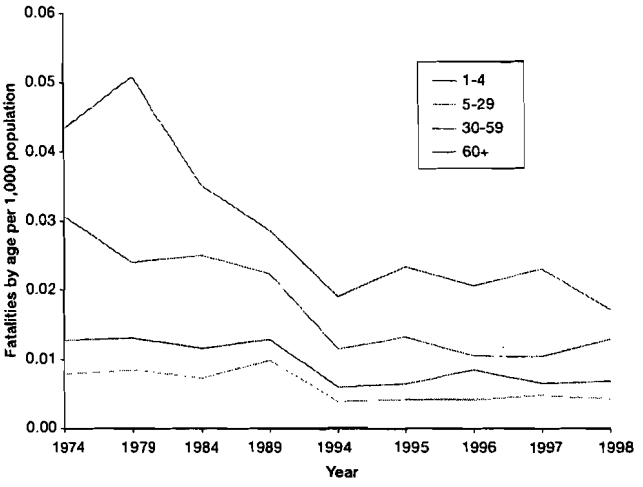
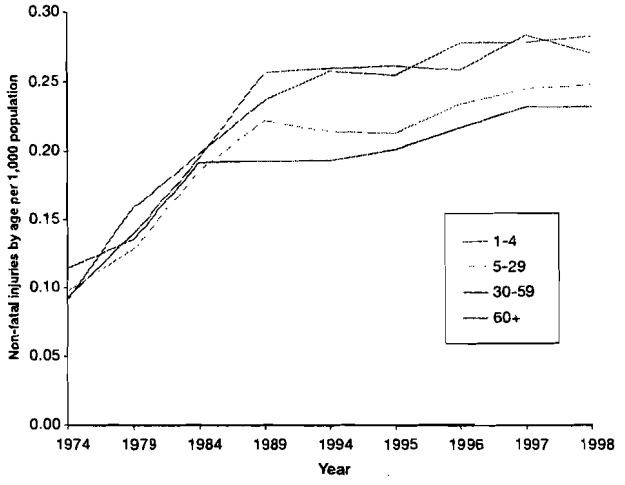


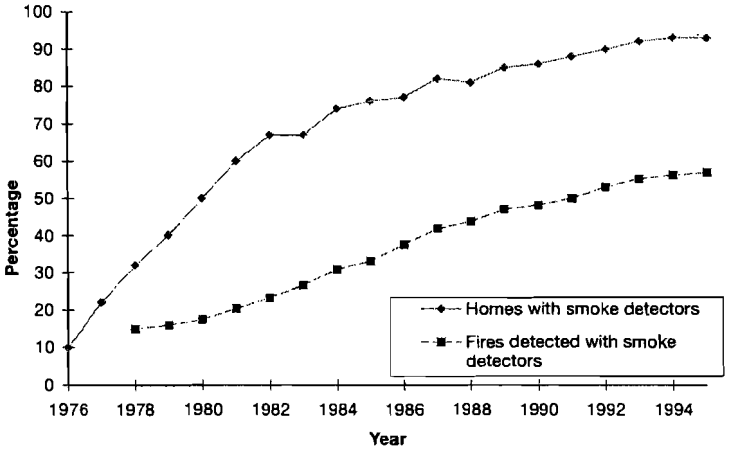
Figure 5 Trend in the number of injuries in household fires in the UK including the effect of age.



5 STATISTICAL TRENDS IN US RESIDENTIAL FIRES

US fire statistics trends in the last two decades appear to be dominated by the influence of smoke alarms, in contrast to the position in the UK. As shown in figure 6, in the period from 1976 the number of homes containing fire alarms has increased to over 90% of the total (although not all may be working effectively) and over 50% of domestic fires are now first detected by a smoke alarm. This has progressively contributed to reducing the total number of serious fires, deaths and injuries.

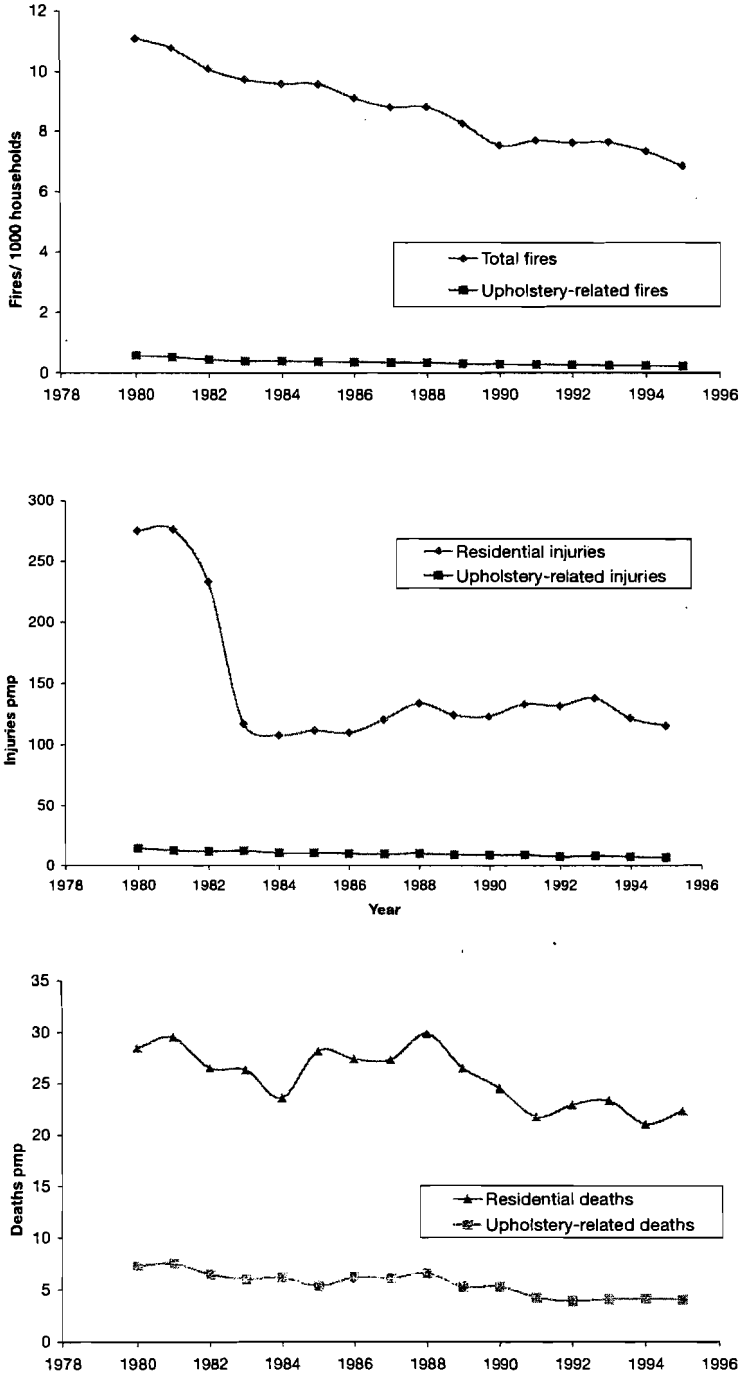
Figure 6 US smoke alarm household penetration and fire detection rate.



In order to make comparisons with UK fire statistics, the US data has been corrected for demographic changes and for the effect of smoke alarms. Some of the key results are shown in figure 7 in terms of the number of fires, deaths and injuries per household or pmp. With the exception of an anomalous step reduction in the number of injuries between 1980 and 1983, the trends are continuous and show level or small reductions in each of the statistical measures considered. The cause of the step change in residential fires injuries between 1980 and 1983 is unknown but we assume it is due to a change in the data collection or the reporting method.

There is no evidence for a change in statistical trends similar to that observed for the pre- and post-1988 UK dwelling fire statistics and all key indicators show a slow but progressive reduction in time.

Figure 7 US fire statistics corrected for demographic changes and the influence of smoke alarms.

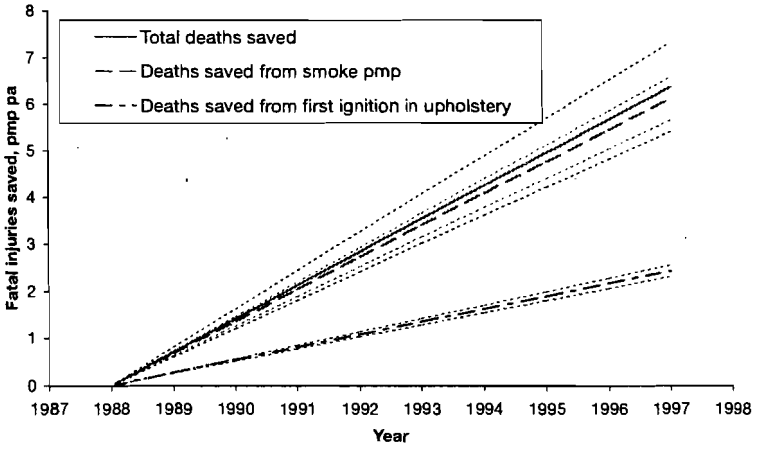


6 POST 1988 LIFE, INJURY AND ECONOMIC SAVINGS

6.1 Life Saving Benefits

The life saving benefits can be determined by comparing the pre- and post-1988 projections. Pre- and post-1988 trends have been projected forward to 1997 using a simple linear least squares fitting model. This analysis and the errors associated with the projections are discussed in Appendix 5. By subtracting the pre- and post-1988 projections in figure 1 where the intercept is set to give a zero difference in 1988 it is possible to estimate the number of fires, deaths and injuries saved, as shown in figure 8.

Figure 8 UK non-fatal injury savings pmp per annum from 1988 (dotted lines correspond to the 95% confidence limits)

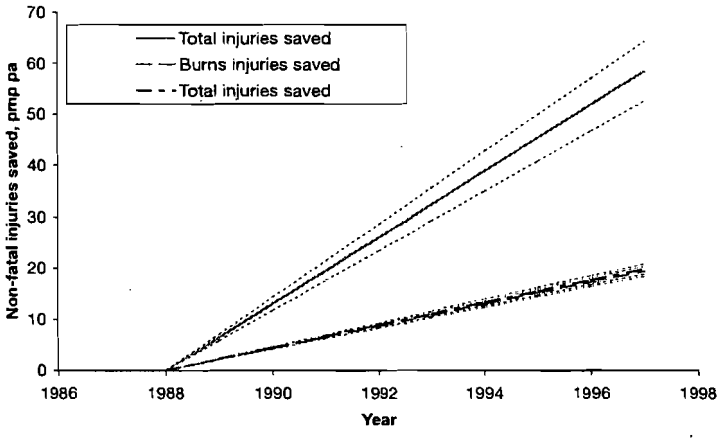


This indicates that in 1997 an overall annual life-saving benefit of 6.0 pmp per annum was achieved against a historic trend of around 17 pmp per annum; this is close to 362 lives saved in 1997. In the case of fatal injuries saved that can be directly attributed to upholstered furniture as the first item ignited, the corresponding benefits are 2.4 lives pmp per annum or around 138 lives saved in 1997. Since the introduction of the regulations the cumulative saving amounts to around 12 lives pmp (around 710 since 1988).

6.2 Injury Saving Benefits

The number of total non-fatal injury savings pmp and that for burns and upholstery are shown in figure 9.

Figure 9 UK non-fatal injury savings pmp per annum from 1988 (dotted lines correspond to the 95% confidence limits)



In 1997 the estimated gross annual injury savings amount to 56.2 pmp per annum (close to 3,315 injuries saved in total). For injuries saved in relation to upholstered furniture as the first item ignited, the actual saving amounted to 19.1 pmp per annum (or around 1,126 injuries in total).

6.3 Economic Losses and Benefits

The insurance industry data on loss-adjusted fire claims was provided by the Fire Protection Association and Appendix 6 discusses their conditional criteria and the data we have used to assess the cost savings estimated from this claims data. We have also taken the DTI Consumer Safety Unit's assumed cost associated with the loss of a standard statistical life as £3m.

The average insurance loss-adjusted cost per fire claim was approximately £60,400 in 1997 (it has been around this value for the last 13 years – see Appendix 6) based on a total claim figure of £5.9m. Since 1988 the number of claims involving fatalities has been in the range 15-30% of the annual number of reported dwelling fire fatalities from the UK fire statistics. Similarly, the number of large claims (according to the criteria given in Appendix 6) is only around 0.24% of the annual number of UK dwelling fires and this percentage has been progressively decreasing over the last decade.

This suggests that the FPA loss-adjusted fire claims annual costs are not representative of the actual losses experienced across the UK as a whole. If taken at face value they would be expected to significantly understate the true losses. However, we have elected to use the average annual loss-adjusted cost per fire claim to estimate what the true costs might be. In this case we assume that around 10% of reported dwelling fires would result in losses comparable with those of loss-adjusted fires. This appears to be a reasonable starting point because the number of dwelling fire fatalities is around 10-12% of the total number of reported fires and as little as 15% of dwelling fatalities appear in loss-adjusted claims (all of which contain fatalities).

For 1997 this would account for a loss of £415m on the basis of the loss-adjusted average for this year, in contrast to the £5.9m actually reported. In 1995 the loss would be £351m according to this approach. This 1995 figure is almost identical to that given in the British Crime Survey for 1995 (HMG, 1997b) which estimated £355m for all home fires and just over £300m for those fires that were reported i.e. fires to which the fire brigade was called. This should be contrasted with costs based solely on the value attached to a statistical life; in 1995 the total loss by this measure was about £1.7bn. In turn this can be compared with the 1995 loss-adjusted claim total of £7.7m.

Using the same unit costs we can calculate the effective cost saving benefits resulting from the regulations. In 1997 the loss-adjusted savings would be £53m and the life-saving benefit would be about £1.08bn; in 1995 the corresponding savings would be £36m and £868m respectively. Further annual and cumulative economic benefits are given in the next section.

It is also possible to calculate the cost of dwelling fires per fatal casualty in the US and for the UK. These are remarkably close with the US being £810k per fatal injury and the UK £650k per fatal injury using the 1995 estimates.

6.4 Annual and Cumulative Benefits and Costs

In order to gauge the progressive growth in lives saved, injuries reduced and economic benefits arising from the introduction of the regulations, we summarise in Table 1 the 1992 and 1997 annual benefits and the cumulative benefits from 1988 to 1997.

Table 1 Change in annual savings benefits and cumulative benefits of the regulations up to 1997

Benefit Measure	1992 Annual Benefit	1997 Annual Benefit	1988-1997 Cumulative Benefit
Number of dwelling fires	3,715	8,769	42,754
Total lives saved	169	362	1,856
Lives saved for upholstery as item first ignited	65	138	710
Total non-fatal injuries saved	1,548	3,315	17,000
Injuries saved for upholstery as the first item ignited	526	1,126	5,774
Loss-adjusted cost saving, £m p.a.	23	53	249
Fatality cost saving, £m p.a.	507	1,085	5,567
Total cost saving, £m p.a.	**530**	**1,138**	**5,615**

Critically we could ask " *how many of these benefits could be solely ascribed to the introduction of the regulations?* ". We suggest the minimum position is that of lives and injuries saved for upholstered furniture as the first item ignited; this gives cumulative figures of 710 lives and 5,774 injuries. The corresponding minimum cost savings would be a pro-rata of the first-item ignited life saving, i.e. £2,150m. We believe the actual savings are closer to the "total lives saved" row in Table 1.

In this analysis we have not attempted to critically assess the corresponding costs of achieving these benefits. However, discussions with the furniture and coverings industry indicate that the additional cost of treatment is between £15 to £20 per unit of furniture. For the expected 1997 annual production of around 1.5m furniture units (see section 7.1) this would amount to approximately £22.5m to £30m per annum (£225m to £300m cumulative since 1988) or around 2.3% to 3.1% of total sales revenue. This would produce a benefit:cost ratio of around 2 based on insurance industry cited loss-adjusted savings for 1997 and a benefit:cost ratio of 38 for the more realistic total cost savings we estimate for 1997 – a large economic benefit in relation to the costs. This assessment also places no value on the social impacts of fire or on the externality costs of fires.

Interestingly, these estimates compare with UK furniture retailers and manufacturers allocating £214m and £28.5m respectively to direct advertising in 1996 of which about 14% is spent on upholstered furniture advertising, i.e. ~£34m p.a. This compares with total sales of £980m on upholstered furniture and around £3b for the total sales of domestic furniture in 1996 (Business and Research Associates, 1997a).

7 FUTURE UK PROSPECTIVE TRENDS AND BENEFITS

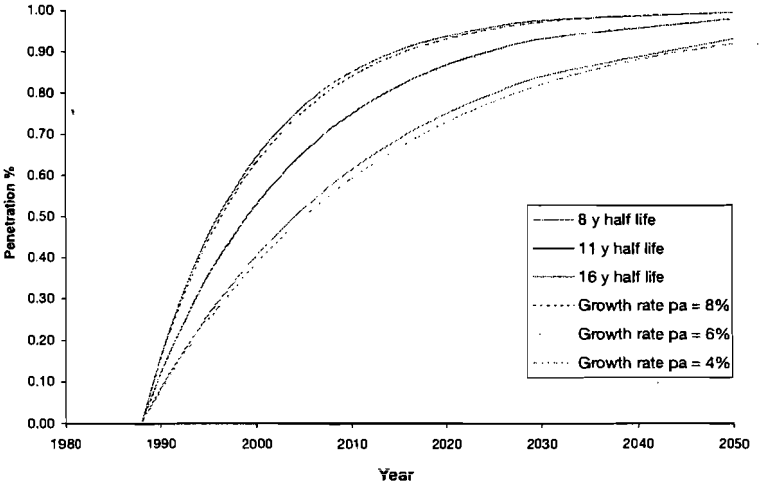
7.1 Furniture and Bedding Production and Replacement Trends in the UK

The furniture production index remained approximately constant over the period 1985 to 1996, with a small peak in 1988 (Business and Research Associates, 1997a). Production estimates for the first half of 1997 are quoted as 0.77m units of furniture; so in round terms we assume that the actual number of units produced is close to 1.5m per annum.

Table 3 Estimate of annual number of units of bedding sold

	1994	1995	1996
Interior spring mattresses	3.1m	3.0m	3.1m
Upholstered bases	2.3m	2.4m	2.5m
Divan beds			1.9m

Figure 10 Penetration of furniture, based on scenarios of half-lives of 8, 11 or 16 years, solid lines (equivalent to penetration rates of 8, 6 and 4% pa respectively, dashed lines)



The corresponding most recent bedding production figures are given in Table 3 (Business and Research Associates, 1997b). Again, to a first approximation the number of units sold each year is constant.

Using the above figures it is estimated that the number of households buying a unit of upholstered furniture per year is approximately 6% of the total and the number buying a unit of bedding is approximately 12%. A unit of furniture could, for instance, be a 3-piece suite or a single chair. It is assumed that a unit of bedding is sufficient for one bed, with an average of 2.5 to 3 units of bedding (bedrooms) per household.

The percentage penetration (PN) of the market by new upholstered furniture since 1988 has been estimated using these figures and an exponential penetration growth model has been used of the form:

$$P_n = (1 - e^{-kt}).100\% \qquad [1]$$

Where k is the annual rate of penetration, shown as the dash lines in graph of figure 10.

The solid lines of figure 10 show that these annual replacement figures equate to half-lives of 8, 11 and 16 years (i.e. 50% of households change their furniture every 8 to 16 years). The equivalent penetration curves based on annual percentage change have been calculated at 8%, 6% and 4% of the old furniture population, which was taken to be 100% in 1988. Thus the fraction of new furniture in the population is calculated using the formula:

Current year's % population of new furniture = $\{1 - P_n.$(previous-year % population of old furniture)$/100\}.100\%$

i.e. $N_{n,i} = \{1 - P_n \,.\, N_{o,i-1}/100\}.100\% \qquad [2]$

In both calculations, it is assumed that the overall rate of production and UK sales of furniture remains constant, as known for the period 1985 to 1996.

7.2 Estimating Prospective Benefits

Post-1998 forward projections of the savings in the number of fires, deaths and injuries are dependent on making assumptions about a) the rate of penetration of the market by new furniture (P_n), b) the effectiveness (E_I) of the regulations (and the measures that satisfy the regulations) in reducing the incidence of fire and c) its consequences (e.g. deaths, injuries etc.). In general, we can say that the number of savings (S) is a function (F) of the product $P_n.E_{n,i}$ where P_n is also a function of time. Mathematically:

$$S = F\,[\,P_{n(t)}.\,E_I\,] \qquad [3]$$

It is impossible to separate the 2 variables at this point in time from the data available. The best we can do is make assumptions about $P_{n(t)}$ and use the existing data to infer the effects of E_I.

Note that $P_{n(t)}$ and E_I must change in opposing senses if the savings product is to fit the existing data, i.e. the more rapid the assumed penetration, the less effective the regulations must be to give the same result. The corollary therefore is also true, that the scenario with the highest assumed rate of penetration of new furniture will give the lowest predicted savings when $P_{n(t)}$ approaches 100%. The question to answer is "*when will the savings plateau out and at what level?*".

Plotting S against $P_{n(t)}$, as estimated as above, gives a clue to the value of E. The relationship turns out to be a simple power law function of the form (as shown in Annexe 5):

$$S = A.P_{n(t)}^{B} \qquad [4]$$

Where A and B are constants which vary according to the penetration function chosen; between them the constants set the maximum value of S as P(t) approaches 100%. We can use the penetration scenarios of figure 10 as the best upper, lower and middle case options currently available. The values of A and B for each case are given in Table 4.

Table 4 Power law function constants for fire saving expression.

Scenario	A	B
Lower: 4% of households buying new per annum	718	1.169
Middle: 6% of households buying new per annum	909	1.121
Upper: 8% of households buying new per annum	1223	1.082

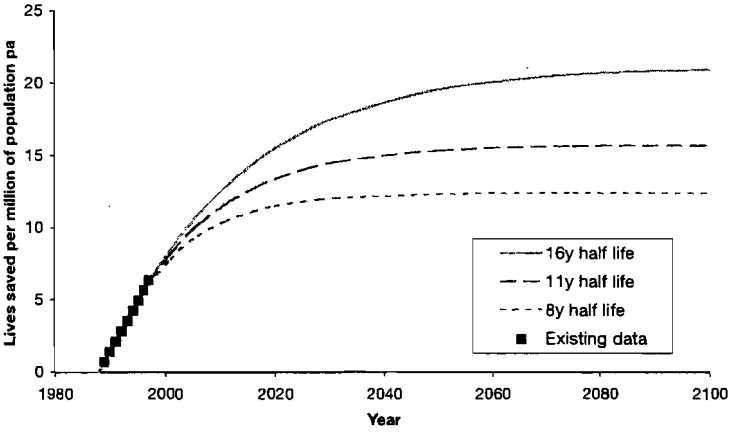
Projecting these figures forward, we can predict a middle-case scenario saving of 836 fires per million households per annum by the year 2031, with lower and upper case figures of 702 and 1012 and average savings of 882 and 902 by 2050 and 2100 respectively. Using the same techniques for deaths and injuries, we calculate average number of lives saved of 19.5 and 20.9 per million of population per annum by 2050 and 2100 respectively and corresponding injuries saved of 179 and 192 pmp per annum by 2050 and 2100.

7.3 Prospective Long Term Benefits

We follow the same approach as that used to assess post-1988 benefits to estimate the prospective post-1998 long-term benefits of the regulations. In this case we consider the prospective number of lives saved, injuries reduced and economic benefits arising. These are considered fully in Annexe 5.

By way of illustration the projected number of lives saved for the 3 furniture replacement scenarios is shown in Figure 11. It is clear that the upper case scenario (4% pa replacement condition with a replacement half-life of 16 years) has the longest time to plateau of the 3 cases but it produces the largest long term saving. This case also sets the time scales for full achievement of the benefits. We have taken this to be 2100 for the 16-year half-life case and 2030 for the 8-year half-life case.

Figure 11 Projected number of lives saved for different furniture penetration scenarios



In Table 5 we compare the prospective annual and cumulative savings in the years 2010 and 2031 for the lower case scenario in which the annual replacement rate is 4% - this is the most conservative case to consider.

Table 5 Prospective annual and cumulative benefits of the regulations up to 2031

Benefit Measure	2011		2031	
	Annual	Σ	Annual	Σ
Fires saved, x1000	16.1	94	21.3	142
Lives saved	644	3,833	791	5081
Injuries saved, x1000	5.9	35.1	7.25	46.5
Cost saving, £M	93	1268	112	1,406
Cost savings on fatalities at £3M per fatality, £M	1,933	26,695	2,373	36,000

This lower case scenario demonstrates that the medium to longer-term prospective annual and cumulative benefits are substantial in relation to pre-1988 trends.

8 DISCUSSION

Examination of the fire statistics data demonstrates very obvious changes in trends after the introduction of the regulations. This is particularly true for fatal and non-fatal injuries despite a strong upward trend in the case of non-fatal injuries. It is also true for data on upholstered furniture as the item first ignited but it is less clear for beds. This is perhaps not too surprising as upholstered furniture fires are more common and potentially more serious than bedding fires. As a consequence of this we made no attempt to assess the benefits arising from any change in bedding performance. Indeed we assume that these savings will be integrated into the total number of dwelling fire fatal and non-fatal injuries which are used to assess gross benefits.

UK and US fire statistics that have been corrected for demographic changes and the influence of smoke alarms provide a very effective comparison to underscore the change in trends seen in the UK post-1988. No corresponding change is seen at all in the US data but what is observed is a progressive reduction in fatal and non-fatal injuries arising from the steady and now significant penetration of smoke detectors and alarms in US residences over the last 20 to 25 years. Smoke detectors in the UK have not achieved the same success as in the US. Despite this it is clear that further US reductions are possible and this could be achieved via additional passive and active fire safety measures.

Our calculation of benefits relies on the linear fits we have obtained to the pre- and post-1988 fire statistics data which have been corrected for demographic changes and the influence of smoke alarms. Whilst the statistical fluctuations can be large the fit of pre-1988 data over 20 years or so and of post-1988 data is reasonable and provides a good estimate of the actual benefits achieved by the regulations to date. We estimate that the uncertainty in our projections is typically ± 10%.

In contrast, the fit of our post-1988 market penetration model for new furniture and the separation of the penetration curve from the effectiveness parameter is a matter for further discussion and refinement if the uncertainties are to be reduced. Despite the uncertainties, the range of effectiveness for the 8 to 16 year half-life cases suggests that if we have a long replacement cycle for furniture the remaining long term benefits will be very large in comparison with the benefits that have been realised to date.

Care is required in the interpretation of the data we present because it is likely that those households with lower incomes and/or greater monetary problems may be more inclined to purchase furniture having a shorter replacement cycle. If this is combined with the observation that such households carry much higher risk factors (up to 3 times greater than the best performing households – Stevens and Mann 1999) then most of the benefits may actually accrue to the shorter replacement-cycle furniture. If this is true the 8-year half-life case is the most relevant.

The 8-year half-life case produces the lowest effectiveness of the three scenarios we have considered. Indeed in this case most of the benefits of the 1988 regulations will be realised by the year 2030 (see Figure 11 and Figure A5.8) and the plateau saving level will be around 12

lives saved pmp in contrast with a pre-1988 loss of 17 lives pmp. This amounts to an effectiveness of 70% which is probably the most conservative case. This compares with an achieved effectiveness in 1997 of 35% corresponding to an overall life saving benefit of 6 pmp per annum. So at the time of writing we have probably experienced just over half the maximum potential benefit of the Regulations.

In contrast the 11-year half-life case will produce an effectiveness close to 88% while the 16-year case exceeds 100% at plateau (see Figure A5.8), a result which is meaningless unless the pre-1988 background trend is increasing. We are therefore inclined to believe that reality sits somewhere between 70% and perhaps 90% effectiveness in relation to the 1997 level of 35%.

This range of 35%-achieved to 90%-prospective future benefit is precisely the range of potential effectiveness assessed for flame retardants used in high risk consumer products such as upholstered furniture and televisions. This was based on several lines of evidence including laboratory and fire test results expressed in terms of risk reduction (Stevens and Mann 1999).

These benefits are realised most by those in society who experience the highest incidence of fires. These are the financially challenged who would also tend to buy cheaper lower quality furniture having shorter lifetimes. The other groups include young children between 1 and 4 years of age and the elderly, both of whom may be more involved in starting fires and are also the most vulnerable when escaping from fire.

9 CONCLUSIONS

1. Significant life saving and injury reduction benefits have resulted from the introduction of the Furniture and Furnishings (Fire) (Safety) Regulations in 1988 (the Regulations) in the UK. Corresponding benefits relate to reductions in the number of serious dwelling fires and in cost savings arising from reduced property loss and from lives saved.

2. In 1997 an annual life-saving benefit of 6.0 per million of the population (pmp) per annum was achieved as a result of the introduction of the Regulations. This compares with a pre-1988 dwelling fatality trend of 17 pmp per annum. This is equivalent to 362 lives saved in 1997. The corresponding benefit for fires first ignited in upholstered furniture is 2.4 lives pmp per annum, equivalent to 138 lives saved in 1997. Since the introduction of the regulations the cumulative saving amounts to around 12 lives pmp which is equivalent to 710 lives saved since 1988. In 1997 the estimated gross annual injury savings amounted to 56.2 pmp per annum (close to 3,315 injuries saved in total). For injuries saved in relation to upholstered furniture as the first item ignited, the actual saving amounted to 19.1 pmp per annum (or around 1,126 injuries in total).

3. We calculate the effective cost saving benefits resulting from the regulations to be £53m on a total estimated cost of £415m in 1997 (in comparison to the £5.9m reported by the insurance industry) using insurance loss-adjusted cost data. There is a further £1.08bn for the life-saving benefit based on a figure of £3m for the value of a standard statistical life. The estimated minimum cumulative cost saving between 1988 and 1997 is £2.15bn based upon lives and injuries saved in upholstery related fires.

4. In relation to the costs of meeting the regulations, we estimate the benefit: cost ratio to be around 2 based on the grossly underestimated but reported insurance loss-adjusted savings. In contrast a benefit: cost ratio of 38 is achieved using more realistic cost savings estimates.

5. Against a background where the total number of UK dwelling fires and injuries have continued to increase, the total number of demographically corrected deaths before 1988 appear to be generally constant at around 17 pmp per annum. After 1988 there is a very clear and significant downward trend.

6. In contrast, the number of demographically corrected non-fatal injuries related to smoke inhalation increases with time both before and after 1988. Significantly however, there is a clear reduction on the rising number of injuries after 1988. Interestingly the pre-1988 downward trend in the number of fatal injuries caused by burns appears to be unaffected by the introduction of the regulations.

7. Post-1988 trends in the total number of deaths and injuries related to smoke is largely influenced by upholstered furniture either acting as first item ignited or as a fuel source following some other cause of the fire.

8. Against a background of a constantly increasing number of non-fatal injuries over the last 30 years there is a clear reduction in the rate of growth after 1988. Similar trends exist for the number of non-fatal injuries related to burns where upholstery is the first item ignited.

9. We estimate prospective future life savings of 790 fires per million households per annum by the year 2030. For deaths and injuries, we calculate that the average number of lives saved will be at least 12 pmp per annum and injuries saved 110 pmp per annum by 2030. These translate to total annual fire and fatality cost savings of £2.4bn by 2030.

10. Smoke detector penetration into UK domestic dwellings is modest and appears to have had little affect on post-1988 trends. This is in contrast to US trends where a progressive reduction in fatal and non-fatal injuries per capita, recorded since 1976, has resulted from a significant penetration of smoke detectors into residential buildings. This penetration has been matched by a significant number of residential fires being detected by smoke detectors in comparison with very small numbers being detected in the UK. Poor positioning and maintenance of smoke detectors in UK dwellings is the prime cause.

11. There is no evidence for a decrease in the rate of change in US residential fire statistical trends compared to that which occurs in the UK following the introduction of the 1988 furniture fire regulations.

12. We estimate the eventual long-term life-saving effectiveness of the introduction of the 1988 regulations to be 70% in the most conservative case, related to short furniture lifetimes (i.e. 8 year half-life), and potentially up to 90% or more for longer lifetimes. This compares closely with the levels of risk reduction previously estimated for the use of flame retardants in high risk consumer products.

13. These benefits are realised most by those in society who experience the highest incidence of fires. These are the financially challenged who would tend to buy lower quality furniture having shorter lifetimes. The groups include young children between 1 and 4 years of age and the elderly both of whom may be more involved in starting fires and are also the most vulnerable when escaping from fire.

10 REFERENCES

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Stevens G C and Mann A H, (1999), *Risks and Benefits in the Use of Flame Retardants in Consumer Products,* a report for the Department of Trade and Industry, DTI ref: URN 98/1026, January 1999. Technical and Commercial Annexes available as a Polymer Research Centre report PRC 07b/98/DTI, January 1999.

APPENDIX 1

Organisations Contacted

BF Goodrich Chemicals (UK) Ltd

British Furniture Manufacturers Federation (UK)

British Shops and Stores Association (UK)

Consumer Product Safety Commission (US)

Corporate Intelligence on Retailing (UK)

FIRA International (formerly Furniture Industries Research Association) (UK)

Fire Protection Association (UK)

HMG Department of the Environment, Transport and Regions (UK)

HMG Department of Trade and Industry (UK)

HMG Home Office (UK)

National Bed Federation (UK)

National Fire Protection Association (US)

Office for National Statistics (UK)

Qualitas Furnishing Standards (UK)

US Bureau of Census (US)

APPENDIX 2

UK Demographic and Raw Fire Statistics Data

UK fire statistics were taken from the Home Office, Fire Statistics Reports; individual reports back to 1966 were consulted. UK population statistics were taken from the 1961, 1971, 1981 and 1991, decennial census reports. The Office for National Statistics Inter-census provided estimates of population. Data on the number and occupancy of households, including forecasts to 2016, were provided by the Department of the Environment, Transport and Regions (DETR) HDS Division. The rate of growth of the UK population figures slows down slightly between the 1971 and the 1981 census results, but has grown at a linear rate since then of about 0.2M per year (Fig A2.1)

In the following fire statistic figures, the number of fires is expressed as a number per 1000 households, account is taken of the increase in the number of households and corrections are made for the effect of smoke alarms. Similarly the number of deaths and injuries are expressed per million of the population and account is taken of the increase in population (Figs A2.2 and A2.3). We focus on those statistics that relate to fatal and non-fatal injuries in dwellings and those where the reported first point of ignition relate to upholstery or bedding. In all cases the progressive reduction in the demographically corrected fire deaths and injuries in dwellings (Figs A2.4 and A2.6) and fatal injuries in fires with upholstery as the first item ignited (Fig A2.5) after 1988 is very clear, despite the statistical fluctuations that are present in the data. The trends are less clear for bedding. There appears to have been a step reduction during 1988 and a slow slow reduction since (Figs A2.5 and A2.7).

Some care is required when examining this data because there was a change in the reporting procedures in 1969, which is shown by a break in the data at this date, and again in reporting first ignition source in 1978. Similarly, some definition changes occurred in 1977 and the categories of fires that continue in bedding and in furniture were introduced in 1985.

Mean squares average lines are drawn through the data in figure A2.2 in order to enable estimation of the variance in the data.

Figure A2.1 UK population demographics, census data and future projections

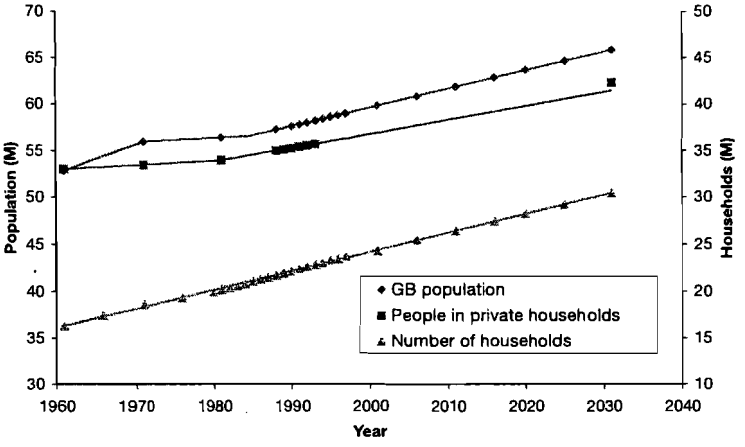


Figure A2.2 Overview of fire statistics 1960 to 1997 (arrow indicates change in definition)

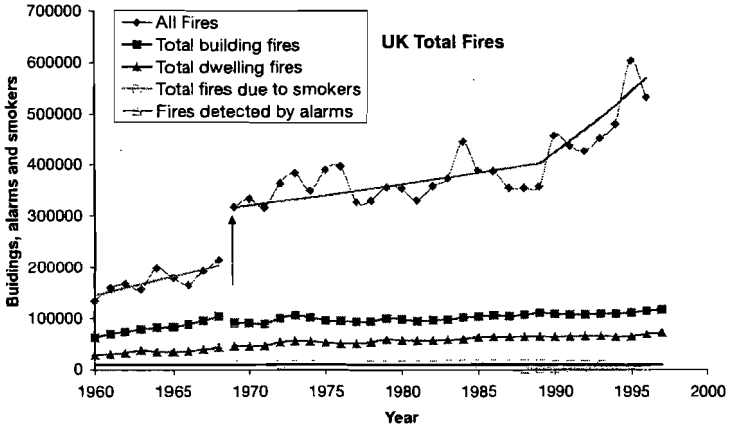


Figure A2.3 Causes of fire by source of first ignition and source of continuation (arrow indicates change in definition)

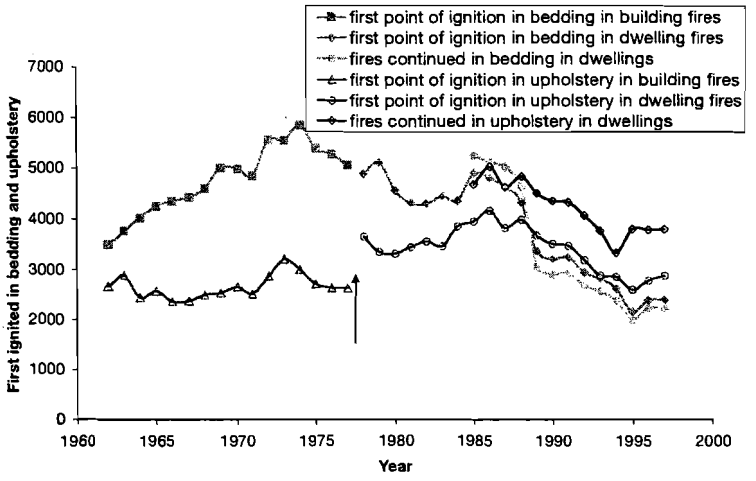


Figure A2.4 Deaths in dwellings by source of first ignition and continuation of fire

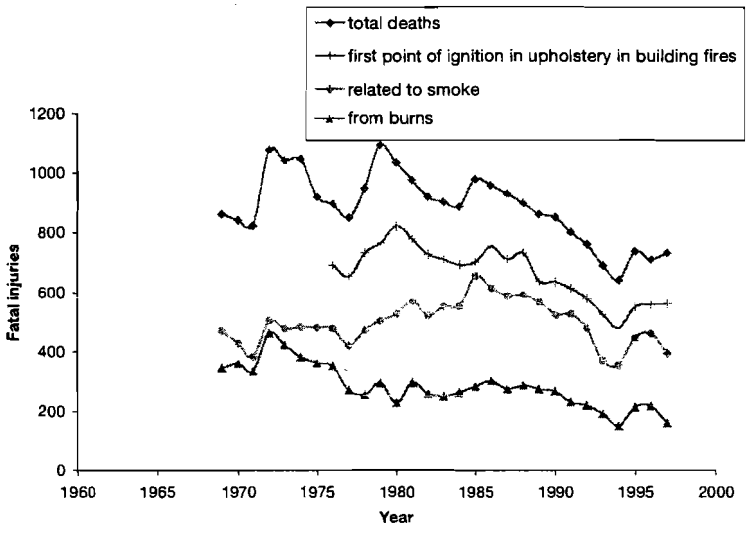


Figure A2.5 Total deaths, deaths in dwellings and causes of death

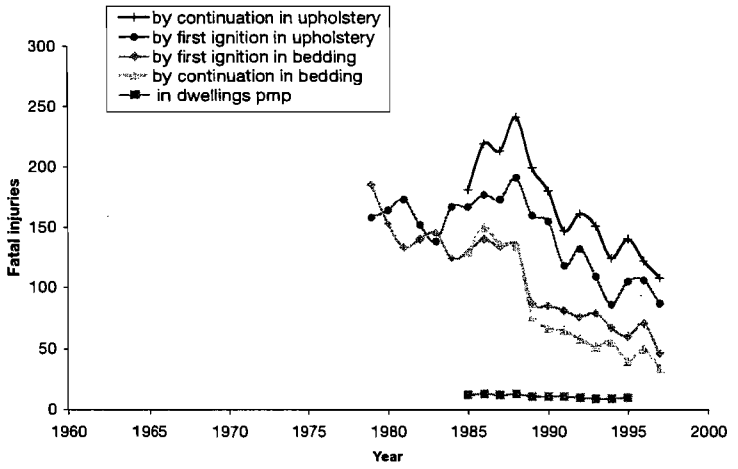


Figure A2.6 Total non-fatal injuries, injuries in dwellings and causes of injury

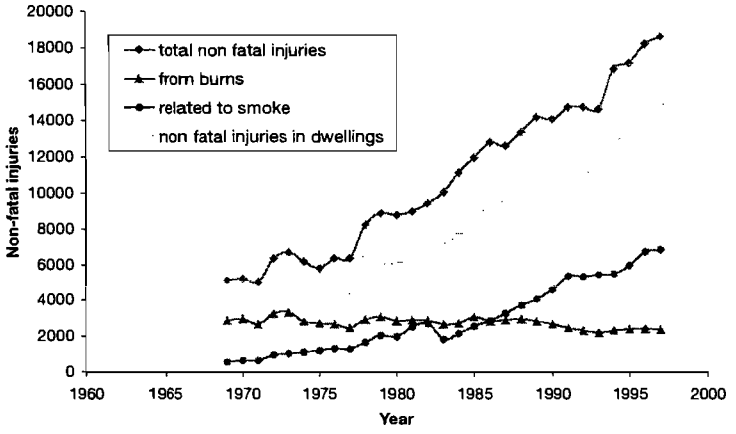
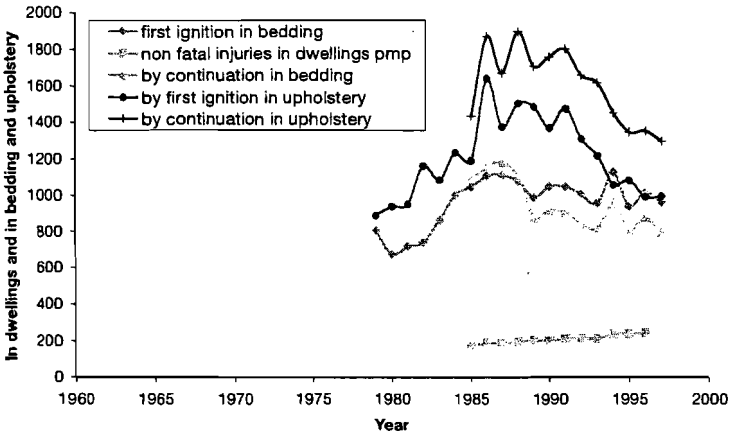


Figure A2.7 Non-fatal injuries by source of first ignition and source of continuation of fire



APPENDIX 3

US Fire Statistics

1. US Fire and Demographic Statistical Sources

US fire statistics were provided by the Directorate for Economic Analysis, US Consumer Product Safety Commission in Washington D.C.. US population and household statistics were obtained from government census office web pages and updated using the web addresses at http://www.census.gov/main/www/subjects.html#H. Housing estimates were taking from the census office web site at http://www/census.gov/population/estimates/housing/hsehold96.txt

ST-96-24R Estimates of Housing Units, Households, Households by Age of Householder, and Persons per Household of States: Annual Time Series, 1 July 1991 to 1 July 1996 (includes revised census housing and population counts). These data were superseded by data released with Press Release CB97-112, July 7, 1997 and data released with Product Announcement CB96-166. Following other new information, these estimates were revised further. The revisions included small changes to the estimates of housing units, household population, and population per household. The household estimates were not affected.

Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233

Contact: Statistical Information Staff, Population Division, U.S. Bureau of the Census 301-457-2422

Internet release date: July 7, 1997
Revised release date: August 21, 1997
Internet release date: July 7, 1997
Revised release date: August 21, 1997

Future housing estimates were taking from the census web site at:
http://www.census.gov/population/www/estimates/nation1.html

Inter-censal Estimates of Total Households for the United States:
April 1, 1980 to April 1, 1990
Source: U.S. Bureau of the Census Release date: March 1996
Population Distribution Branch
Internet Release date: June 25, 1998

Consistent with Current Population Reports Series P25-1123, issued 10/94.

Note: The base population of April 1, 1990 is 248,765,170. The April 1, 1990 population includes count resolution corrections processed through August, 1997 and does not include adjustments for census coverage errors except for adjustments estimated for the 1995 test census in various localities in California, New Jersey, and Louisiana. Estimates for dates prior to April 1 1990, do not reflect these corrections, which amount to a total of 55,297 persons.

Source: U.S. Bureau of the Census Release date: March 1996

2 US FIRE STATISTICS

US residential fire statistics are dominated by the effects of smoke alarms (see figure 4 in the main report). In the period since 1976, when data for fire alarms were first recorded and there was an active public policy for their introduction, the number of homes containing fire alarms has increased to over 90% of the total (although they may not all be working effectively). Over 50% of domestic fires are now first detected by a smoke alarm, as shown in figure 5 in the main report. The original data are shown uncorrected in figure A3.2. This has had the effect of progressively reducing the annual number of fires, deaths and injuries. In order to make comparisons with the UK fire data, the US data has been corrected for the effect of smoke alarms as follows: the raw data has been multiplied by (1 + the fractional proportion of fires detected by smoke alarms). So, if 25% were first detected by an alarm, the data were multiplied by 1.25. A similar correction was applied to the UK data for consistency, although, in practice, it had little effect.

Total US residential fire property loss costs are shown below in figure A3.1. These are currently running at $3b to $4b per annum.

Figure A3.1 US fires costs in residential property

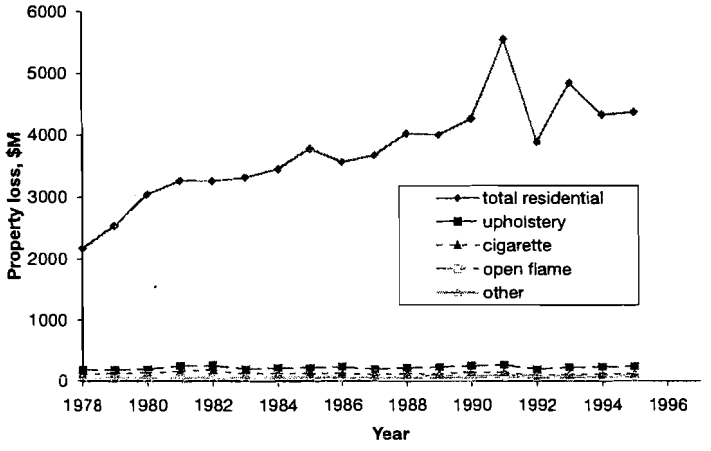
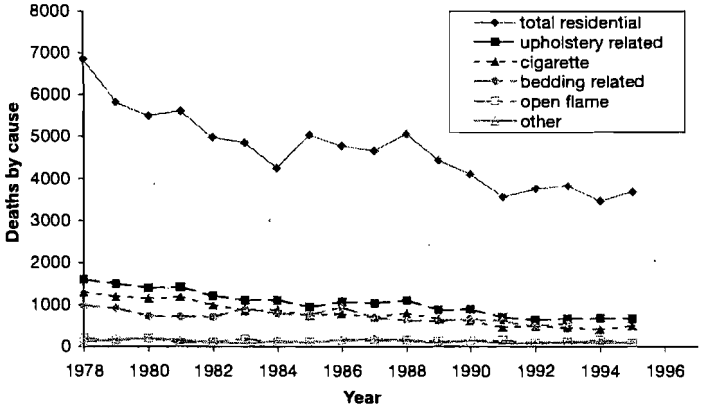
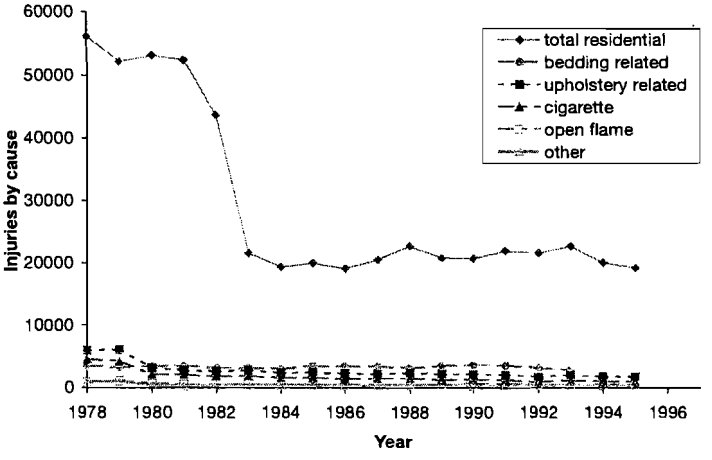


Figure A3.2 US fire deaths and injuries, uncorrected for effects of smoke detectors and alarms





APPENDIX 4

Statistical Trends in UK Household Fires, with Pre and Post 1988-Trend Projections

The UK raw fire trend data are reproduced in figures A4.1 to A4.3, which show total fires, total building fires and fires by source of first ignited. Some care is required when examining this data because there was a change in the reporting procedures in 1969, which is shown by a break in the data at this date, and again in reporting first ignition source in 1978. Similarly, fires that continue in bedding and furniture were first reported in 1985.

In these plots, which are corrected for population and household demographic changes, the total number of fires, deaths and injuries have continued to increase and indeed accelerated away since 1988, but the numbers associated with fires first ignited or continued in furniture and bedding show a significant decrease. The step change in the bedding trend across 1988 probably occurs as a result of reporting changes and it is not possible to use these data future projections.

In the following figures the number of fires is expressed as a number per 1000 households and account is taken of the increase in the number of households. In addition, corrections are made for the effect of smoke alarms. Similarly the number of deaths and injuries are expressed as a number per million of the population and account is taken of the increase in population. In all cases the progressive reduction in the demographic corrected fire deaths and injuries after 1988 is very clear despite the statistical fluctuations that are present in the data.

These data can be directly compared to the US data previously presented. The modified US fire data, corrected for the number of households and injury data, corrected for the population increase, still show a slow downward trend (figure A3.1), but the striking downward turns, which are evident in the UK data are not present. The significant decreases in the fire injury data between 1982 and 1984 probably reflect a change in reporting.

Pre-1988 and post-1988 UK trends have been projected forward to 1997 using a simple linear least squares fitting model. These projections are shown in figures A4.1 onwards. By subtracting the pre- and post-1988 projections provides an estimate of the number of fires, deaths and injuries saved (lower graphs in figures A4.1 – A4.3).

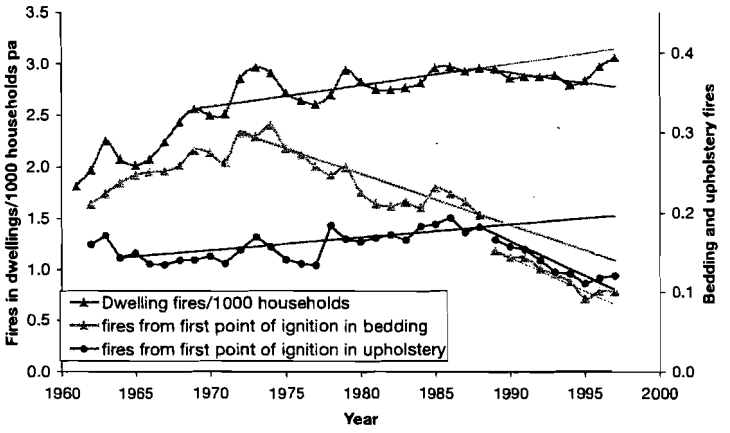
Approximate percentage errors in the estimates have been calculated from the scatter in the pre-1988 data, by calculating the standard deviation from the line. The figures are tabulated below in Table A4.1.

Table A4.1 Calculated errors in estimates for incidence of fires saved since 1988

Metric	Percentage Error (%)
Fires saved/1000 households	10
Bedding fires saved	10
Upholstery fires saved	10
Total deaths per million of population	12.5
Deaths due to smoke	7.5
Deaths from fires first ignited in bedding	7.5
Deaths from fires first ignited in upholstery	5
Total injuries	10
injuries due to smoke	7.5
Injuries from fires first ignited in bedding	7.5
Injuries from fires first ignited in upholstery	7.5

Figure A4.1 Total dwelling fires and fires with first point of ignition and continuation in furniture and bedding

4-1a



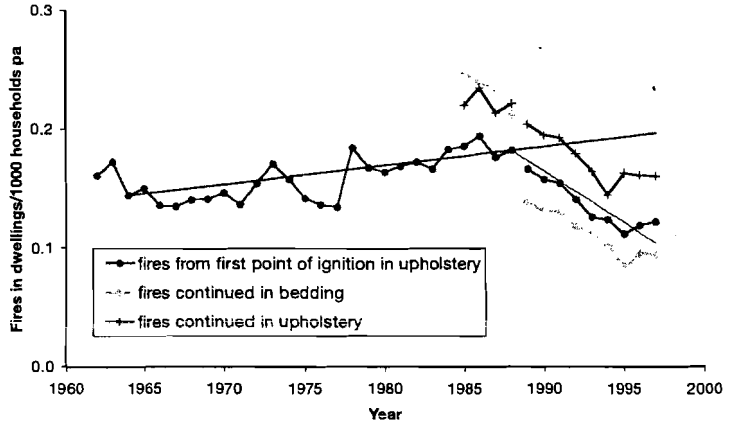


Figure A4.2 Fatal injury related fires in upholstery and bedding

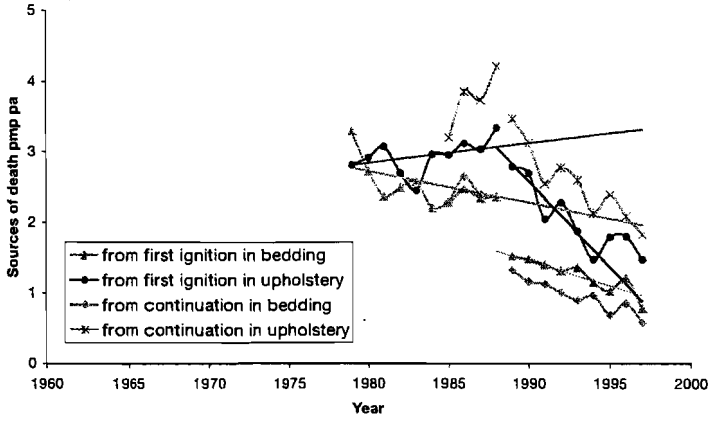
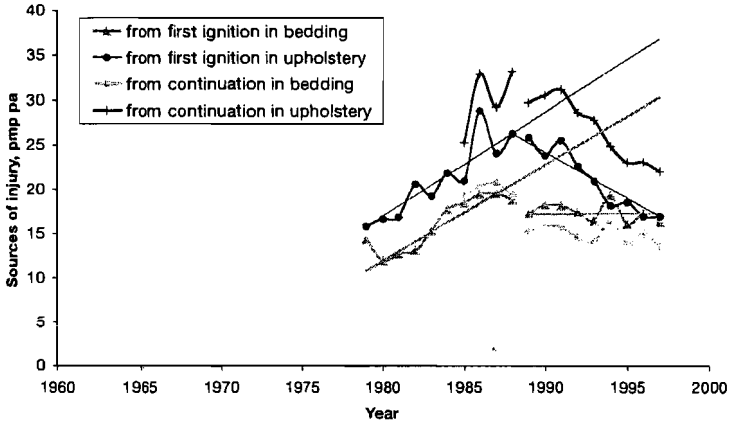


Figure A4.3 Non-fatal injury related to fires in upholstery and bedding



APPENDIX 5

Future Projections of Savings

In the following figures, model market penetration scenario data for the period 1988 to 1997 (based on furniture half lives of 8, 11 and 16 years as defined in the main report) are projected to the year 2050, using the following methodology:

i) the best fit lines to the 1988 to 1997 fires, fatal and non-fatal injuries saved data were calculated by a linear least squares fit. The fires saved lines are shown in figure A5.1, with the 95% confidence limits dotted. Lives and injuries saved are reproduced in the main report (figs 6 and 7).

ii) points from the best fit lines were then plotted, furniture penetration and a simple power law function fitted to the data by least squares regression. The equations of the best fit lines are given in the upper graphs in figures A5.2 to A5.6.

iii) the power law parameters were then used to construct estimates of fires, lives and injuries saved post 1997, for each of the penetration scenarios (plotted in the lower graphs). The power law functions clearly must all fit the 1988 to 1997 data (denoted "existing data" in the graphs) and give a measure of the effectiveness of the fire retardants, which is then manifested as a separation of the projections post 1977. The data are extended to 2100 to demonstrate levelling off of the projections for all 3 scenarios.

iv) finally the same data are reproduced in a different format to show the model projections of total fires, fatal and non-fatal injuries, post 1988, compared to linear projections of the pre-1988 data (figs A5.7, A5.8 and A5.9). The fact that the fatal injury projections go to zero (and negative) in figure A5.8 indicates that the 16y half-life scenario is untenable.

Figure A5.1 UK Total building fires saved per million households (dotted lines show 95% confidence limits)

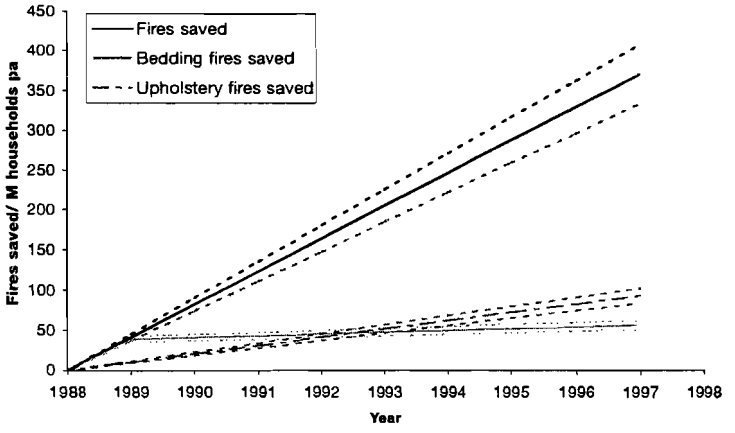
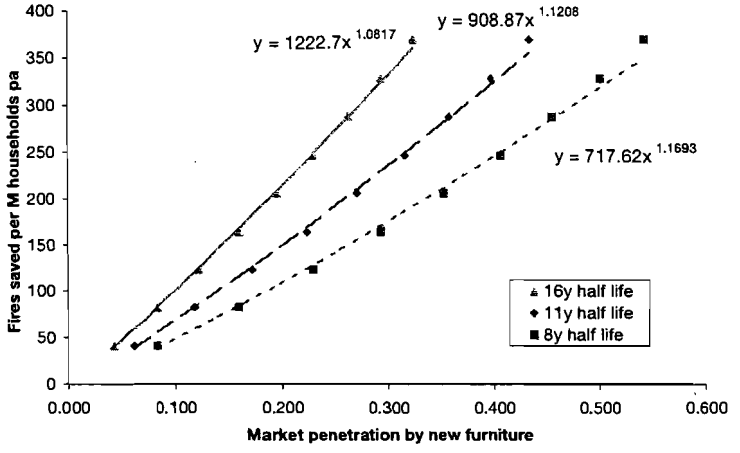


Figure A5.2 Fires saved as a function of market penetration of fire retarded furniture



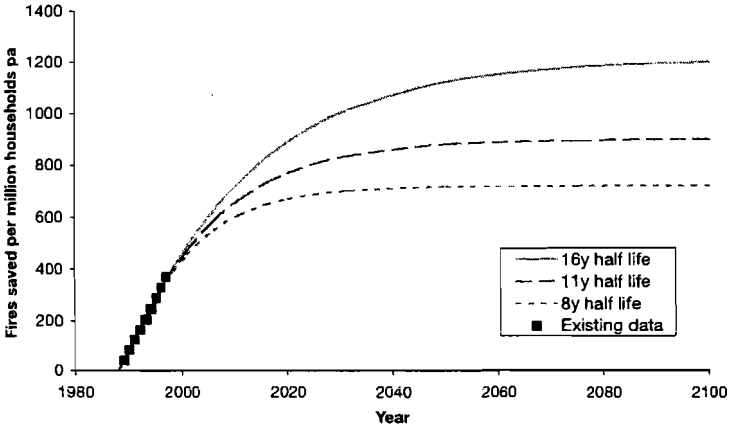
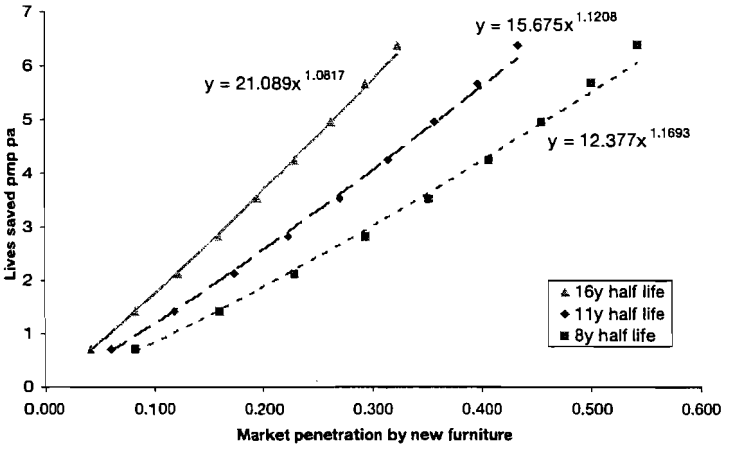


Figure A5.3 Lives saved as a function of market penetration of fire retarded furniture



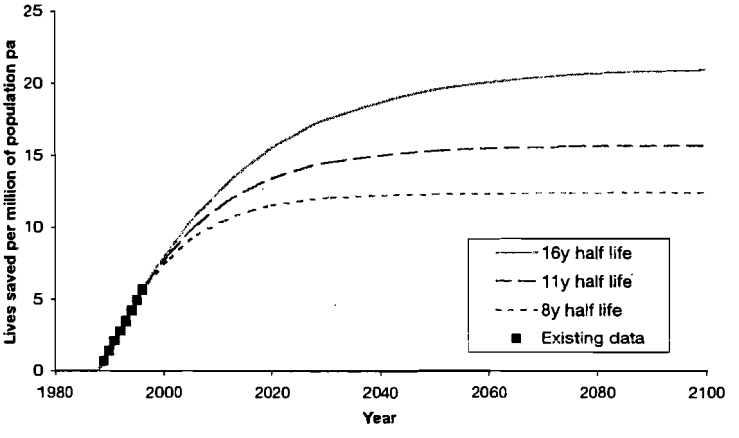
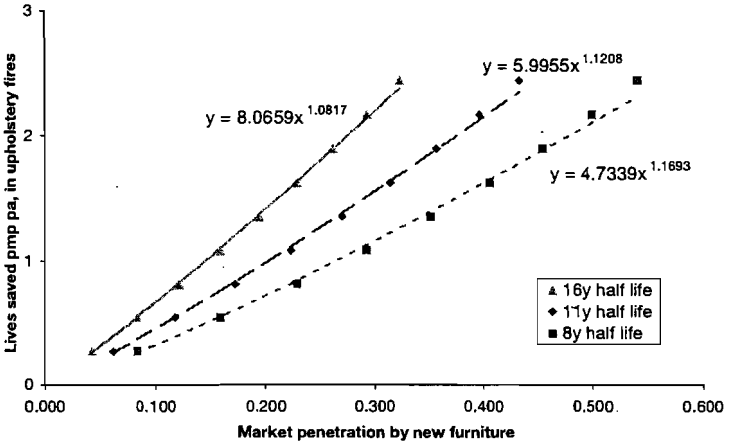


Figure A5.4 Lives saved as a function of market penetration of fire retarded furniture in fires due to first ignition in upholstery



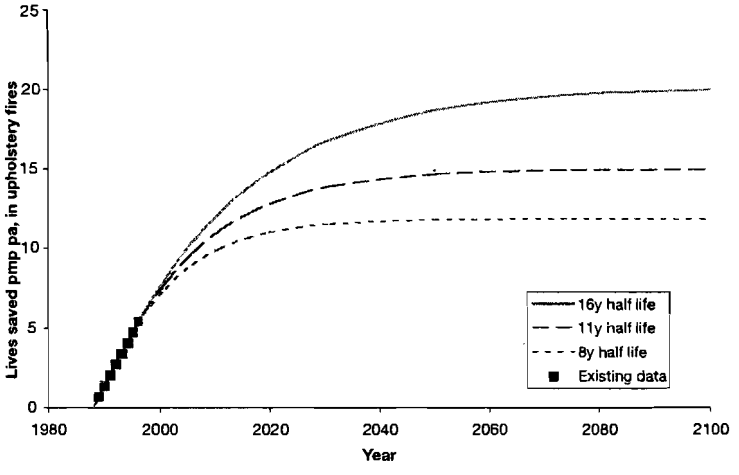
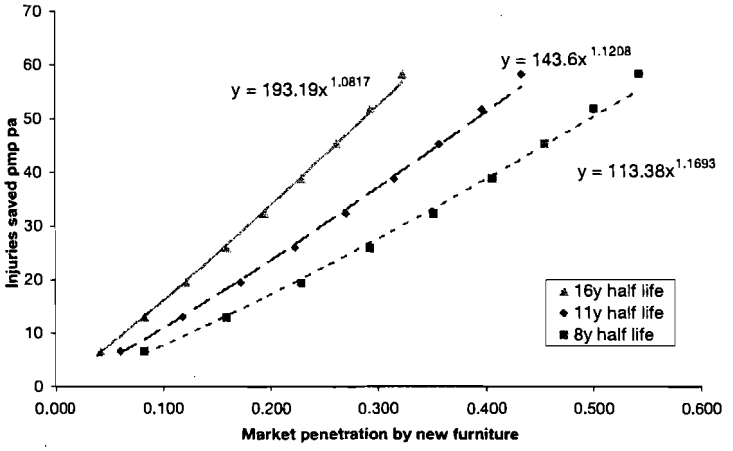


Figure A5.5 Injuries saved as a function of market penetration of fire retarded furniture



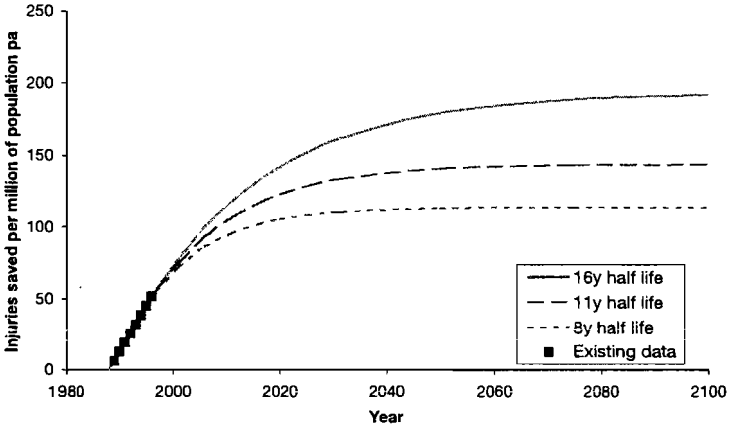
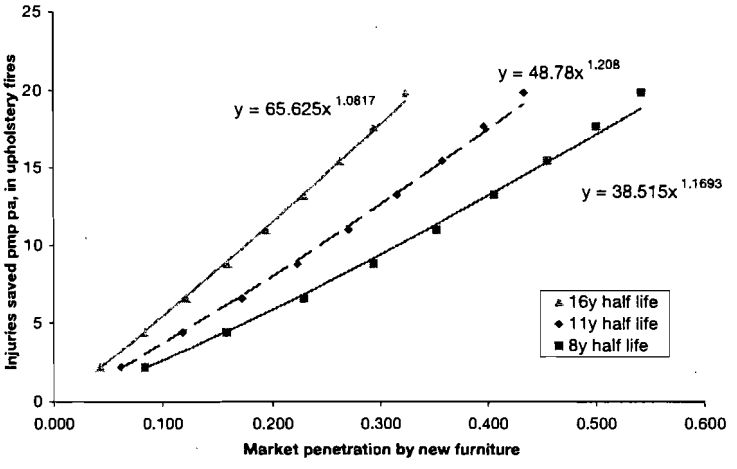


Figure A5.6 Injuries saved as a function of market penetration of fire retarded furniture in fires due to first ignition in upholstery



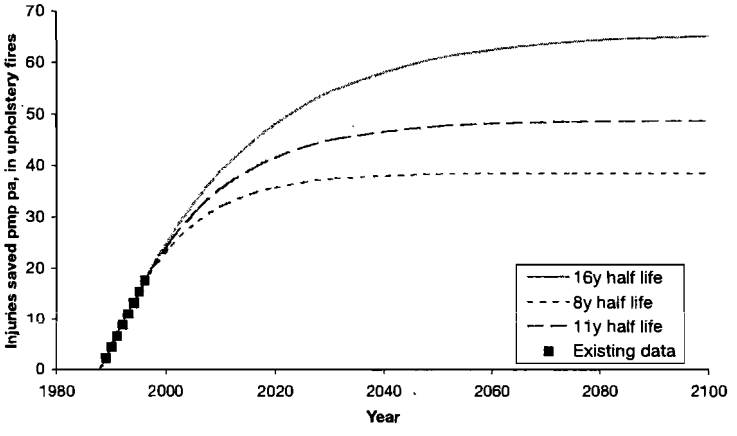


Figure A5.7 UK Total building fires per 1000 households pa

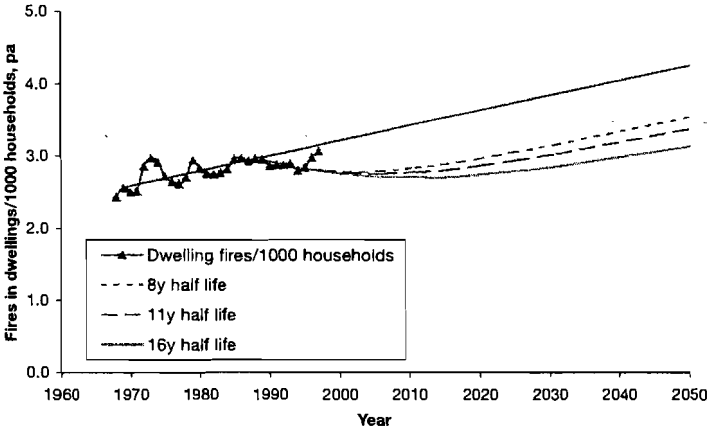


Figure A5.8 UK Fatal Injuries per million of population

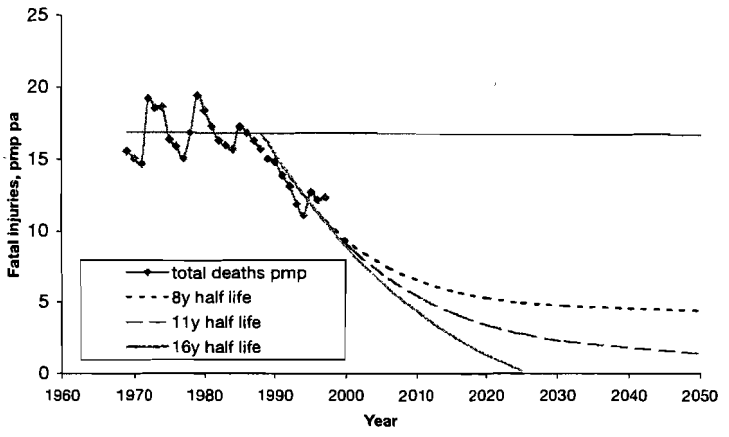
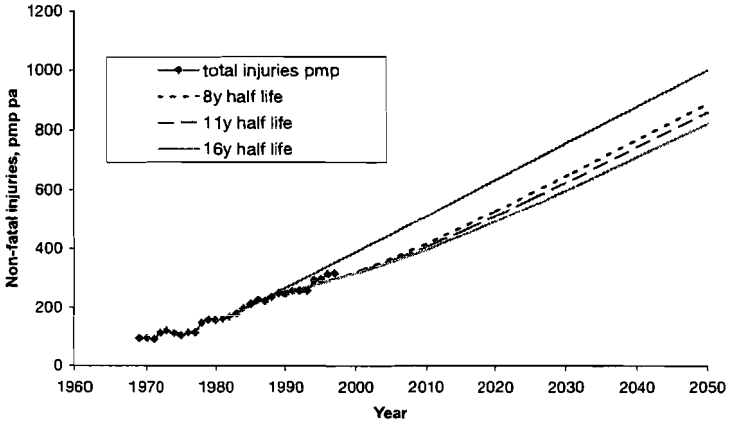


Figure A5.9 UK Non-fatal Injuries per million of population



APPENDIX 6

Long Term Cost Benefit Assessments

In the UK at this time we can only estimate the costs associated with insurance industry calculations, which are based on loss-adjusted fire claims. We can also account for the costs associated with loss of a statistical life. We have not been able to obtain any accepted method or data for calculating the cost of injuries, indirect costs and externalities associated with household fires. Our figures must therefore be seen as lower estimates.

For loss-adjusted cases data exists for two cases (Fire Protection Association, private communication):

(i) the total cost of a fire exceeded £50k and/or there was a fatality, or

(ii) the total cost exceeds £25k and/or there was an injury (FPA data).

We will refer to these as "loss adjusted fires". The raw data are plotted from 1984 to 1997 in figure A6.1, with the numbers of fires, deaths and injuries on the right axis and the total costs on the left axis. Once again there is a downward trend from 1998, despite the rising cost of individual events (figure A6.2). The reason is that the number of loss adjusted fires, as a fraction of the total number of household fires, has decreased steadily since about 1984 (figure A6.4). Combining the trends in loss adjusted fire costs of figure A6.1, with the projected numbers of future fires saved in figure A5.7, we can estimate lower and upper bounds of costs saving on loss adjusted fires (fig A6.5).

Figure A6.1 Lost adjusted costs of UK dwelling fires

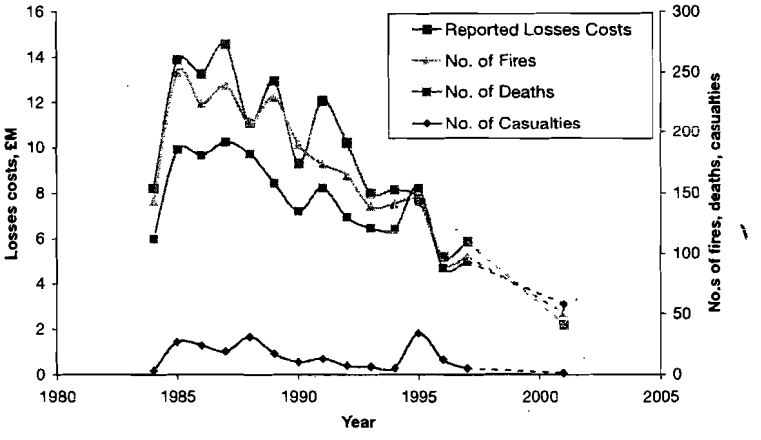


Figure A6.2 Lost adjusted costs of UK dwelling fires

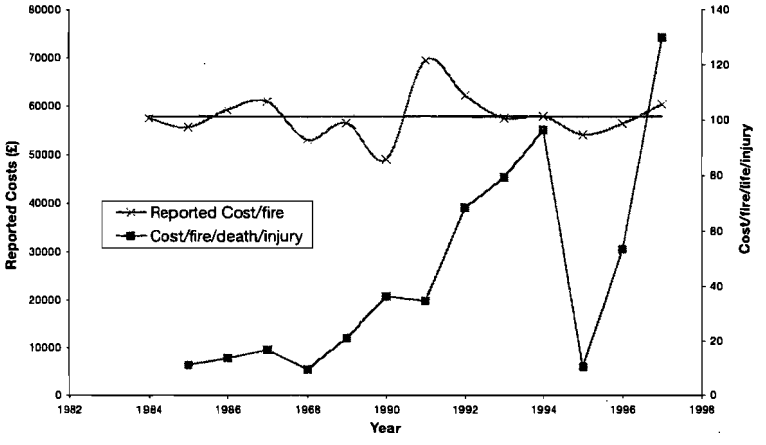


Figure A6.3 Projected costs per loss adjusted fire/death/injury

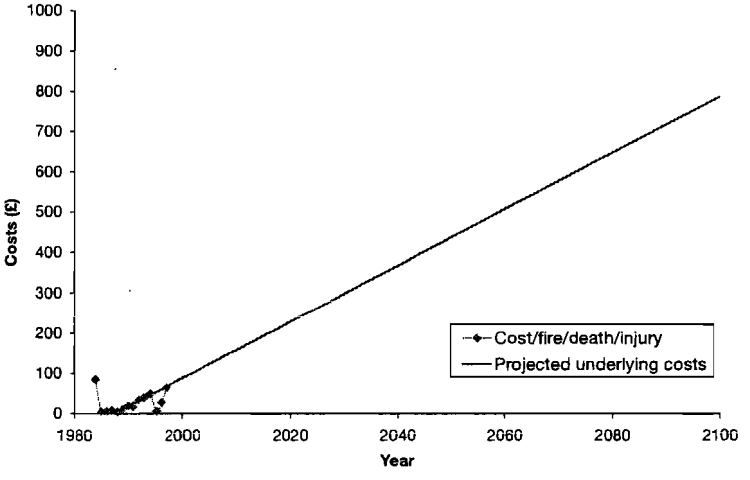


Figure A6.4 Fraction of fires resulting in loss adjusted claims

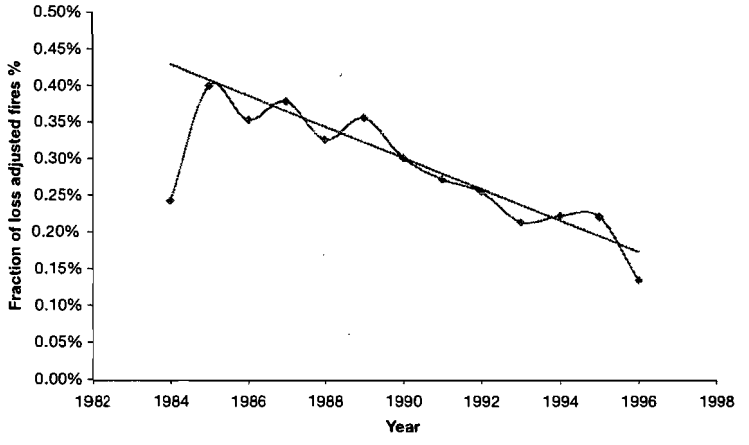
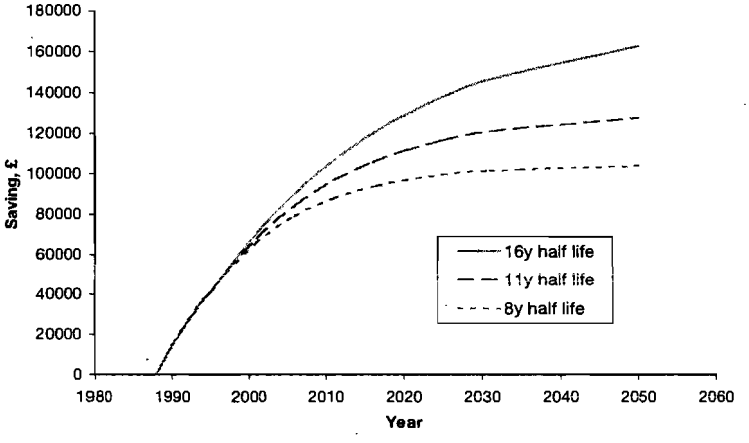


Figure A6.5 Annual cost savings on loss adjusted claims only



June 2000

URN 00/783

STATE OF ILLINOIS
HOUSE OF REPRESENTATIVES

CAPITOL OFFICE
248-W Stratton Building
Springfield, Illinois 62706
217-782-5970 Fax 217-558-1253

DISTRICT OFFICE
County Office Building
1504 3rd Ave.
Rock Island, Illinois 61201
309-793-4716 Fax 309-793-4764

COMMITTEES
AGRICULTURE & CONSERVATION
APPROPRIATIONS-HUMAN SERVICES
ENVIRONMENT & ENERGY
GAMING
VETERANS' AFFAIRS

PATRICK J. VERSCHOORE
STATE REPRESENTATIVE
72ND DISTRICT

May 6, 2008

Office of the Secretary
Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

Dear Chairwomen Nord:

I am writing to express my concerns for the direction the CPSC is moving towards in response to fire safety standards on residential furniture. As leaders in our state, we must fulfill our promise to our constituents, to establish sound legislation that will protect every citizen and put their safety above all other concerns.

In 2004, all stakeholders reached a consensus on a standard that would make sure all parts of a piece of furniture are flame retarded. It was agreed that both the covering textile and the foam needed to be retarded in order solve the problem of furniture fires. Ignoring this consensus, the CPSC staff continued to release proposals either calling for treating the covering fabric or the foam but not the entire piece of furniture.

Chemical flame retardants are used to protect the foam as well as the covering fabric from both small open flames and smoldering ignition. While they do not put out fires, they do provide crucial added time for the occupants to leave the residence thus saving lives. The reduction in fire deaths over the years has been attributed to the use of approved and studied chemical flame retardants. To eliminate this important tool from the fire safety tool box will result in an increase in fire deaths and property damage.

In fact, it is quite possible that measures like the one being considered by the Commission could weaken some of the toughest laws in the country such as California's furniture safety standard. On another note, 84% of furniture designed with no protection in the foam tends to be the class of furniture that finds its way either in its original or second-hand form in lower income households who cannot afford the higher-value, barrier protected furniture. The proposal does not address the increased danger that these citizens may be exposed to.

We have the opportunity to do this right the first time. The CPSC must take the time and consideration to propose a concept that will not require adjustments and further debate in the coming years.

To finalize a standard that will lead to high protection from fire for one end of the economic spectrum and a lesser standard for those at the lower end is not fire protection for all consumers. The CPSC should reconsider the stakeholder agreement from 2004, designed to protect the fabric and the foam, resulting in a standard that will provide the maximum protection to the public.

Sincerely,

Patrick Verschoore

cc: cpsc-os@cpsc.gov

Upholst Furn NPR 07

May 7, 2008

Office of the Secretary
Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

Dear Chairwomen Nord:

As a long time town official and state fire warden, I have dedicated my time to helping educate the citizens of my area about the dangers of residential fires and the steps they can take to help prevent them. Ours is a small rural Maine community that relies on other towns for fire protection and other emergency services. This makes the standard for fire retardants something that we cannot diminish. When trucks are coming from miles away time is of critical concern and lives are at stake. One of the biggest factors in residential fire safety is the standard for fire retardants on the products within the home. Fire retardants add crucial time for residents to leave a house during a fire, as well as minimize the potential reach of the flames. The CPSC holds the power to set these fire safety standards for residential products, and I am disappointed in the direction of the latest CPSC flammability standards proposals.

I would expect the CPSC to partner with fire personnel to provide the highest standards of fire protection available. As a member of the Citizens for Fire Safety coalition I am writing to request that you revisit your current proposal on flame retardant standards in residential furniture. In 1991, the National Association of State Fire Marshals petitioned the Consumer Product Safety Commission to develop a standard to deal with flammability issues related to residential upholstered furniture. This was in response to the high incidence of deaths due to fires caused by small open flames and smoldering cigarettes. Since that time, the Commission has made several proposals dealing with one element or another of the problem but has failed to come up with a comprehensive standard that has the support of the furniture industry while allowing for the highest levels of fire safety.

The Commission's most recent proposal deals only with the covering fabric and does not require the foam – which is the most flammable – to be treated for flame retardancy. The proposal fails to acknowledge that the furniture would only be as flame protected as the integrity of the barrier. If the barrier is not put together well (leaving gaps around the foam) or it is punctured by pets, children or other causes, the furniture is no longer flame retarded. The lives of firefighters and the citizens we strive to protect are at stake. The current flammability standards play a significant role in residential fire safety and should be revisited by the CPSC.

Sincerely,

Daniel Sprague
Selectman, Town of Palmyra, Maine

cc: cpsc-os@cpsc.gov

DuPont Advanced Fibers Systems
P.O. Box 27001
Richmond, VA 23261

DuPont Advanced Fibers Systems

May 8, 2008

US Consumer Products Safety Commission
4330 East West Highway
Bethesda, MD 20814
Attn: Mr. Dale Ray

Dear Mr. Ray:

DuPont has reviewed the CPSC proposed rule for a flammability standard for residential upholstered furniture, 16 CFR Part 1634. While we believe that an open flame standard for upholstered furniture would better serve consumer safety and is practical as evident by the successful adoption of CFR 1633 in the mattress industry, we do support changes to the proposed CFR 1634 rule draft prior to its adoption if the smoldering ignition test remains the only acceptable test option.

Specifically, we support the incorporation of seam criteria into the flammability standard. It is our assessment that sewn seams without sufficient resistance to thermal disruption are likely failure points similar to cover fabrics or internal fire barriers not passing the currently proposed flammability standard.

As a result, we concur with the proposed changes to CFR 1634 outlined by our industry colleagues at Coats North America. The proposed changes (see attachment) request the inclusion of seam rupture as a failure criterion. We believe this is an important component of flammability safety for upholstered furniture where seams will be present and ask that you strongly consider the suggested changes for the next draft of CFR 1634.

Sincerely,

Ley Richardson, Ph.D.
Senior Research Engineer
DuPont Advanced Fibers Systems

Coats North America

Coats North America
3430 Toringdon Way
Suite 301
Charlotte, NC 28277
Telephone: 704/329-5800
Fax: 704/329-5827

May 2, 2008

US Consumer Products Safety Commission
4330 East West Highway
Bethesda, Md 20814

Attn: Mr. Dale Ray,

Coats has reviewed the proposed CPSC 16CFR Part 1634 draft and found several areas where we would like to suggest amendments to the document. I am attaching a copy of the draft with highlighted and numbered sections showing where we feel changes should be made in order to produce more consistent, relevant and dependable legislation.

We are asking that the flammability testing not be limited to only fabrics but extended to include seams as well. As you might well imagine, we feel that an upholstery seam is more likely to be subject to flame risk than would be plain fabric. There is also the precedent set forth in CFR 1633 mattress legislation which does include seam flammability testing.

Please consider these suggested changes and let us know if you feel that some or all of them could be included in the next draft of the CFR.

1) (f) *Upholstery cover fabric* means the outermost layer of attached fabric or other material, such as leather and sewing threads in seams, used to cover the seating area of the upholstered furniture item.

2) (s) *Specimen* means an individual piece of upholstery fabric, barrier material, and sewing threads in seams, as defined in paragraph (n) of this section, used in a mockup assembly for smoldering or open flame ignition testing.

3) (c) *Summary of § 1634.4 through § 1634.5 tests.* The test methods set forth in §§ 1634.4 through 1634.6 measure the flammability performance (resistance to smoldering or small open flame ignition) of cover fabrics, fire barrier materials, and sewing threads in seams through a series of tests using small scale mockups representative of the typical construction of upholstered furniture.

4) Vertical and horizontal panels of a standard foam substrate are covered, using the upholstery cover fabric to be tested. The standard cover fabric can be with or without stitched seams

5) The mockup must not continue to smolder nor the sewn seams rupture at the end of the test or transition to flaming at any time during the test, and the substrate must not exceed the mass loss limit.

6) (c) *Significance and use.* This test method is designed to measure the resistance of an upholstery cover fabric and any associated seams to a smoldering ignition source when the fabric and/or seams is placed over a standard polyurethane foam substrate.

7) (5) At 45 minutes, if the mockup assembly is smoldering or if stitched seams have ruptured, record a failure for the mockup and extinguish with appropriate means and proceed to paragraph (m) of this section. See Subparts C and D of this part.

8) (m) Pass/fail criteria. (1) The sample passes the requirements of this test procedure if the following criteria are met:

(i) ok as written
(ii) ok as written
(iii) ok as written
(iv) No stitched seam has failed with rupture from melting or burning.

9) Vertical and horizontal panels of the interior fire barrier material to be tested are placed between a standard foam substrate and a standard cover fabric. The interior fire barrier material and standard cover fabric can be with or without stitched seams

10) (c) *Significance and use.* This test method is designed to measure the resistance of an interior fire barrier material and any associated seams to a smoldering ignition source when the barrier and/or seams is placed between a standard cover fabric and a standard foam substrate.

11) (g) *Standard cover fabric.* (1) The standard cover fabric represents a smolder-prone fabric and any associated sewn seams. Use the standard cover fabric specified in subpart C of this part.

12) (5) At 45 minutes, if the mockup assembly is smoldering or if stitched seams have ruptured, record a failure for the mockup and extinguish with appropriate means and proceed to paragraph (m) of this section. See Subparts C and D of this part.

13) (n) Pass/fail criteria. (1) The sample passes the requirements of this test procedure if the following criteria are met:

(i) ok as written
(ii) ok as written
(iii) No stitched seam has failed with rupture from melting or burning.

14) The interior fire barrier material to be tested is placed between a standard cover fabric and a standard foam substrate and assembled on a metal frame. The interior fire barrier material and standard cover fabric can be with or without stitched seams

15) (c) *Significance and use.* This test method is designed to measure the resistance of an interior fire barrier material and any associated seams to an open flame ignition source when the barrier and/or seams is placed between a standard cover fabric and a standard foam substrate.

16) (iii) Terminate a test run if any of the following conditions occurs:

(A) The mockup self-extinguishes;
(B) The 45 minute test duration has elapsed;
(C) A stitched seam ruptures; or
(D) The mass of the mockup reaches more than 20% mass loss of the initial mass before 45 minutes have elapsed.

Sincerely,

Chris Smith
Director of Governmental Affairs, CNA
Coats North America

Tuesday,
March 4, 2008

Part II

Consumer Product Safety Commission

16 CFR Part 1634

Standard for the Flammability of Residential Upholstered Furniture; Proposed Rule

In accordance with the National Environmental Policy Act ("NEPA"), the Executive Director of CPSC has issued a Finding of No Significant Impact ("FONSI") for the proposed upholstered furniture flammability standard. The FONSI is based on the staff's Environmental Assessment and concludes that there will be no significant impacts on the quality of the human environment as a result of the proposed upholstered furniture flammability standard. The Commission requests comments on both the Environmental Assessment and the FONSI.[93]

L. Executive Order 12988

According to Executive Order 12988 (February 5, 1996), agencies must state the preemptive effect, if any, of new regulations. The preemptive effect of this proposed regulation is as stated in section 16 of the FFA. 15 U.S.C. 1203(a).

M. Effective Date

The Commission proposes that the rule would become effective one year from publication of a final rule in the **Federal Register** and would apply to upholstered furniture manufactured on or after that date. The Commission believes that a one-year effective date should allow sufficient time for manufacturers to develop products for nationwide markets that will meet the proposed requirements. The Commission requests comments, especially from small businesses, on the proposed effective date and the impact it would have.

N. Proposed Findings

1. *General.* In order to issue a flammability standard under the FFA, the Commission must make certain findings and include these in the regulation, 15 U.S.C. 1193(j)(2). These findings are discussed in this section.

2. *Voluntary standards.* In the 1970s the Upholstered Furniture Action Council (UFAC) developed a voluntary industry program to assess the cigarette ignition propensity of upholstered furniture. The substance of the UFAC tests was then adopted in the ASTM E–1353 test method. CPSC staff estimates that approximately 90% of furniture production conforms to the UFAC voluntary program/ASTM E–1353 standards. However, while fire losses from cigarette-ignited upholstered furniture fires have been declining, a large number of deaths (260 annually) and injuries (320 annually) over the period 2002–2004 that could be addressed by the proposed rule remain. Moreover, CPSC laboratory testing has found that UFAC-conforming furniture can nevertheless ignite and burn when exposed to smoldering cigarettes. The Commission is unaware of any other adopted and implemented voluntary standards that address the risk of fire from upholstered furniture ignitions. Accordingly, the Commission finds that compliance with any adopted and implemented voluntary upholstered furniture flammability standard is not likely to result in the elimination or adequate reduction of the risk of injury from such fires.

3. *Relationship of benefits to costs.* The Commission estimates the potential discounted benefits of a year's production of upholstered furniture complying with the standard to range from about $419 million to $424 million (based on a 3 percent discount rate). Compliance costs range from an estimated $34 million to $59 million annually. Thus, projected net benefits of the proposed standard range from $363 million to $385 million. On this basis, the Commission finds that the expected benefits from the regulation bear a reasonable relationship to its costs.

4. *Least burdensome requirement.* The Commission considered proposing the following alternatives: the staff's 2005 draft standard, the staff's 2001 draft small open flame standard, revised requirements drafted by California, a rule based on the industry's voluntary program, and a "no action" alternative under which the status quo would continue to prevail. Although the staff's 2005 draft standard could result in substantial net benefits, it would impose significantly higher costs and would necessitate the increased use of FR chemicals. While the staff's 2001 draft small open flame standard would likely be more effective in reducing small open flame fire losses, it would also impose greater costs and necessitate an increase in FR chemicals (nearly 66 percent of upholstery covers would likely need to receive FR treatments to pass). A proposal based on California's TB 117 requirements, which contains provisions for both fabrics and filling materials, would likely have substantial annual costs (about $370 million) and would result in significantly lower net benefits (about $190 million) than the proposed standard. The fact that significant levels of annual deaths and injuries remain despite the existence of the voluntary standard and a high level of compliance with it demonstrate that both the alternatives of a rule based on the voluntary standard and the no action alternative are unlikely to result in adequate reduction or elimination of the risk. Therefore, the Commission finds that the proposed upholstered furniture flammability standard is the least burdensome requirement that would prevent or adequately reduce the risk of injury for which the regulation is being promulgated.

O. Conclusion

For the reasons stated in this preamble, the Commission preliminarily finds that a flammability standard for upholstered furniture is needed to adequately protect the public against the unreasonable risk of the occurrence of fire leading to death, injury, and significant property damage. The Commission also preliminarily finds that the standard is reasonable, technologically practicable, and appropriate. The Commission further finds that the standard is limited to the fabrics, related materials and products which present such unreasonable risks.

List of Subjects in 16 CFR Part 1634

Consumer protection, Flammable materials, Labeling, Upholstered furniture, Upholstered furniture materials, Records, Textiles, Warranties.

For the reasons stated in the preamble, the Commission proposes to amend Title 16 of the Code of Federal Regulations by adding part 1634 to read as follows:

PART 1634—STANDARD FOR THE FLAMMABILITY OF UPHOLSTERED FURNITURE AND UPHOLSTERED FURNITURE MATERIALS

Subpart A—General, Definitions, Performance Requirements

Sec.

1634.1 Purpose, scope and effective date.
1634.2 Definitions.
1634.3 General requirements.
1634.4 Upholstery cover fabric smoldering ignition resistance test.
1634.5 Interior fire barrier material smoldering ignition resistance test.
1634.6 Interior fire barrier material open flame ignition resistance test.

Subpart B—Requirements Applicable to Manufacturers, Labeling, Guaranties

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[93] Both of these documents are available from the Commission's Office of the Secretary (see **ADDRESSES** section above) or from the Commission's Web site at: *http://www.cpsc.gov/library/foia/foia08/brief/briefing.html.*

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Authority: 15 U.S.C. 1193.

Subpart A—General, Definitions, Performance Requirements

§1634.1 Purpose, scope, and effective date.

(a) *Purpose.* This part 1634 establishes flammability limits that all upholstered furniture subject to this part must meet before sale or introduction into commerce. The purpose of these requirements is to reduce deaths and injuries associated with upholstered furniture fires.

(b) *Scope.* All upholstered furniture as defined in § 1634.2(a) manufactured or reupholstered on or after the effective date of this standard is subject to the requirements of this part.

(c) *Effective date.* The standard shall become effective on [the effective date of this standard] and shall apply to all upholstered furniture, as defined in 1643.2(a), manufactured or reupholstered on or after that date.

§1634.2 Definitions.

In addition to the definitions given in section 2 of the Flammable Fabrics Act as amended (15 U.S.C. 1191), the following definitions apply for purposes of this part 1634.

(a) *Upholstered furniture* means, for purposes of this part 1634, an article of seating furnishing intended for indoor use in a home or other residential occupancy that: consists in whole or in part of resilient cushioning materials (such as foam, batting, or related materials) enclosed within a covering consisting of fabric or related materials, such as leather; and is constructed with contiguous upholstered seat and back or arms(s).

(1) Items included in the scope of paragraph (a) of this section include, but are not limited to, products that are intended or promoted for indoor residential use for sitting or reclining upon, such as: chairs, sofas, motion furniture, sleep sofas, home office furniture customarily offered for sale through retailers or otherwise available for residential use, and upholstered furniture intended for use in dormitories or other residential occupancies. This includes the unattached cushions or pillows on such items if they are sold with the item of upholstered furniture.

(2) Items excluded from the scope of paragraph (a) of this section consist of: furniture, such as patio chairs, intended solely for outdoor use; furniture without contiguous upholstered seating and backs and/or arm surfaces, such as ottomans; pillows or pads that are not sold with an article of furniture; commercial or industrial furniture not offered for sale through retailers or not otherwise available for residential use; furniture intended or sold solely for use in hotels and other short-term lodging and hospitality establishments; futons, flip chairs, the mattress portions of sleep sofas; and infant or juvenile products such as walkers, strollers, high chairs, or pillows.

(b) *Type I* upholstered furniture means upholstered furniture that is constructed with an upholstery cover fabric or other material that covers the seating area and is certified to meet the performance requirements of § 1634.4.

(c) *Type II* upholstered furniture means upholstered furniture that is constructed with an interior fire barrier material that:

(1) Is located directly beneath the external covering material;

(2) Completely encases the filling material used in the seating area of the item of upholstered furniture; and

(3) Is certified to meet the performance requirements of §§ 1634.5 and 1634.6.

(d) *Manufacturer* means any entity that produces or reupholsters upholstered furniture or manufactures upholstered furniture materials subject to this part 1634. For purposes of this part, an importer of upholstered furniture is also a manufacturer. See subpart F of this part for additional information on reupholstering.

(e) *Produced* means, for the purposes of this part 1634, manufactured or imported.

(f) *Upholstery cover fabric* means the outermost layer of attached fabric or other material, such as leather, used to cover the seating area of the upholstered furniture item.

(g) *Crevice* means the location in the mockup formed by the intersection of the vertical and horizontal surfaces of the test mockup.

(h) *Interior fire barrier* means a fire-resistant material which is interposed between the upholstery cover fabric and any interior filling material.

(i) *Fire-resistant material* means a material capable of reducing the likelihood of ignition or delaying fire growth.

(j) *Flame retardant* means having a chemical coating or treatment added that imparts greater fire resistance.

(k) *Ignition* (for open flame testing) means continuous, self-sustaining combustion, characterized by the presence of any visible flaming, glowing, or smoldering, after removal of the ignition source.

(l) *Metal test frame* means the apparatus consisting of two rectangular metal frames used for assembly of seating area mockups in open flame ignition resistance tests. See subpart E of this part.

(m) *Mockup assembly* means the seating area mockup consisting of the component material to be evaluated and all required standard test materials, fully assembled in the appropriate specimen holder or metal test frame.

(n) *Sample* means a material to be tested for use in upholstered furniture subject to this part.

(o) *Seating area* means those portions of an item of upholstered furniture which a person may sit upon, or rest against while sitting, including the seat

and the inside of the back and arms of the item. The seating area includes such surfaces of any loose pillows or cushions that are not attached to the item of upholstered furniture but are sold with it.

(p) *Self-extinguishment* means the unassisted termination of any visible combustion within a defined time period after ignition source removal and before the specimen is completely consumed.

(q) *Sheeting material* means cotton sheeting fabric used to cover the cigarette ignition source in smoldering ignition resistance tests. See subpart C of this part.

(r) *Smolder* means combustion characterized by smoke production, without visible flame or glowing.

(s) *Specimen* means an individual piece of upholstery fabric or barrier material, as defined in paragraph (n) of this section, used in a mockup assembly for smoldering or open flame ignition testing.

(t) *Specimen holder* means the two wooden panels used for assembly of seating area mockups in smoldering ignition resistance tests. See subpart C of this part.

(u) *Standard polyurethane foam (SPUF) substrate* means the standard substrate used for the assembly of seating area mockups to evaluate materials used in upholstered furniture construction. See subparts C and E of this part.

(v) *Substrate* means the innermost material of the tested seating area mockup, representing the filling material used in upholstered furniture.

(w) *Warp or machine direction of the fabric* means the direction of yarns that run lengthwise, i.e., parallel to selvage, in woven fabrics.

§ 1634.3 General requirements.

(a) *Upholstered furniture.* Each item of upholstered furniture subject to this part shall comply with the performance requirements of this part applicable to the upholstered furniture materials required for that "Type" of upholstered furniture and all other applicable requirements of this part.

(b) *Guaranties.* Each guaranty issued under this part shall be in accordance with the applicable requirements of § 1634.9.

(c) *Summary of § 1634.4 through § 1634.6 tests.* The test methods set forth in §§ 1634.4 through 1634.6 measure the flammability performance (resistance to smoldering or small open flame ignition) of cover fabrics and fire barrier materials through a series of tests using small scale mockups representative of the typical construction of upholstered furniture.

(d) *Standard cover fabric cutting*—(1) *Smoldering test.* The vertical panel pieces shall be cut with the long dimension being in the warp direction and the top edge is defined such that the pile lays smooth when brushed from top to bottom. The horizontal panel pieces shall be cut with the long dimension being in the warp direction and the top edge is defined such that the pile lays smooth when brushed from top to bottom.

(2) *Open flame test.* The open flame test specimens shall be cut with the long dimension being in the warp direction (if applicable).

§ 1634.4 Upholstery cover fabric smoldering ignition resistance test.

(a) *Scope.* This test method is intended to measure the cigarette ignition resistance of upholstery cover fabrics used in upholstered furniture. This test applies to all upholstery cover fabrics to be used in Type I upholstered furniture.

(b) *Summary of test method.* Ten initial test specimens are required for the upholstery cover fabrics sample. Vertical and horizontal panels of a standard foam substrate are covered, using the upholstery cover fabric to be tested. These panels are placed in the specimen holders, and a lighted cigarette is placed in the crevice formed by the intersection of vertical and horizontal panels of each test assembly. Each cigarette is covered with a piece of sheeting fabric. The cigarettes are allowed to burn their entire length. Test measurements and observations are recorded during and after the 45-minute test duration. The mockup must not continue to smolder at the end of the test or transition to flaming at any time during the test, and the substrate must not exceed the mass loss limit. If the 10 initial specimens meet the performance criteria in paragraph (m) of this section, the cover fabric sample passes. If a failure is recorded in any of the 10 initial specimens, the test shall be repeated on an additional 20 specimens. At least 25 of the 30 specimens tested must meet the performance criteria of paragraph (m) of this section.

(c) *Significance and use.* This test method is designed to measure the resistance of an upholstery cover fabric to a smoldering ignition source when the fabric is placed over a standard polyurethane foam substrate.

(d) *Test apparatus and materials.* The test apparatus and materials used in this test are detailed in subpart C of this part.

(e) *Ignition source.* The ignition source is the standard cigarette specified in subpart C of this part.

(f) *Sheeting material.* Sheeting material shall be used to cover the standard test cigarettes. For testing, the fabric shall be cut into squares 127 × 127 mm (5.0 × 5.0 in). Use the sheeting material specified in subpart C of this part.

(g) *Standard polyurethane foam substrate.* Upholstery cover materials shall be tested in a specimen holder using standard polyurethane foam (SPUF) substrate. Use the SPUF substrate specified in subpart C of this Part.

(1) The SPUF substrate shall be cut into 203 × 203 × 76 mm (8.0 × 8.0 × 3.0 in) pieces for vertical panels and 127 × 203 × 76 mm (5.0 × 8.0 × 3.0 in) pieces for horizontal panels.

(2) Each SPUF substrate piece shall be hand crushed before use by wadding or balling up one time in the fist.

(3) On the data sheet, record the initial mass of each horizontal and vertical SPUF substrate piece to the nearest 0.1 grams.

(h) *Specimen holder.* The specimen holder shall consist of two wooden panels, each a nominal 203 × 203 mm (8.0 × 8.0 in) and nominal 19 mm (0.75 in) thickness, joined together at one edge. A moveable horizontal panel support shall be positioned on a centrally located guide. See subpart C and Figures 1 and 2.

(i) *Test facility and cautions.* The test facility, exhaust system, and cautions are detailed in subpart D of this part.

(j) *Conditioning.* All test specimens and standard test materials (including SPUF substrates, cigarettes, and sheeting material) shall be conditioned in accordance with subpart C of this part.

(k) *Test specimens*—(1) *Specimen requirements.* (i) From the upholstery cover fabric sample to be tested, initially 10 specimens shall be cut, comprised of vertical panels, each 203 × 432 mm (8.0 × 17.0 in), and horizontal panels, each 203 × 280 mm (8.0 × 11.0 in).

(ii) The vertical and horizontal panel cover fabric pieces shall be cut with the long dimension in the warp direction and such that the major areas of fabric variation will lie in the crevice of the mockup assembly.

(iii) The horizontal panel cover fabric pieces shall be mounted warp to warp with the vertical panel pieces such that the major areas of fabric variation will lie in the crevice of the mockup assembly.

(2) *Specimen mounting.* (i) For vertical panels, place the cover fabric on the 203 × 203 × 76 mm (8.0 × 8.0 × 3.0

in) SPUF substrate pieces, taking care that any areas of fabric variation mentioned in paragraph (k)(1) of this section are positioned such that they will form the crevice of the assembled mockup. The warp or machine direction of the fabric should run front to back on the mockup assembly. Attach the cover fabric to the SPUF substrate pieces with straight pins and pull the cover fabric smooth so that no air gaps exist between the fabric and SPUF substrate. Attach the cotton sheeting material to the vertical panels with straight pins so that the sheeting material will cover the cigarette when placed in the crevice, approximately 50 mm (2 in) from the top of the 203 mm (8.0 in) dimension.

(ii) For horizontal panels, place the cover fabric on the 127 x 203 x 76 mm (5.0 x 8.0 x 3.0 in) SPUF substrate pieces, taking care that any areas of fabric variation mentioned in paragraph (k)(1) of this section are on the edge which will form the crevice of the assembled mockup. The warp direction of the cover fabric shall run front to back on the mockup assembly. Attach the cover fabric to the SPUF substrate pieces with straight pins and pull the fabric smooth so that no air gaps exist between the fabric and foam substrate.

(iii) Place the assembled vertical and horizontal panels in the specimen holder. Press the horizontal panel against the vertical panel to create a straight-line crevice at the intersection. See Figure 3.

(l) *Test procedure.* (1) Place the assembled mockups a sufficient distance apart from each other to avoid heat transfer between samples.

(2) Light cigarettes so that no more than 4 mm (0.16 inch) is burned away and place one cigarette on each mockup crevice created by the intersection of the vertical and horizontal panels, such that the cigarette contacts both surfaces and is equidistant from the side edges of the test panels.

(3) Immediately after placement in the crevice of each mockup, cover cigarettes with cotton sheeting and run one finger over the sheet along the length of the covered cigarette to ensure good cover sheeting-to-cigarette contact and begin timer. If a test is inadvertently interrupted or a cigarette self-extinguishes on lighting, it shall be repeated from the beginning with a new cigarette.

(4) Continue testing for 45 minutes.

(5) At 45 minutes, if the mockup assembly is smoldering, record a failure for the mockup and extinguish with appropriate means and proceed to paragraph (m) of this section. See Subparts C and D of this part.

(6) Remove cotton sheeting fabric and remains of upholstery fabric from the substrate pieces.

(7) Carefully remove the SPUF substrate pieces, clean all carbonaceous char from panels with a brush.

(8) If the application of an extinguishing agent was not necessary or a gaseous extinguishing agent (e.g., carbon dioxide or nitrogen) was applied to the SPUF substrate, record the mass of the un-charred portions of the SPUF substrate pieces to the nearest 0.1 grams within 15 minutes and proceed to paragraph (m) of this section.

(m) *Pass/fail criteria.* (1) The sample passes the requirements of this test procedure if the following criteria are met:

(i) No mockup continues to smolder after the 45 minute test duration;

(ii) No mockup transitions to open flaming; and

(iii) No SPUF substrate (i.e., sum of both horizontal and vertical pieces) of any mockup assembly has more than 10% mass loss.

(2) If the 10 initial specimens meet the performance criteria of this paragraph (m), the cover fabric sample passes. If a failure is recorded in any of the 10 initial specimens, the test shall be repeated on an additional 20 specimens. At least 25 of the 30 specimens tested must meet the criteria of this paragraph.

(n) *Test report.* The test report shall include, at a minimum, the following information:

(1) Name and address of test laboratory;

(2) Date of the test(s);

(3) Name of the operator conducting the test;

(4) Complete description of the test specimens;

(5) Applicable smoldering and mass and data for each SPUF substrate piece from each mockup including:

(i) Mockup smoldering at 45 minutes (Yes/No);

(ii) Pre-test mass;

(iii) Post-test mass; and

(iv) The percent mass loss of the SPUF substrate of each mockup assembly.

(6) Statement of overall pass/fail results.

§1634.5 Interior fire barrier material smoldering ignition resistance test.

(a) *Scope.* This test method is intended to measure the cigarette ignition resistance of interior fire barrier materials used in upholstered furniture to be used in Type II upholstered furniture. This test method applies to fire-resistant materials including, but not limited to, all interior fabrics or high loft battings to be qualified as fire barriers.

(b) *Summary of test method.* Ten initial test specimens are required for the interior fire barrier sample. Vertical and horizontal panels of the interior fire barrier material to be tested are placed between a standard foam substrate and a standard cover fabric. The panels are placed in the specimen holders and a lighted cigarette is placed in the crevice formed by the intersection of the vertical and horizontal panels in each test assembly. Each cigarette is covered with a piece of sheeting fabric. The cigarettes are allowed to burn their full length. Test measurements and observations are recorded during and after the 45-minute test duration. The substrate must not exceed the mass loss limit at the end of the test and the mockup assembly must not transition to open flaming at anytime during the test. If the initial 10 specimens meet the performance criteria in paragraph (n) of this section, the interior fire barrier sample passes. If a failure is recorded in any of the 10 initial specimens, the test shall be repeated on an additional 20 specimens. The performance criteria of paragraph (n) of this section must be met on at least 25 of the 30 specimens tested.

(c) *Significance and use.* This test method is designed to measure the resistance of an interior fire barrier material to a smoldering ignition source when the barrier is placed between a standard cover fabric and a standard foam substrate.

(d) *Test apparatus and materials.* The test apparatus and materials are detailed in subpart C of this part.

(e) *Ignition source.* The ignition source is the standard cigarette specified in subpart C of this part.

(f) *Sheeting material.* Sheeting material shall be used to cover the standard test cigarettes. For testing, the fabric shall be cut into squares 127 x 127 mm (5.0 x 5.0 in). Use the sheeting material specified in subpart C of this part.

(g) *Standard cover fabric.* (1) The standard cover fabric represents a smolder-prone fabric. Use the standard cover fabric specified in subpart C of this part.

(2) From the standard cover fabric, initially 10 pieces shall be cut for vertical panels each 203 x 432 mm (8.0 x 17.0 in) and initially 10 pieces for horizontal panels each 203 x 280 mm (8.0 x 11.0 in).

(h) *Standard polyurethane foam substrate.* (1) Fire barrier materials shall be tested in a specimen holder using standard polyurethane foam (SPUF) substrate. Use the SPUF substrate specified in subpart C of this part.

(2) The SPUF substrate shall be cut into pieces 203 x 203 x 76 mm (8.0 x 8.0 x 3.0 in) for vertical panels and 127 x 203 x 76 mm (5.0 x 8.0 x 3.0 in) for horizontal panels.

(3) Each SPUF substrate piece shall be hand crushed before use by wadding or balling up one time in the fist.

(4) Record the initial mass to the nearest 0.1 grams of each horizontal and vertical SPUF substrate piece in the data sheet.

(i) *Specimen holder.* The specimen holder shall consist of two wooden panels, each a nominal 203 x 203 mm (8.0 x 8.0 in) and nominal 19 mm (0.75 in) thickness, joined together at one edge. A moveable horizontal panel support is positioned on a centrally located guide. See subpart C and Figures 1 and 2.

(j) *Test facility and cautions.* The test facility, exhaust system, and cautions are detailed in subpart D of this part.

(k) *Conditioning.* All test specimens and standard test materials (including SPUF substrates, cigarettes, and sheeting material) shall be conditioned in accordance with subpart C of this part.

(l) *Test specimens*—(1) *Test specimen requirements.* From the interior fire-barrier material sample to be tested, initially 10 specimens shall be cut, comprised of vertical panels each 203 x 356 mm (8.0 x 14.0 in) and horizontal panels each 203 x 229 mm (8.0 x 9.0 in). If the interior fire-barrier material is directional, the vertical panel pieces shall be cut with the long dimension being in the warp direction. The horizontal panel specimens shall be cut such that the short dimension is in the warp direction.

(2) *Specimen mounting.* (i) For vertical panels, place the 203 x 432 mm (8.0 x 17.0 in) standard cover fabric over the fire-barrier material on a 203 x 203 x 76 mm (8.0 x 8.0 x 3.0 in.) SPUF substrate piece. The standard cover fabric and interior fire-barrier shall be oriented such that the top edges of these materials run from top to bottom. Attach with straight pins and pull smooth so that no air gaps exist. Attach the cotton sheeting material to the vertical panels with straight pins so that the sheeting material will cover the cigarette when placed in the crevice, approximately 50 mm (2.0 in) from the top of the panel.

(ii) For horizontal panels, place the 203 x 280 mm (8.0 x 11.0 in) standard cover fabric over the interior fire-barrier on the 127 x 203 x 76 mm (5.0 x 8.0 x 3.0 in) SPUF substrate pieces. The standard cover fabric and interior fire-barrier shall be oriented such that the top edges of these materials run from the crevice to the front. Attach with straight pins and pull smooth so that no air gaps exist.

(iii) Place the assembled vertical and horizontal panels in the specimen holders. Press the horizontal panel against the vertical panel to create a straight-line crevice at the intersection. See Figure 4.

(m) *Test procedure.* (1) Place the assembled mockups a sufficient distance apart from each other to avoid heat transfer between samples.

(2) Light cigarettes so that no more than 4 mm (0.16 inch) is burned away and place one cigarette on each mockup crevice created by the intersection of the vertical and horizontal panels, such that the cigarette contacts both surfaces and is equidistant from the side edges of the test panels.

(3) Immediately after placement in the crevice of each mockup, cover cigarettes with cotton sheeting and run one finger over the sheet along the length of the covered cigarette to ensure good cover sheeting-to-cigarette contact and begin timer. If a test is inadvertently interrupted or cigarette self extinguishes on lighting, it shall be repeated from the beginning with a new cigarette.

(4) Continue testing for 45 minutes.

(5) At 45 minutes, if the mockup assembly is smoldering, extinguish with appropriate means. See subparts C and D of this part.

(6) Remove cotton sheeting fabric, remains of standard cover fabric, and interior fire-barrier material from the substrate panels.

(7) Carefully remove the SPUF substrate test panels and clean all carbonaceous char from panels with a brush.

(8) If the mockup has self-extinguished by the end of the 45 minute test, or if a gaseous extinguishing agent (e.g. carbon dioxide or nitrogen) was applied to the mockup, record the mass of the un-charred portions of the SPUF substrate pieces to the nearest 0.1 grams within 15 minutes and proceed to § 1634.5(n).

(9) If a mass-adding extinguishing agent (e.g., water-based agent) was applied to the substrate, re-condition the SPUF substrate pieces as follows.

(i) Place the SPUF substrate pieces in the active flow of a laboratory air hood to dry for at least 24 hours.

(ii) Measure and record the mass of the SPUF substrate pieces to the nearest 0.1 gram.

(iii) Place the SPUF substrate pieces in the active flow of the laboratory air hood to dry for at least three additional hours.

(iv) Measure and record the mass of the SPUF substrate pieces to the nearest 0.1 gram and compare the measurement with the previous one.

(v) Repeat this procedure every three hours until the mass of the substrate pieces remains within a tolerance of 0.5% from the previous reading.

(vi) Re-condition the SPUF pieces according to paragraph (k) of this section.

(vii) Record the mass of the un-charred portions of the SPUF substrate pieces to the nearest 0.1 grams.

(n) *Pass/fail criteria.* (1) The sample passes the requirements of this test procedure if the following criteria are met:

(i) No SPUF substrate (i.e., sum of both horizontal and vertical pieces) of any specimen from a mockup assembly has more than 1% mass loss; and

(ii) No mockup assembly transitions to open flaming.

(2) If the 10 initial specimens meet the performance criteria of this paragraph (n), the interior fire-barrier sample passes. If a failure is recorded in any of the 10 initial specimens, the test shall be repeated on an additional 20 specimens. At least 25 of the 30 specimens tested must meet the performance criteria of this paragraph (n).

(o) *Test report.* The test report shall include, at a minimum, the following information:

(1) Name and address of test laboratory;

(2) Date of the test(s);

(3) Name of the operator conducting the test;

(4) Complete description of the test specimens;

(5) Mass data for each SPUF substrate piece from each mockup including:

(i) Pre-test mass;

(ii) Post-test mass; and

(iii) The percent mass loss of the SPUF substrate of each mockup assembly.

(6) Statement of overall pass/fail results.

§ 1634.6 Interior fire barrier material open flame ignition resistance test.

(a) *Scope.* This test procedure is intended to measure the open flame ignition resistance of interior fire-barrier materials to be used in Type II upholstered furniture. This test applies to materials including, but not limited to, interior fabrics or high loft battings to qualify them as fire-barriers.

(b) *Summary of test method.* Ten initial test specimens are required for the interior fire-barrier sample. The interior fire-barrier material to be tested is placed between a standard cover fabric and standard foam substrate and assembled on a metal test frame. An

open flame ignition source is applied to the crevice formed by the intersection of the seat/back surfaces of the mockup. Test measurements and observations are recorded during the 45-minute test duration. The mockup assembly must not exceed the mass loss limit. If the 10 initial specimens meet the performance criteria of paragraph (n) of this section, the interior fire-barrier sample passes. If a failure is recorded in any of the 10 initial specimens, the test shall be repeated on an additional 20 specimens. At least 25 of the 30 specimens tested must meet the performance criteria of paragraph (n) of this section.

(c) *Significance and use.* This test method is designed to measure the resistance of an interior fire-barrier material to an open flame ignition source when the barrier is placed between a standard cover fabric and a standard foam substrate.

(d) *Test apparatus and materials.* The test apparatus and materials are detailed in subpart E of this part.

(e) *Ignition source.* The ignition source is the nominal 240 mm butane gas flame described in subpart E of this part.

(f) *Standard cover fabric.* (1) The standard cover fabric represents a moderately flammable upholstery cover fabric. Use the standard cover fabric specified in subpart E of this part.

(2) The standard cover fabric size needed for each test is 1020 x 700 ± 10 mm (40 x 27.5 ± 0.4 in). From the standard cover fabric, cut triangular cut-outs centered 575 mm (22.5 in) from the top edge on both sides. The size of these cut-outs shall be approximately 55 x 135 ± 5 mm (2.1 x 5.25 ± 0.2 in) high. See subpart E of this part and Figure 5.

(g) *Standard polyurethane foam substrate.* (1) Interior fire-barrier materials shall be tested with a standard polyurethane foam (SPUF) substrate. Use the SPUF substrate specified in subpart E of this part.

(2) Two panels of the SPUF substrate shall be used. The vertical (back) block shall be 457 x 305 ± 5 mm (18.0 x 12.0 ± 0.2 in) x 76 ± 2 mm (3.0 ± 0.08 in) thick. The horizontal (seat) block shall be 457 x 83 ± 5 mm (18.0 x 3.25 ± 0.2 in) x 76 ± 2 mm (3.0 ± 0.08 in) thick.

(h) *Metal test frame.* The metal test frame shall consist of two rectangular metal frames locked at right angles to each other. A rod shall be continuous across the back of the metal test frame. See subpart E of this part and Figure 6.

(i) *Test facility and cautions.* The test facility, exhaust system and cautions are detailed in subpart D of this part.

(j) *Conditioning.* All test specimens and standard test materials shall be conditioned in accordance with subpart E of this part.

(k) *Test specimens.* (1) The interior fire-barrier specimen needed for each test is 1020 x 700 ± 10 mm (40 x 27.5 ± 0.4 in). From the interior fire-barrier specimen, cut triangular cut-outs centered 575 mm (22.5 in) from the top edge on both sides. The size of these cut-outs shall be approximately 55 x 135 ± 5 mm (2.1 x 5.25 ± 0.2 in) high. See subpart E of this part and Figure 5.

(2) If the interior fire-barrier material is directional, the specimen shall be cut with the long dimension (1020 mm, 40 in) being in the warp direction and the top edge is defined as appropriate.

(l) *Mockup assembly.* (1) Position the seat frame in the upright position. Adjust the horizontal and vertical (seat and back) panels by loosening the screws holding the two panels in place. Pull the horizontal panel forward and the vertical panel upwards creating a larger gap between the two panels at the crevice. Temporarily secure the two panels in place (expanded position).

(2) Lay the interior fire-barrier specimen flat and face up on the table. Lay the standard cover fabric on top, face up.

(3) Fold the two sides of the top (larger) section of fabric and fire-barrier specimen (from the cutout upwards) over the face of the standard cover fabric.

(4) Thread the folded standard cover fabric and fire-barrier specimen under the horizontal rod and pull them out from the back of the metal test frame until the cutouts are lined up with the horizontal rod.

(5) Thread the folded standard cover fabric and fire-barrier specimen back over the rod and pull them out from the front of the frame.

(6) Line up and pull both the top and bottom sections of the standard cover fabric and fire-barrier specimen so that the cutouts are lined up with the metal rod on both sides and the standard cover fabric and fire-barrier specimen are laying flat and free of folds and wrinkles.

(7) Place the larger SPUF block flush against the back metal frame and resting on the fire-barrier specimen. Loosen the screws holding the vertical (back) panel and lower the panel until the top of the panel is flush with the top of the larger SPUF foam block. Tighten the screws so that the vertical panel is secure.

(8) Lift the larger portion of both the fire-barrier specimen and standard cover fabric over the SPUF back block and secure them to the top of the back section of the metal frame using metal clips.

(9) Starting at the lowest part of the vertical section on one side, clip both the fire-barrier specimen and standard cover fabric to the frame. At the top corner, make a diagonal fold of the fire-barrier specimen separate from the standard cover fabric. Make a similar fold with the standard cover fabric and secure all the folded layers (both fire-barrier and standard cover fabric) to the frame with metal clips to the side of the test frame. Repeat for the other side.

(10) When the back section is completed, place the frame down so that the back of the frame is on the table.

(11) Lift up the smaller portion of the standard cover fabric and fire-barrier specimen and lay them flat on the back panel.

(12) Place the smaller SPUF block with the 83 mm (3.25 in) side flush against the seat section of the metal frame and press against the back panel. Loosen the screw holding the horizontal panel and move the panel until the panel is flush with the smaller SPUF foam block. Tighten the screws so that the horizontal panel is secure.

(13) Pull the smaller section of the fire-barrier specimen and standard cover fabric over the SPUF seat block and secure them to bottom front edge of the metal frame using metal clips.

(14) Re-position the assembly in the upright position.

(15) On one side, fold the unsecured front edge of the fire-barrier specimen back against the SPUF block. Then, make a diagonal fold with the unsecured top edge of fire-barrier specimen down on top of it. Repeat with the unsecured edges of standard cover fabric and clip to the bottom of the metal test frame. Repeat on the other side.

(16) Ensure that the standard cover fabric and fire-barrier specimens are smooth and under uniform tension at all locations to eliminate air gaps between the standard cover fabric, fire-barrier specimen, and the SPUF blocks. Do not allow a gap exceeding 3 mm (0.125 inch) along the seat/back crevice. See Figure 7.

(m) *Test procedure.* Have a means for extinguishing the specimen close at hand. A hand-held carbon dioxide extinguisher is adequate for most specimens; however, a water spray system should be available as a back-up, in case the carbon dioxide fails to completely extinguish the fire.

(1) *Pretest.* (i) Tare the scale with the empty metal test frame and clips or, if the scale does not have tare capability, record the mass of metal test frame and clips.

(ii) Assemble the mockup as described in paragraph (l) of this section.

(iii) Record the initial mass of the fabric/specimen/substrate assembly directly (if tared) or by subtraction (if not tared).

(iv) Calculate and record the mass corresponding to 20% mass loss of initial mass of the mockup assembly.

(2) *Lighting the igniter flame.* (i) Open the butane tank slowly and light the end of the burner tube. Adjust the gas flow to the appropriate rate to achieve a 240 mm flame. See subpart E of this part.

(ii) Allow the flame to stabilize for at least 2 minutes.

(3) *Starting and performing the test.* (i) Place the lit burner tube in the crevice of the mockup so that the end of the igniter is at the center of the mockup equidistant from either edge.

(ii) Apply the flame for 70 ± 1 seconds, then immediately remove ignition source from the mockup. Observe the mockup combustion behavior for 45 minutes.

(iii) Terminate a test run, if any of the following conditions occurs:

(A) The mockup self-extinguishes;

(B) The 45 minute test duration has elapsed; or

(C) The mass of the mockup reaches more than 20% mass loss of the initial mass before 45 minutes have elapsed.

(n) *Pass/fail criterion.* (1) The sample passes if no mockup assembly has more than 20% mass loss at the end of the 45-minute test.

(2) If the 10 initial specimens meet the performance criterion, the interior fire-barrier sample passes. If a failure is recorded in any of the 10 initial specimens, the test shall be repeated on an additional 20 specimens. At least 25 of the 30 specimens tested must meet the performance criterion of this paragraph.

(o) *Test report.* The test report shall include, at a minimum, the following information:

(1) Name and address of the test laboratory;

(2) Date of the test(s);

(3) Name of operator conducting the test;

(4) Complete description of the test specimens;

(5) Mass data for the mockup including:

(i) Initial mass;

(ii) Mass corresponding to 20% mass loss of initial mass;

(iii) Time to reach the mass equal to 20% mass loss of the initial mass;

(iv) The percent mass loss of the mockup at 45 minutes.

(6) Statement of overall pass/fail results.

Subpart B—Requirements Applicable to Manufacturers, Labeling, Guaranties

§ 1634.7 Requirements applicable to upholstered furniture manufacturers.

(a) *General.* Each manufacturer (including importers) of upholstered furniture subject to this part shall ensure that each article of upholstered furniture it manufactures or imports for introduction into commerce complies with all applicable requirements of this part.

(b) *Label.* Each article of upholstered furniture subject to this part shall bear a label conforming to the requirements of § 1634.8.

(c) *Certification.* The certification statement specified on the label required by paragraph (b) of this section constitutes the manufacturer's certification that the article of upholstered furniture to which it is affixed complies with all applicable requirements of this part.

(d) *Basis for certification.* The manufacturer shall have an objectively reasonable basis for the certification required by paragraph (c) of this section. Examples of an objectively reasonable basis for certification are:

(1) Records of reasonable and representative tests demonstrating compliance with all applicable requirements of this part for each cover or barrier material required for the Type of furniture specified on the label required by § 1634.8; or

(2) Possession of guaranties meeting the requirements of § 1634.9 for each cover or barrier material required for the Type of furniture specified on the label required by § 1634.8 and maintaining that the manufacturer has not, by further processing, negatively affected the fire performance of any such cover or barrier material.

(e) *Records.* (1) Every upholstered furniture manufacturer (including importers) subject to this part shall maintain records of the test results and details of each test performed by or for that manufacturer (including failures) intended to support certification in accordance with paragraph (c) of this section. Details shall include all the information required in the Test Report in accordance with §§ 1634.4(n), 1634.5(o) and 1634.6(o).

(2) Records required by this paragraph (e) shall be in English and kept at a location in the United States.

(3) Records required by this paragraph (e) shall be maintained by the manufacturer during production of the upholstered furniture and for a period of at least three (3) years after production of the article of upholstered furniture ceases. These records shall be made available to Commission staff upon request.

(f) *Cessation of production.* If the manufacturer becomes aware of any information that indicates that any article of upholstered furniture manufactured by that manufacturer fails to comply with this part, the manufacturer shall cease production and distribution of such upholstered furniture until corrective action has been taken to ensure that further production will conform to all applicable requirements of this part.

(g) *Notification to upholstered furniture material suppliers.* An upholstered furniture manufacturer who becomes aware of information indicating that any cover or barrier material used, or intended to be used, in upholstered furniture produced by it fails to meet any applicable requirement of this part shall promptly inform the supplier of that material of the deficiency. (Upholstered furniture manufacturers are also reminded of the reporting requirements of § 15 of the Consumer Product Safety Act, 15 U.S.C. 2064, and implementing regulations at 16 CFR part 1115.)

§ 1634.8 Labeling.

(a) Each article of upholstered furniture subject to this part shall bear a permanent, conspicuous, and legible label containing:

(1) Name of the manufacturer (and importer, if any);

(2) Location of the manufacturer (and importer, if any), including street address, city and state;

(3) Month and year of manufacture;

(4) Model identification;

(5) Type identification (i.e., "Type I" or "Type II"); and

(6) The statement "The manufacturer hereby certifies that this article of upholstered furniture complies with all applicable requirements of 16 CFR part 1634".

(b) The information required by paragraph (a) of this section shall be set forth separately from any other information appearing on the label. Other information, representations, or disclosures, appearing on labels required by this section or elsewhere on the item, shall not interfere with, minimize, detract from, or conflict with, the required information.

(c) No person shall remove or mutilate, or cause or participate in the removal or mutilation of, any label required by this section to be affixed to any article of upholstered furniture.

§ 1634.9 Requirements applicable to guaranties under section 8 of the FFA, 15 U.S.C. 1197.

(a) *General.* Either the manufacturer of a finished article of upholstered furniture subject to this part or the manufacturer of any cover or barrier material subject to this part may issue a guaranty in accordance with this section. The guaranty shall specify the classification(s) (Type I or II) of upholstered furniture for which the guaranty is intended to be valid.

(b) *Tests to support guaranties.* Section 8 of the Flammable Fabrics Act, 15 U.S.C. 1197, requires that a guaranty thereunder ultimately be supported by reasonable and representative tests. Reasonable and representative tests for purposes of this part shall be tests performed sufficiently to demonstrate that the tested item conforms with each applicable requirement of this part.

Subpart C—Apparatus and Materials for Smoldering Ignition Resistance Tests

§ 1634.10 Test room.

(a) The test room shall have an appropriate fire protection suppression system. A suitable extinguishment system such as a water bottle fitted with a spray nozzle shall be provided to extinguish any ignited portions of the mockup assembly. Dry chemical extinguishing agents shall not be used to extinguish or suppress smoldering combustion since the chemicals add mass therefore increasing the post-test mass of the mockup remains. In addition, straight pins, staples, a razor, knife or scissors, a scale, and a brush and/or tongs may be needed to perform the tests.

(b) If conditions in the test room do not meet the conditioning specifications, then testing must be initiated within 10 minutes after the specimens are removed from the conditioning room.

§ 1634.11 Specimen holder.

The specimen holder shall consist of two wooden panels, each nominal 203 x 203 mm (8.0 x 8.0 in) and nominal 19 mm (0.75 in) thickness, joined together at one edge. A moveable horizontal panel support is positioned on a centrally located guide. See Figures 1 and 2.

§ 1634.12 Ignition source.

The ignition source for all smoldering tests shall be cigarettes without filter tips made from natural tobacco, 85 ± 2 mm (3.3 ± 0.1 in) long and with a packing density of 0.27 ± 0.02 g/cm^3 (0.16 ± 0.01 oz/in^3) and a total weight of 1.1 ± 0.1 g (0.039 ± 0.004 oz).

§ 1634.13 Sheeting material.

(a) The specifications of the sheeting material are as follows:

(1) Fiber content: 100% cotton

(2) Color: White

(3) Construction: Plain weave, 19–33 threads per square centimeter (120–210 threads per square inch)

(4) Weight/square yard: 125 ± 28 g/m^2 (3.7 ± 0.8 oz/yd^2).

(b) The sheeting shall be refurbished once before use with the following laundering procedure. The sheeting material shall be washed and dried one time in accordance with sections 8.2.2 and 8.2.3 of American Association of Textile Chemists and Colorists (AATCC) Test Method 124–2001 "Appearance of Fabrics after Repeated Home Laundering." Washing shall be performed in accordance with sections 8.2.2 and 8.2.3 of AATCC Test Method 124–2001 using wash temperature (V) 60 ± 3 °C (140 ± 5 °F) specified in Table II of that method, and the water level, agitator speed, washing time, spin speed and final spin cycle specified in "Normal/Cotton Sturdy" in Table III of the method. A maximum wash load shall be 8 pounds. Drying shall be performed in accordance with section 8.3.1(A) of that test method, Tumble Dry, using the exhaust temperature (66° ± 5 °C; 150° ± 10 °F) and cool down time of 10 minutes specified in the "Durable Press" conditions of Table IV of the method.

§ 1634.14 Standard polyurethane foam substrate.

(a) The SPUF substrate is used for assembly of the mockups for evaluation of upholstery cover fabric and interior fire barriers and to qualify standard cover fabrics.

(b) *Flammability performance.* (1) Open flame performance. The SPUF shall be tested in accordance with the test procedures specified in § 1634.6, but without the use of the standard cover fabric and using a 5-second impingement of the 35 mm butane flame specified in § 1634.20(d). In three consecutive trials, using SPUF from the production lot to be qualified, the SPUF substrate shall have a mass loss that is greater than 20 percent in less than 120 seconds after removal of the ignition source.

(2) *Smoldering performance.* The SPUF shall be tested in accordance with the test procedures specified in § 1634.4, but without the use of a cover fabric. In three consecutive trials, using SPUF from the production lot to be qualified the SPUF substrate shall have a mass loss less than 1%.

(c) The SPUF substrate shall have the following specifications:

(1) Density: 1.8 lb/ft^3

(2) Indentation Load Deflection (ILD): 25 to 30

(3) Air permeability: Greater than 4.0 ft^3/min

(4) No flame-retardant chemical treatment as determined by post-production chemical analysis.

§ 1634.15 Standard cover fabric (cotton velvet) smoldering qualification for barrier test.

(a) *Flammability properties.* The standard cover fabric used in smoldering tests for interior fire barriers in accordance with § 1634.5, shall meet the following requirements: when tested directly over a qualified SPUF foam substrate following the procedure in § 1634.4, the substrate mass loss average of 10 test results shall be 50 ± 5%.

(b) The standard cover fabric shall also have weight/square yard: 10 oz/yd^2.

(c) A 100% cotton, velvet pile fabric of beige color, with no backcoating and treated with certain finishing chemicals involving a resin catalyst that contains small amounts of melamine, generally demonstrates the desired flammability performance characteristics specified.

§ 1634.16 Conditioning.

(a) All test specimens and standard test materials (including SPUF substrates, cigarettes, and sheeting material) shall be conditioned at a temperature of 21° ± 3 °C (70° ± 5 °F) and between 50% and 66% relative humidity for at least 24 hours prior to testing.

(b) If conditions in the test room do not meet these specifications, then testing must be initiated within 10 minutes after the specimens are removed from the conditioning room.

Subpart D—Test facility, exhaust system, and hazards

§ 1634.17 Test facility and exhaust system.

The room in which tests under this part are conducted shall have a volume greater than 20 m^3 in order to contain sufficient oxygen for testing, or if smaller, the room shall have a ventilation system permitting the necessary flow of air. During the pretest and testing period, airflow rates shall be maintained below 0.1 m/s, measured in the locality of the mockup assembly to provide adequate air movement without disturbing the burning behavior. Room ventilation rates before and during tests shall be maintained at about 200 ft^3/min. Airflow rates in this range have been shown to provide adequate oxygen without physically disturbing the burning behavior of the ignition source or the mockup assembly. In addition, the ventilation system of the test facility

shall be capable of extracting smoke and toxic combustion products generated during testing for health and safety reasons.

§ 1634.18 Hazards.

(a) Health and safety risks associated with conducting the required testing in accordance with this part 1634 exist. It is essential that suitable precautions be taken, which include the use of breathing apparatus and protective clothing. Products of combustion can be irritating and dangerous to test personnel. Test personnel should avoid exposure to smoke and gases produced during testing.

(b) A suitable means of fire extinguishment shall be at hand. When the termination point of the test has been reached and the fire is extinguished, the presence of a back-up fire extinguisher is recommended. It is often difficult to determine when combustion in a mockup assembly has ceased, even after an extinguishment action is taken, due to burning deep inside the specimens. Care should be taken that specimens are disposed of only when completely inert.

Subpart E—Test Facility and Materials for Open Flame Ignition Resistance Tests

§ 1634.19 Test room.

The test room shall be draft protected and equipped with a suitable ventilation system for exhausting smoke and any toxic gases generated during testing.

§ 1634.20 Butane gas flame ignition source.

(a) The butane gas flame ignition source shall be in accordance with the following specifications or equivalent:

(1) The burner tube shall consist of a stainless steel tube, 8.0 ± 0.1 mm (5/16 ± 0.004 inch) outside diameter, 6.5 ± 0.1 mm (0.256 ± 0.004 inch) internal diameter.

(2) The butane shall be "C.P. Grade" (chemically pure) butane, 99.0% purity.

(b) There shall be a means to control the flow rate of butane.

(c) In the open flame test of section 1634.6 a nominal 240 mm flame butane is required. The nominal 240 mm butane flame is obtained by establishing a flow rate of butane gas that is 350 ± 10 ml/min at 25 °C (77 °F) and 101.3 kPa (14.7 psi).

(d) In standard material qualification tests for SPUF and Rayon, a nominal 35 mm butane is required. The nominal 35 mm butane flame is obtained by establishing a flow rate of butane gas that is 45 ± 2 ml/min at 25 °C (77 °F) and 101.3 kPa (14.7 psi).

(e) Flame height is measured from the center end of the burner tube when held horizontally and the flame is allowed to burn freely in air.

§ 1634.21 Metal test frame.

(a) The metal test frame shall consist of two rectangular steel frames locked at right angles to each other (See Figure 6).

(b) The frames shall be made of nominal 25 mm x 25 mm (1 x 1 inch) steel angle 3 mm (0.125 inch) thick, and shall securely hold platforms of steel mesh set 6 ± 1 mm (0.25 ± 0.05 inch) below the front face of each test frame.

(c) An optional standard edging section around the steel mesh will provide protection and greater rigidity. The rod shall be continuous across the back of the apparatus.

§ 1634.22 Standard cover fabric (rayon) open flame qualification for barrier test.

(a) The standard cover fabric used in open flame tests for interior fire barriers shall be tested in accordance with the test procedures specified in § 1634.6 using a 20 second application of the 35 mm butane gas flame specified in § 1634.20. In five consecutive trials, the assembly mass loss must be greater than 40% at 5 minutes when tested with a qualified SPUF.

(b) The standard rayon cover fabric shall also:

(1) Be 100% bright regular rayon, scoured, 20/2 ring spun basket weave construction; and

(2) Have weight/square yard: 8.0 ± 0.5 oz/yd^2.

§ 1634.23 Open flame tests fabric cut-out dimensions.

The fabric cut-out dimensions needed for installing in the mockup assembly to conduct open flame tests are shown in Figure 5.

§ 1634.24 Standard polyurethane foam substrate.

(a) The SPUF substrate used for assembly of mockups shall meet the following flammability performance requirements.

(1) The SPUF shall be tested in accordance with the open flame test procedures specified in § 1634.6, but without the use of the standard cover fabric and using a 5-second impingement of the 35 mm butane flame specified in § 1634.20(d). In three consecutive trials, using SPUF from the production lot to be qualified, the SPUF substrate shall have a mass loss that is greater than 20 percent in less than 120 seconds after removal of the ignition source.

(2) The SPUF shall be tested in accordance with the smoldering test procedures specified in § 1634.4, but without the use of a cover fabric. In three consecutive trials, using SPUF from the production lot to be qualified the SPUF substrate shall have a mass loss less than 1%.

(b) The SPUF substrate shall have the following specifications:

(1) Density: 1.8 lb/ft^3

(2) Indentation Load Deflection (ILD): 25 to 30

(3) Air permeability: Greater than 4.0 ft^3/min

(4) No flame-retardant chemical treatment as determined by post production chemical analysis.

§ 1634.25 Conditioning.

(a) All test specimens and standard test materials shall be conditioned at a temperature of 21° ± 3 °C (70° ± 5 °F) and between 50% and 66% relative humidity for at least 24 hours prior to testing.

(b) If conditions in the test room do not meet the conditioning specifications, then testing must be initiated within 10 minutes after the specimens are removed from the conditioning room.

Subpart F—Reupholstering

§ 1634.26 Requirements applicable to reupholstering.

(a) Section 3 of the Flammable Fabrics Act (15 U.S.C. 1192) prohibits, among other things, the "manufacture for sale" of any product which fails to conform to an applicable standard issued under the FFA.

(b) Reupholstering upholstered furniture for sale is manufacturing upholstered furniture for sale and, therefore, is subject to the FFA and all applicable requirements of this part.

(c) Reupholstering is any replacing of upholstered furniture material that is subject to any applicable performance requirements of §§ 1634.4 through 1634.6.

(d) If the person who reupholsters the upholstered furniture intends to retain the reupholstered furniture for his or her own use, or if a customer hires the services of the reupholsterer and intends to take back the reupholstered furniture for his or her own use, "manufacture for sale" has not occurred and such an article of reupholstered furniture is not subject to this part.

(e) If an article of reupholstered furniture is sold or intended for sale, either by the reupholsterer or the owner of the upholstered furniture who hires the services of the reupholsterer, such a transaction is considered to be "manufacture for sale" and the article of upholstered furniture is subject to all applicable requirements of this part.

Dated: February 14, 2008.

Alberta E. Mills,

Acting Secretary, Consumer Product Safety Commission.

Note: The following appendix will not appear in the Code of Federal Regulations.

List of Relevant Documents

1. Briefing memorandum from Dale R. Ray, Project Manager, Directorate for Economic Analysis, to the Commission. "Regulatory Alternatives for Upholstered Furniture Flammability," November 20, 2007.

2. Memorandum from Rohit Khanna & S. Mehta, Directorate for Engineering Sciences, to Dale R. Ray, Project Manager, Directorate for Economic Analysis, "Technical Rationale Report for the Draft Standard for the Flammability of Upholstered Furniture," November 2007.

3. Memorandum from D. Miller, Directorate for Epidemiology to Dale R. Ray, Project Manager, Directorate for Economic Analysis, "Analysis of Laboratory Data for Upholstered Furniture," November 16, 2007.

4. Memorandum from Robert Franklin, EC, to Dale R. Ray, Project Manager, Directorate for Economic Analysis, Environmental Assessment of a Draft Proposed Flammability Standard for Residential Upholstered Furniture," November 2007.

5. Memorandum from Charles L. Smith, Directorate for Economic Analysis, to Dale R. Ray, Project Manager, "Preliminary Regulatory Analysis of a Draft Proposed Flammability Rule to Address Ignitions of Upholstered Furniture," December 2007.

6. Memorandum from Charles L. Smith, Directorate for Economic Analysis, to Dale R. Ray, Project Manager, Directorate for Economic Analysis, "Proposed Rulemaking on Upholstered Furniture Flammability, Initial Regulatory Flexibility Analysis," December 2007.

7. Memorandum from Martha A. Kosh, Office of the Secretary, to Directorate for Economic Analysis, "Ignition of Upholstered Furniture by Small Open Flames and/or Smoldering Cigarettes," List of Comments on CF 04–2, December 29, 2003, revised October 19, 2004.

8. Memorandum from A. Bernatz, L. Fansler & L. Scott, to Dale R. Ray, Project Manager, Directorate for Economic Analysis, "Test Program for Upholstery Fabrics and Fire Barriers," November 8, 2007.

9. Memorandum from P. Semple, Executive Director, to the Commission, "Finding of No Significant Impact from Implementation of the Proposed Flammability Standard for Residential Upholstered Furniture," November 19, 2007.

10. Memorandum from W. Zamula, Directorate for Economic Analysis, to Dale R. Ray, Project Manager, Directorate for Economic Analysis, "Costs for Non-Fatal, Addressable Residential Civilian Injuries Associated with Upholstered Furniture Fires," September 6, 2007.

BILLING CODE 6355–01–P

Figure 1 - Cigarette Ignition Specimen Holder - Base

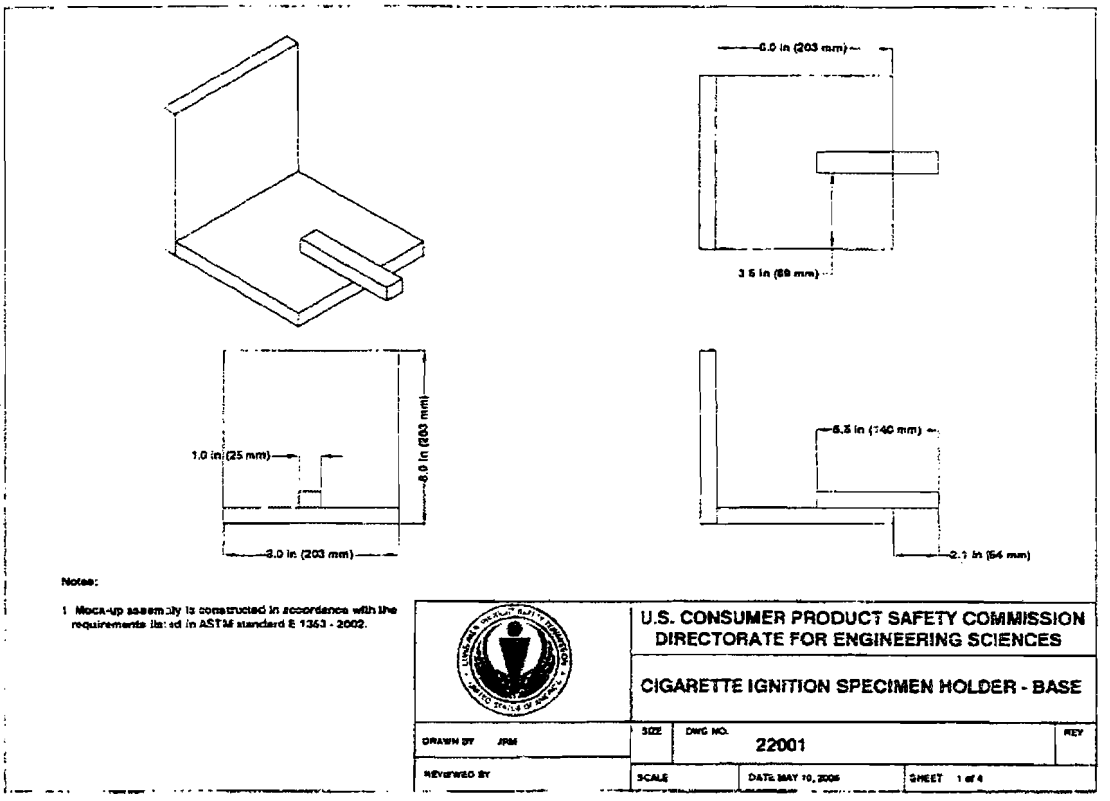


Figure 2 - Cigarette Ignition Specimen Holder - Movable Horizontal Support Panel

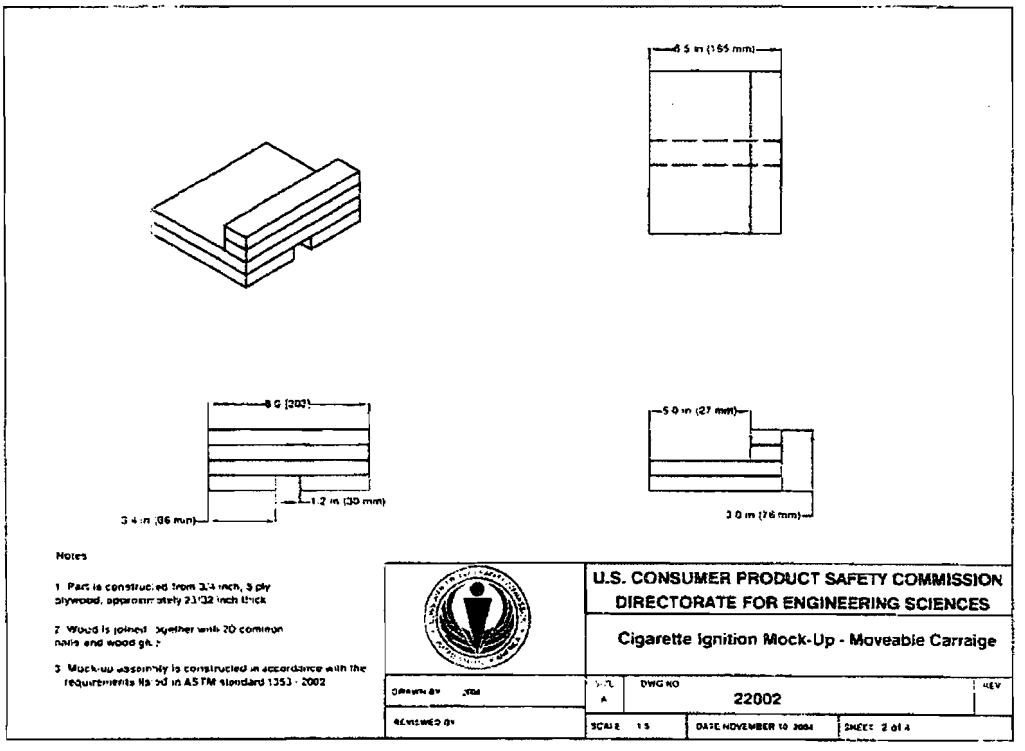


Figure 3 - Mockup Assembly for Upholstery Cover Fabric Smoldering Ignition Resistance Test

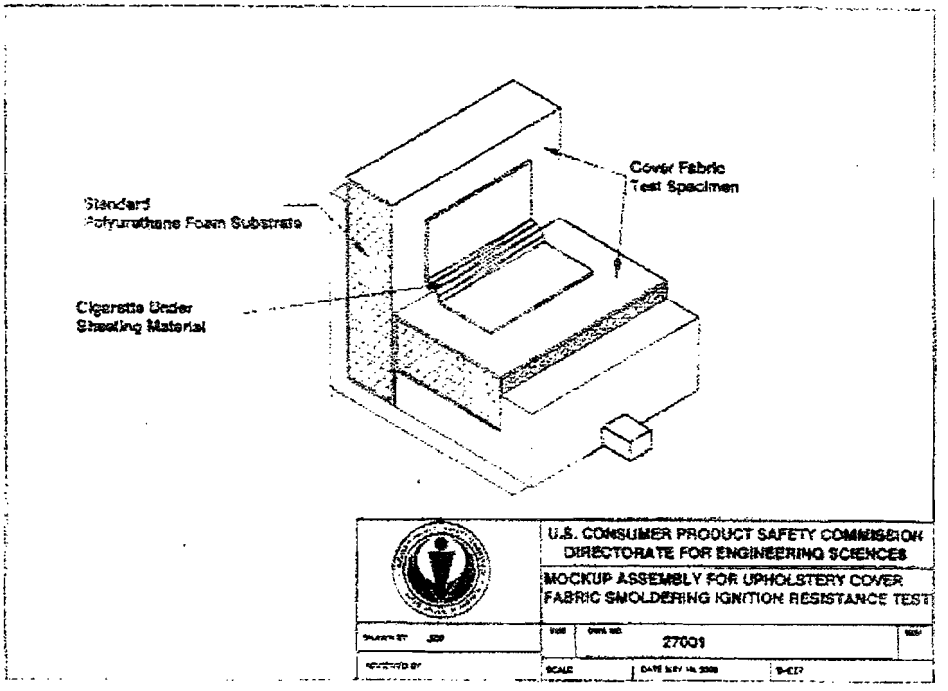


Figure 4 - Mockup Assembly for Interior Fire Barrier Material Smoldering Ignition Resistance Test

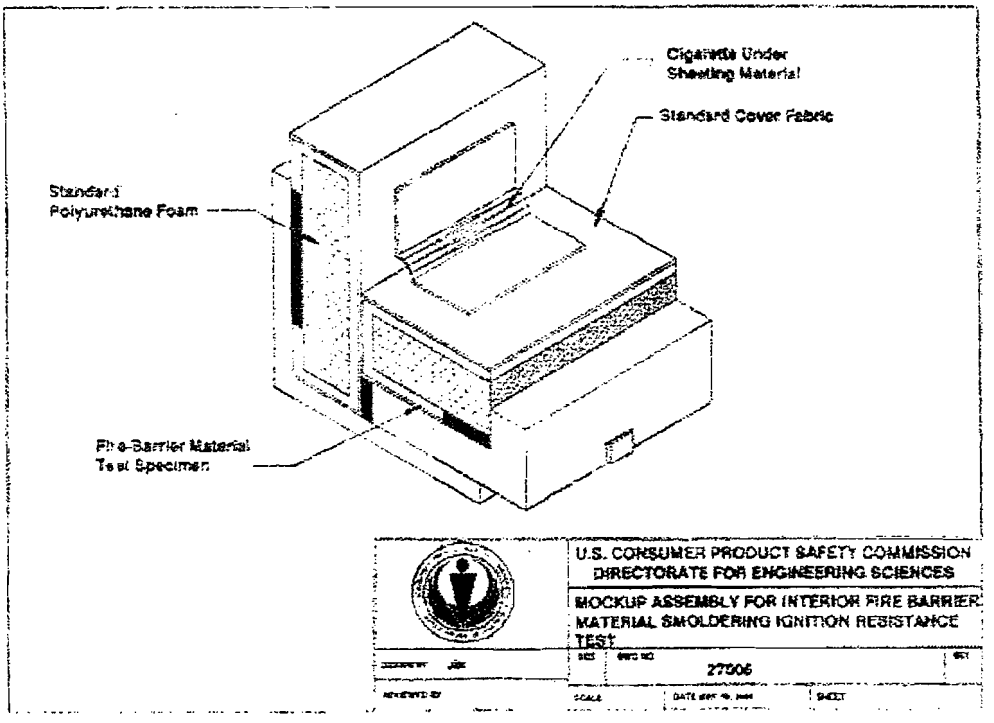


Figure 5 - Cut-Out Template Dimensions for Open Flame Test

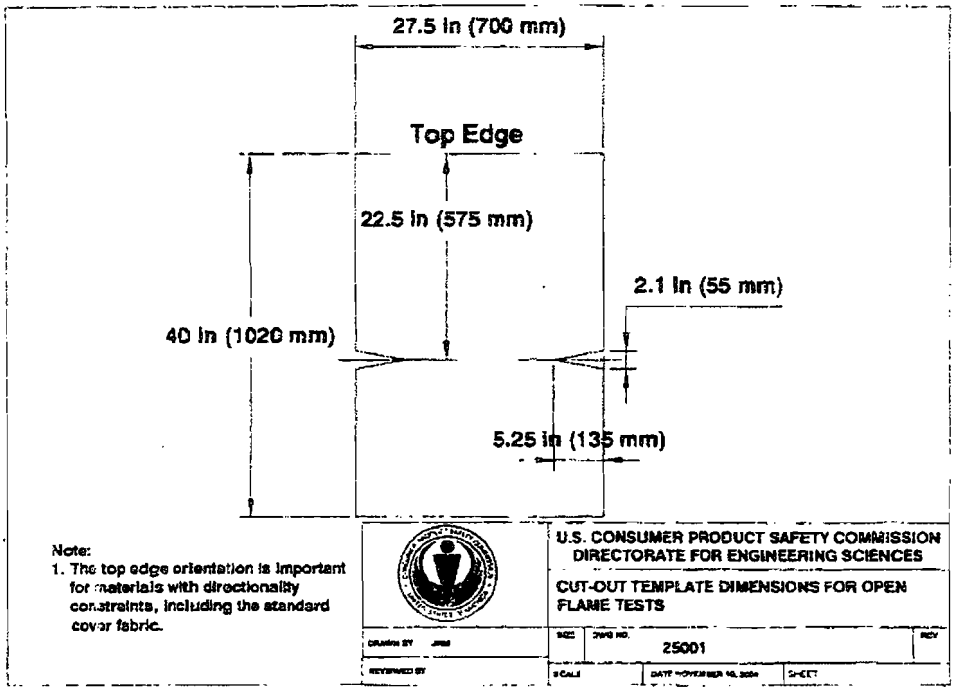
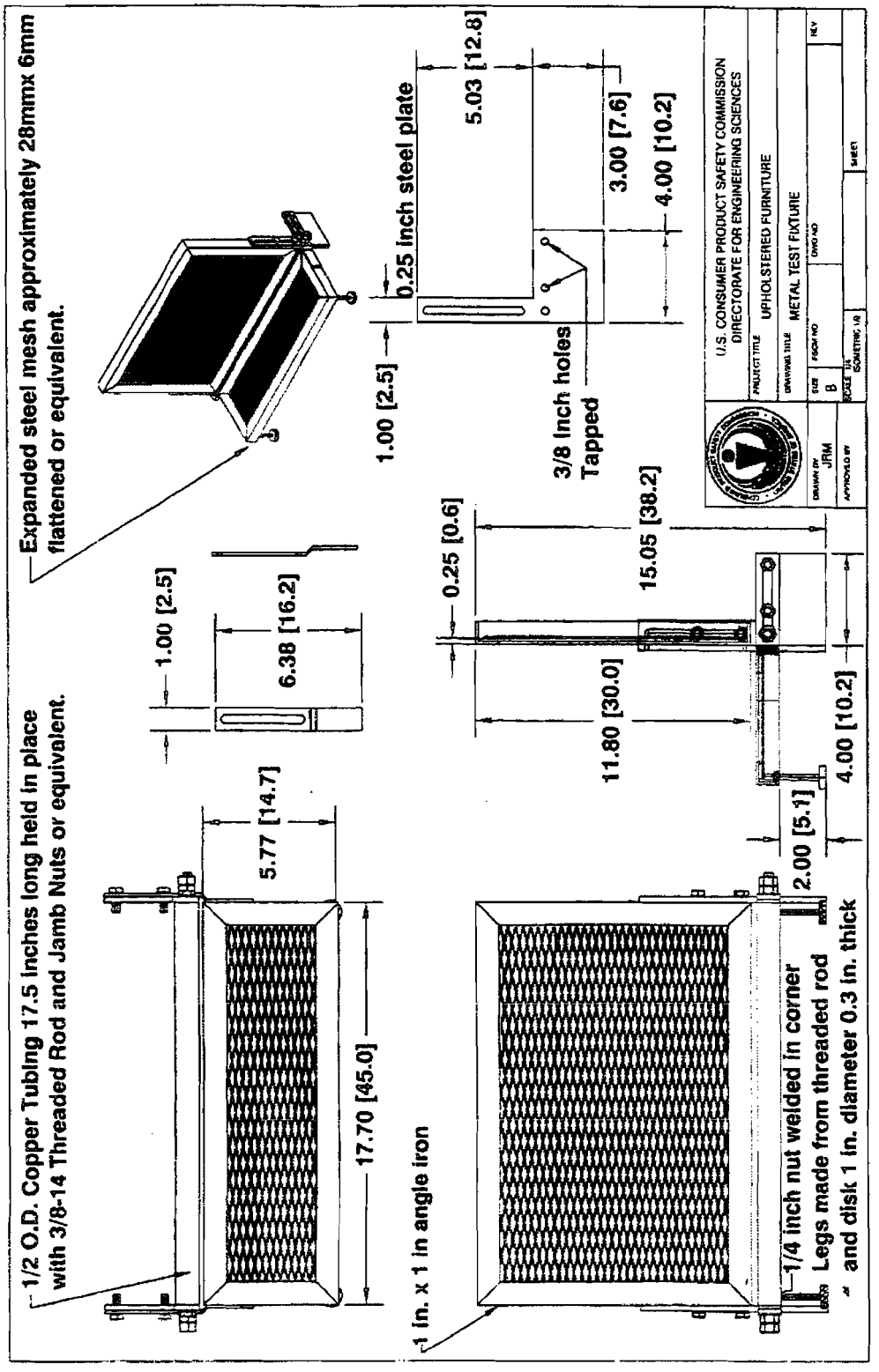


Figure 6 – Open Flame Metal Test Frame



[FR Doc. 08–768 Filed 3–3–08; 8:45 am]
BILLING CODE 6355–01–C

R6

Stevenson, Todd

From: buczekm@aol.com
Sent: Thursday, May 08, 2008 5:05 PM
To: CPSC-OS
Subject: Upholstered Furniture NPR Comments

I have had the opportunity to participate in the CPSC's Upholstered Furniture process on Upholstered Furniture for several years while working for one of the major chemical flame retardant suppliers and also as the past Chairman of the American Fire Safety Council. I am no longer affiliated with any individual company or association at this time, I am simply a consumer. I would like to compliment the CPSC Staff for moving forward with an NPR after several years of starts and stops and I understand how much pressure has been put on the CPSC from stakeholders, especially those with financial interests.

I have been involved in the evaluation of almost all the alternative proposals which the CPSC and even some Stakeholders have put forth. It is my opinion that the CPSC needs to move ahead with the proposed NPR at this time or lose all momentum for the project. I don't think moving ahead with the proposed NPR precludes further work by the staff on the development of a possible future open flame standard. However today the controversy that would accompany the attempt to include an open flame standard, both surrounding the test methods proposed and the concerns over flame retardant chemical toxicity which remain with some industry and consumer groups, would most likely be insurmountable and result in the demise of any Upholstered Furniture Standard and therefore result in no additional protection for consumers.

For the above reasons, I recommend that the CPSC move forward with the proposed NPR. At the same time, the CPSC staff should continue its work on developing an open flame test methodology for possible inclusion at a future date.

Thank you for the opportunity to comment on this NPR.

Mark Buczek

buczekm@aol.com

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Stevenson, Todd

From: dlekowski [dlekowski@neo.rr.com]
Sent: Thursday, May 08, 2008 4:42 PM
To: CPSC-OS
Subject: Upholstered Furniture NPR

How important is fire prevention to you? Do you believe that fires and burns are rare and only happen to other people and other families - therefore, you don't have to concern yourself with prevention?

Well apparently, that is what the US Consumer Product Safety Commission believes by proposing an inadequate flammability regulation pertaining to upholstered furniture. You can't just address part of the furniture fire problem and think it is good enough. You have the power to protect the public; unfortunately, it isn't the public's best interests you are protecting, it is the interests of the furniture industry. As a burn survivor, I find this to be offensive. I heard the furniture industry's weak arguments against being regulated when I testified before the California Bureau of Home Furnishings in 2003. All they care about is economics.

I have to ask, before making this inadequate ruling for upholstered furniture, did you obtain input from the fire service and burn survivors? Or was it just the furniture manufacturers you approached? Because I have to tell you, this ruling is like putting a band aid on a cancer; it isn't going to stop the cancer. Fires from candles and lighters will increase because you will require no protection against these sorts of ignition sources. When you decided on this course, did you take into consideration that the highly flammable polyurethane foam and other filling materials used in furniture would get a free ride and continue to flash over homes across the nation because you are afraid to require protection for these materials?

Shouldn't "Consumer Product Safety" mean just that? I don't find "Protect the Lobbyist" anywhere in your title, yet that is exactly what you are doing with your proposed rule on upholstered furniture. How can you live with yourselves?

Delores Lekowski (a concerned burn survivor)

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Stevenson, Todd

From: Mike Horowitz [MHorowitz@dir.ca.gov]
Sent: Friday, May 09, 2008 9:22 PM
To: CPSC-OS
Subject: Upholstered Furniture NPR

5/9/08

Office of the Secretary

Consumer Product Safety Commission

4330 East West Highway

Bethesda, MD 20814

Re: Upholstered Furniture NPR

While the CPSC is correct to envision a standard for flammability for upholstered furniture, I must urge you to think carefully before mandating PBDE products as part of the solution. Such products have long been mandated by the state of California, and the result has been the buildup of increasing levels or residual PBDE chemicals in the California environment and in homes. Recent studies have shown bioaccumulation of these products in humans, pets and wild animals.

--humans: high levels in Marin County residents

--high levels of dust in homes, and high levels found in pets living in those homes (Environmental Working Group sponsored study publicized in the last month or so).

--Just yesterday, a California government study that showed increasingly high levels of PBDE in urban based peregrine falcons was written about in the LA Times (http://www.latimes.com/news/local/la-me-birds9-2008may09,0,7041240,print.story). The disturbing thing about this study was the indication that the increased levels may be a reason for unhatched eggs and dead chicks.

If PBDE byproducts bioaccumulate in these ways, what is happening to the workers who manufacture, handle and apply these chemicals in much higher concentrations than found in the finished products? By making the use of these chemicals mandatory, will we be sentencing workers to illness and death?

There is much that can be done to reduce fabric fire hazards without applying PBDE chemicals to the fabrics. There are fire resistant fibers; there are certain weaves that resist fire initiation. Let's not make PBDE use mandatory unless and until we can be sure we will not be despoiling our own nests!

Thank you.

Sincerely,

Michael Horowitz

Senior Industrial Hygienist

Cal/OSHA Research and Standards Unit

510-286-7009

29

Stevenson, Todd

From: Irwin Gasner [igasner@wearbest.com]
Sent: Friday, May 09, 2008 12:31 PM
To: CPSC-OS
Subject: CPSC Response

Dear Sirs,

We would like to provide comments on the Consumer Products Safety Commission's proposed mandatory rule published in the March 4, 2006 federal Register - **16 CFR Part 1634 Standard for the Flammability of Residential Upholstered Furniture.**

Wearbest is a specialty upholstery fabric weaving mill in northern New Jersey. We pride ourselves for our design, innovation, and product technical performance. In this matter we offer a very broad array of woven fabrics for upholstery end use that contain many different yarns and fiber types. A portion of our product line includes products, which are highly cellulosic in content as referenced in this NPR summary.

We feel that the new NPR by CPSC regarding Flammability of Residential Upholstered Furniture is flawed in terms of the history to support such a need for the rule. It also does not properly incorporate all current industry best practices and initiatives. Additionally, the cost to a small business such as ours to maintain the type of testing that is being proposed is highly prohibitive.

1) Current Industry Practices - We have been involved in the discussions regarding furniture flammability for these last 20 years. The numbers we have seen have shown a dramatic decrease in the number of furniture related fires and deaths due to cigarette ignitions. A lot of this can be attributed to the UFAC program that has been in place for years and a lot is also due to the efforts focused in this area by the end item manufacturers leading to current industry best practices to help reduce furniture fires.

Many furniture manufacturers have already switched to FR foam in their upholstered furniture. This has not been considered in the CPSC summaries. Additionally, the use of a poly batting, which is also a standard item for many furniture manufacturers, is not considered and included as part of the tests. Our small scale testing on several highly cellulosic materials incorporating the use of poly battings and/or FR foam has shown that these fabrics will pass as Type 1 quite easily. Yet these are not an option under the new NPR.

2) Testing Costs - The test that is being proposed is very labor intensive and overkill on the number of samples required. Our small scale testing has shown that if a fabric is bad it will be very noticeable after the first set of 2-3 tests. The necessity to test 10 samples and then 20 samples is excessive and very costly.

CPSC has indicated a cost of roughly $50 per test. As a regulatory requirement, we will need to test all fabric designed for use in residential upholstery. For our company, and many companies like ours, this would require millions of dollars per year to be spent on testing just to verify fabrics pass Type I requirements. For products that do not pass as Type I, we can chose to go to the type II classification, but many of our customers do not want to use a fire barrier approach as mentioned by CPSC. Thus there will be a need to re-design and/or post treat the goods with an FR finish. Both efforts will then cost us additional monies that CPSC has not figured into their thinking.

3) RIP Cigarettes - The commission has also ignored current cigarette manufacturer's production practices. The cigarette that is being used by CPSC is no longer available in the US. All cigarette manufacturers have converted to or are in the process of converting to a new Reduced Ignition Propensity (RIP) cigarette. These cigarettes are designed to burn slower and help prevent smolder prone fabrics to progress to fire.

Further, any fire data (deaths, number of fires, etc....) is all based on the old cigarettes. So the impact of the new RIP cigarettes is not being considered or understood. Further, if a new test method is put in place the new RIP cigarettes should be the standard ignition source.

In our ever shrinking textile supply base, we think it is inappropriate for CPSC to try and institute a new rule such as this that is, not only very costly, but does not consider all the other industry practices that are already in place to help alleviate the concern of furniture fires due to smolder prone fabrics. CPSC has put all the responsibility of this requirement on the fabric suppliers without understanding the consequences it will have on our industry.

The bottom line is, if this standard was put into regulation as it is currently written it would completely render obsolete the woven upholstery industry in the U.S. putting thousands out of work.

Regards,

Irwin Gasner
President

Irwin Gasner
President

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Withdrawal Form - 31

April 11, 2008

Consumer Product Safety Commission
Office of the Secretary
4330 East West Highway
Bethesda, MD 20814

To Whom It May Concern:

I am greatly concerned of the direction that the CPSC is moving in reference to fire safety standards on residential furniture.

The reduction in fire deaths has been the result of the use of approved and studied chemical flame retardants. To now eliminate this important tool will result in an increase in fire deaths and property damage.

I recently became well aware of these type fire safety related issues, as it was discussed recently and defeated in the Alaska legislature. It was a move in the wrong direction in Alaska and no doubt the same for the CPSC. So, please oppose lessening of existing fire safety standards.

Thank you for your consideration.

Stephan Patterson

Stephan Patterson
Box 2487
Anchorage, AK99510

HOME FIRES THAT BEGAN WITH UPHOLSTERED FURNITURE

Marty Ahrens
Fire Analysis and Research Division
National Fire Protection Association

May 2008

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
www.nfpa.org

HOME FIRES THAT BEGAN WITH UPHOLSTERED FURNITURE

Marty Ahrens
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May 2008

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Abstract

Based on data from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey, NFPA estimates that during 2002-2005, upholstered furniture was the item first ignited in an average of 7,630 reported home structure fires per year. (Homes include one- and two-family dwellings, apartments or other multiple family dwellings, and manufactured housing.) These fires caused an estimated annual average of 600 civilian deaths, 920 civilian injuries and $309 million in direct property damage. Upholstered furniture is the leading item first ignited in home fire deaths. Although upholstered furniture fires started by smoking materials have fallen sharply since 1980, smoking materials remain the leading cause of these fires and associated losses.

Keywords: upholstered furniture; small open flame; fires; home fires, fire causes, fire statistics; smoking materials, smoke alarms.

Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this analysis are available from:

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NFPA No. USS56

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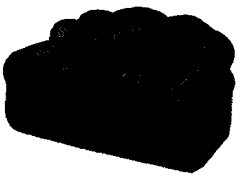


Home Fires that Began with Upholstered Furniture

In 2002-2005, U.S. fire departments responded to an average of 7,630 home structure fires per year in which upholstered furniture was the first item ignited. These fires caused an annual average of 600 civilian fire deaths, 920 civilian fire injuries, and $309 million in direct property damage.

On average, one of every 13 upholstered furniture fires resulted in death.

Overall, fires beginning with upholstered furniture accounted for 2% of reported home fires but 21% of home fire deaths.

Major Causes of Upholstered Furniture Fires

Smoking materials remain the leading cause of upholstered furniture fires and losses.

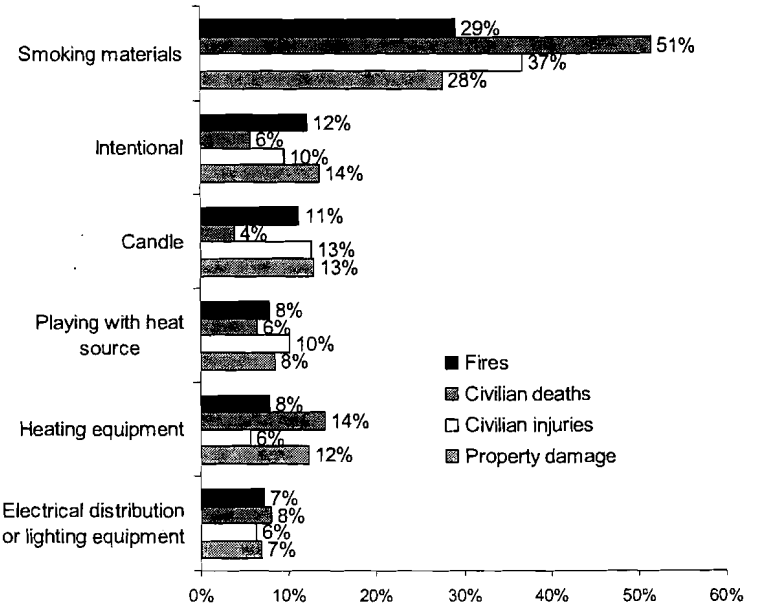
- One of every seven upholstered furniture fires started by smoking materials resulted in death.

Together, candles, matches and lighters were involved in 22% of the fires and 12% of the deaths.

- On average, one of every 23 such fires resulted in death.

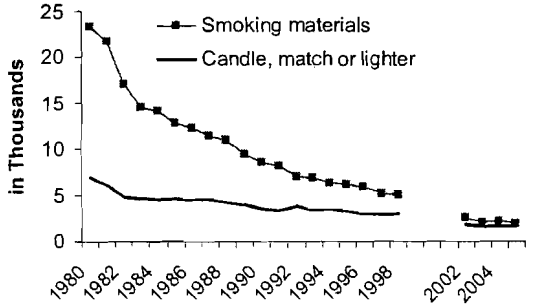
Portable and fixed space heaters were involved in 6% of the upholstered furniture fires and 12% of the associated deaths.

Electrical failures or malfunctions were factors in 14% of the home upholstered furniture fires and deaths. These failures were in all types of electrical appliances, not just electrical distribution or lighting equipment.

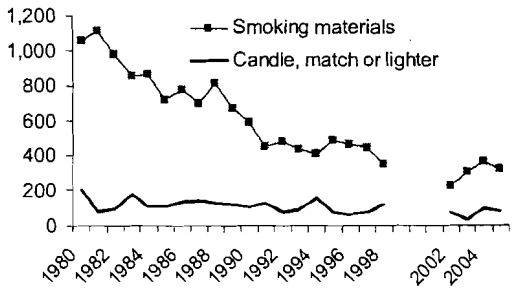


Upholstered furniture fires started by smoking materials and associated deaths fell sharply since 1980. The decline in upholstered furniture fires started by candles, matches or lighters was not as sharp. No clear trend was seen for upholstered furniture deaths from candles, matches and lighters.

Home Upholstered Furniture Fires Started by Smoking Materials vs. Candles, Matches and Lighters, by Year



Civilian Deaths from Home Upholstered Furniture Fires Started by Smoking Materials vs. Candles, Matches and Lighters, by Year



Executive Summary

During 2002-2005, upholstered furniture was the item first ignited in an average of 7,630 reported home structure fires per year. These fires caused an estimated annual average of 600 civilian deaths, 920 civilian injuries and $309 million in direct property damage. Overall, fires beginning with upholstered furniture accounted for 2% of reported home fires but 21% of home fire deaths.

Upholstered furniture fires in the home environment have decreased sharply, with a very large decrease seen in fires started by smoking materials. However, upholstered furniture remains the leading item first ignited in home fire deaths. Smoking materials remain the leading heat source. Voluntary standards have played a role in reducing these fires and deaths, but mandatory standards have been proposed to reduce them further. In the early 1980s, more than three times as many upholstered furniture fires were started by smoking materials as by candles, matches or lighters. That gap narrowed considerably over time. Upholstered furniture fires from candles, matches and lighters have also declined, but not as sharply. Deaths from these small flame ignitions show no clear pattern, but are much less frequent than deaths from upholstered furniture fires started by smoking materials.

The term "upholstered furniture" is not further defined in the National Fire Incident Reporting System (NFIRS), the source of detailed data about these fires. The CPSC uses a narrower definition in its proposed flammability standard. Furniture that is intended for outdoor use would not be covered under that standard. In 2002-2005, an average of 1,690 fires per year on home properties were either coded

a) with incident types identifying the fire as outside or unclassified, or
b) as structure fires that began in outside or open spaces such as balconies, patios or by exterior walls.

Assessing the probable impact of standards is challenging. Upholstered furniture is a durable product. New furniture is likely to meet current standards. Over time, things get spilled on the furniture, the fabric may wear out, and the furniture may pass to a different household. It is important to remember that these statistics are based on all upholstered furniture ranging from very old and heavily used to newly purchased and never used.

Changes in the environment also complicate the issue. Homes are much more likely to have smoke alarms today than they were in 1980. This means that more fires may be discovered before fire department assistance is required. The CPSC required lighters to be child-resistant beginning in 1994, resulting in a drop in fires started by children playing. The increase in candle sales in the 1990s was accompanied by an increase in candle fires. New materials enter the marketplace. "Fire-safe" cigarettes that extinguish in minutes when not inhaled are required in increasingly more states.

While playing with fire dominates the candle, match or lighter scenarios for small open flames, a candle flame is likely to impinge on the furniture differently than a match or lighter held by a child. Intentional fires are often excluded from the discussion, but the

large number of intentional fires that had playing with heat source as a contributing factor suggest that these fires may be intentionally set by children, not determined arsonists.

Many upholstered furniture fires were not started by smoking materials or open flames. For example, 15% of the upholstered furniture fires and 22% of the associated deaths involved either heating equipment or electrical distribution or lighting equipment. Equipment such as heaters or cords may be under or adjacent to the furniture. Scenarios with convective or radiant heat transfer should be included in the discussions.

Home Fires Beginning with Upholstered Furniture

Overview

On average, 7,630 home structure fires began with upholstered furniture each year. During the four-year period of 2002-2005, upholstered furniture was the item first ignited in an estimated average of 7,630 reported home structure fires per year. These fires caused an annual average of 600 civilian deaths, 920 civilian fire injuries, and $309 million in direct property damage.

Homes include one- and two-family dwellings, manufactured housing, apartments, tenements, flats, townhouses and row houses, regardless of ownership. The term "civilian" is used to describe anyone who is not a member of the fire service.

Upholstered furniture has been the leading item first ignited in home fire deaths for years. On average, one of every 13 upholstered furniture fires resulted in death.

Statistics are derived from NFIRS and NFPA's annual fire department survey. The national estimates in this analysis are projections based on fire department assessments of cause, circumstances, and occupancy. These estimates are derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and NFPA's annual fire department survey. Upholstered furniture was identified by item first ignited code 21, which captures upholstered sofas, chairs and vehicle seats.[1] In the Consumer Product Safety Commission's 2008 notice of proposed rulemaking on residential furniture flammability, a narrower definition is used that includes only furniture intended for indoor use that is constructed with a contiguous upholstered seat and back or arms.[2]

Only fires reported to public fire departments are included in the statistics in this analysis. Only details from Version 5.0 of NFIRS were used in the 2002-2005 estimates in this analysis. Data originally collected in earlier versions were used only in the trend tables for 1980-1998. The total number of home upholstered furniture structure fires was taken from NFPA's report, *Home Structure Fires.*[3] This estimate includes a proportional share of fires in which the item first ignited was unknown or not reported. Percentages calculated from the details in NFIRS 5.0 were applied to the projections of home fires and losses derived from NFPA's survey. In the analysis that follows, fires and losses with missing or unknown data were allocated proportionally among fires with known data.

---

[1] U.S. Fire Administration National Fire Data Center. National Fire Incident Reporting System 5.0, Complete Reference Guide, January 2006.

[2] U.S. Consumer Product Safety Commission. "16 CFR Part 1634: Standard for the Flammability of Residential Upholstered Furniture: Notice of Proposed Rulemaking," *Federal Register,* March 4, 2008, p. 11703.

[3] Marty Ahrens. *Home Structure Fires.* Quincy, MA: National Fire Protection Association, September 2007.

NFIRS 5.0 includes six categories of confined structure fires, identified by incident type. For cooking fires confined to the cooking vessel, confined chimney or flue fires, confined incinerator fires, confined fuel burner or boiler fires or delayed ignitions, confined commercial compactor fires, and trash or rubbish fires in a structure with no flame damage to the structure or contents, little more than basic dispatch data and property use is required by the NFIRS 5.0 system. These confined fires were excluded from the analysis of upholstered furniture fires. Appendix A describes the methodology used. Tables supporting the text are provided at the end of this analysis.

21% of home structure fire deaths resulted from fires that began with upholstered furniture.

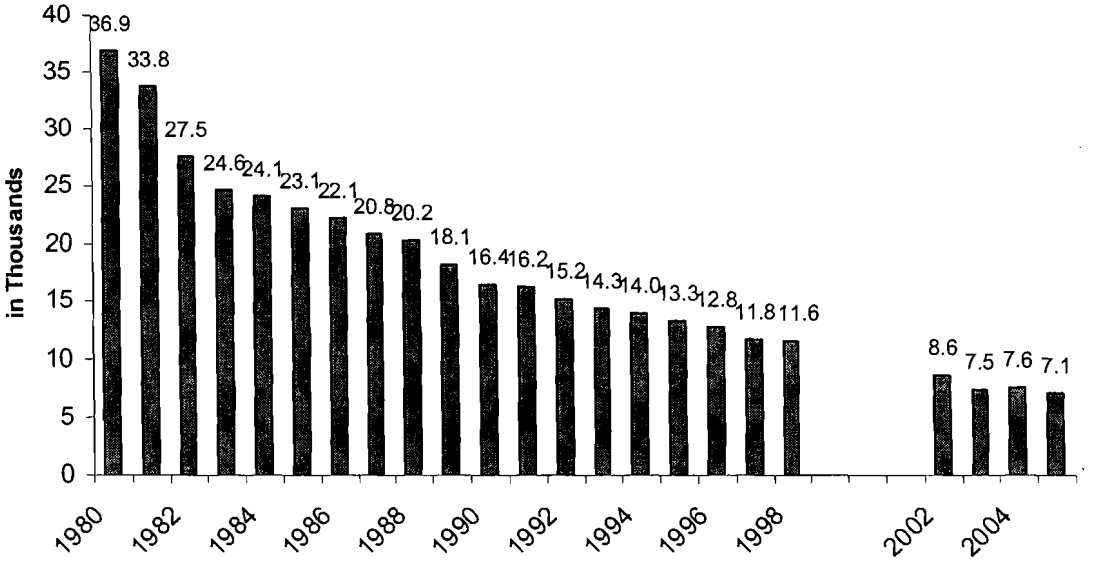
During 2002-2005, U.S. fire departments responded to an estimated average of 377,100 home structure fires per year. These incidents caused an average of 2,870 civilian deaths, 13,360 civilian fire injuries, and $5.9 billion in direct property loss per year. The 7,630 fires that began with upholstered furniture accounted for an average of 2% of the reported home structure fires, 21% of the home civilian structure fire deaths, 7% of the civilian structure fire injuries, and 5% of the structure fire direct property loss per year.

Since 1980, these structure fires fell 81%.

As shown in Table 1 and Figure 1, home structure fires beginning with upholstered furniture fell 81% from a high of 36,900 in 1980 to 7,100 in 2005, the lowest point in the 26 years of data. From 2004 to 2005, these fires fell 3%. Details collected in NFIRS 5.0 were used to derive the estimates from 1999 on. Due to the small portion of fires originally collected in NFIRS 5.0 during 1999-2001, estimates for these years are omitted from the trend graphs.

Total home structure fires fell 48% from 1980 to 2005. From 2004 to 2005, total home structure fires fell 4%.

Figure 1. Home Structure Fires that Began with Upholstered Furniture, by Year

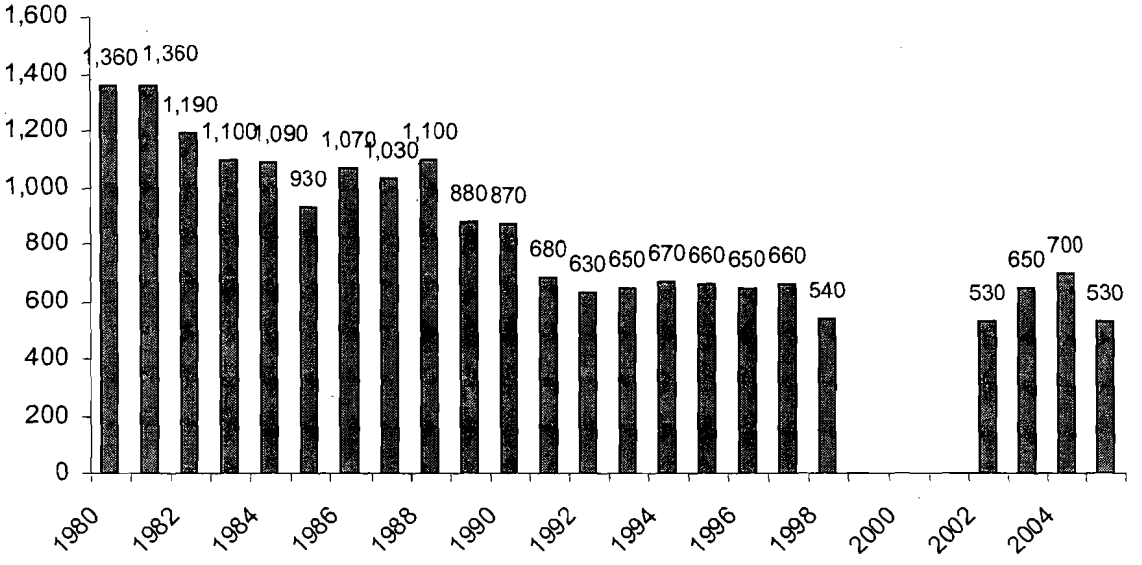


Source: NFIRS and NFPA survey.

Upholstered furniture fire deaths declined sharply in the 1980s, then hit a plateau. Deaths resulting from home structure fires beginning with upholstered furniture were at their highest in 1980 and 1981, with an estimated 1,360 such deaths both years. Figure 2 shows that deaths hit a plateau in the 1990s at roughly half the 1981 and 1982 highs. The 2002-2005 average is only 4% lower than the 1995-1998 average and 56% below the peak. The 530 deaths reported in 2005 is 61% lower than the highs in 1980 and 1981, and 23% lower than the 14-year peak of 700 reported in 2004.

The average number of civilian fire deaths from all home structure fires fell 42% from 1980 to 2005 and 5% from 2004 to 2005.

Figure 2. Civilian Fire Deaths Resulting from Home Structure Fires that Began with Upholstered Furniture, by Year



Source: NFIRS and NFPA survey.

Vast majority of upholstered furniture fires began with fabric.
Table 2 shows that fabric, fiber or finished goods made of cotton, blends, rayon or wool was the type of material first ignited in roughly three-quarters of these fires and associated losses. In 14% of the fires and 12% of the deaths, an unclassified fabric, textile or fur was first ignited.

56% of upholstered furniture deaths resulted from fires in the living room, family room or den.
Table 3 shows that 39% of the home structure fires that began with upholstered furniture started in the living room, family room, or den. These fires caused 56% of the associated civilian deaths, 48% of the civilian injuries, and 41% of the direct property damage. Roughly one-quarter of the fires and associated losses began in an unclassified function area. The 15% that started in a bedroom caused 8% of the deaths.

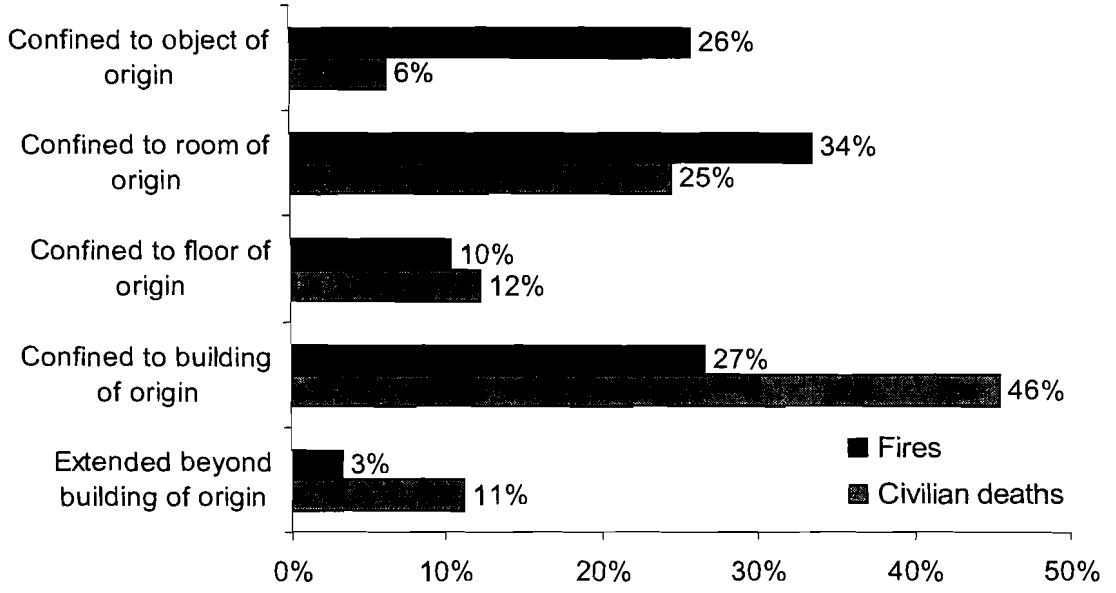
On average, 1,690 upholstered furniture per year were outside or unclassified fires or began in outside structural areas.

In 2002-2005, an annual average of 1,360 fires on home properties began with upholstered furniture and had incident types identifying the fire as outside or unclassified. In addition, an average of 330 home structure fires per year began in outside or open spaces. Table 3 shows that an annual average of 160 (2%) began on exterior balconies or unenclosed porches; 60 (1%) began on a courtyard, terrace or patio; another 60 began at an exterior wall; and 50 (1%) started in an unclassified outside area. Combined, these 1,690 fires caused an average of seven civilian deaths, 31 civilian injuries, and $16 million in direct property damage per year. A few of the incidents described in Appendix B reference upholstered furniture on the porch. Such furniture may have been purchased specifically for porch use or old furniture may have been relegated there.

Flame damage was limited to the room of origin in almost one-third of home upholstered furniture fire deaths.

Figure 3 and Table 4 show that that the 60% of home upholstered furniture fires with flame damage confined to the object or room of origin resulted in 31% of the associated civilian deaths.

Figure 3. Home Structure Fires that Began with Upholstered Furniture By Extent of Flame Damage: 2002-2005



Source: NFIRS and NFPA survey.

Upholstered furniture ranked second in item contributing most to flame spread for fire deaths.

NFIRS 5.0 collects information about the item contributing most to flame spread. However, if no flame spread occurred, if the item contributing most to flame spread is the same as the item first ignited, or if the item contributing most to flame spread is unknown, a box may be checked and the section skipped. In some cases, data were entered even when not required. Because of these limitations, national estimates were

not calculated. Based on the known data entered in this field, upholstered furniture was the item contributing most to flame spread in 5% of the non-confined home structure fires, 16% of the associated civilian deaths, 9% of the civilian injuries, and 5% of the direct property damage. Upholstered furniture ranked fifth in item contributing most to flame spread for fires and direct property damage, second in civilian deaths and third in civilian injuries. (Structural member or framing ranked first across all loss measures.)

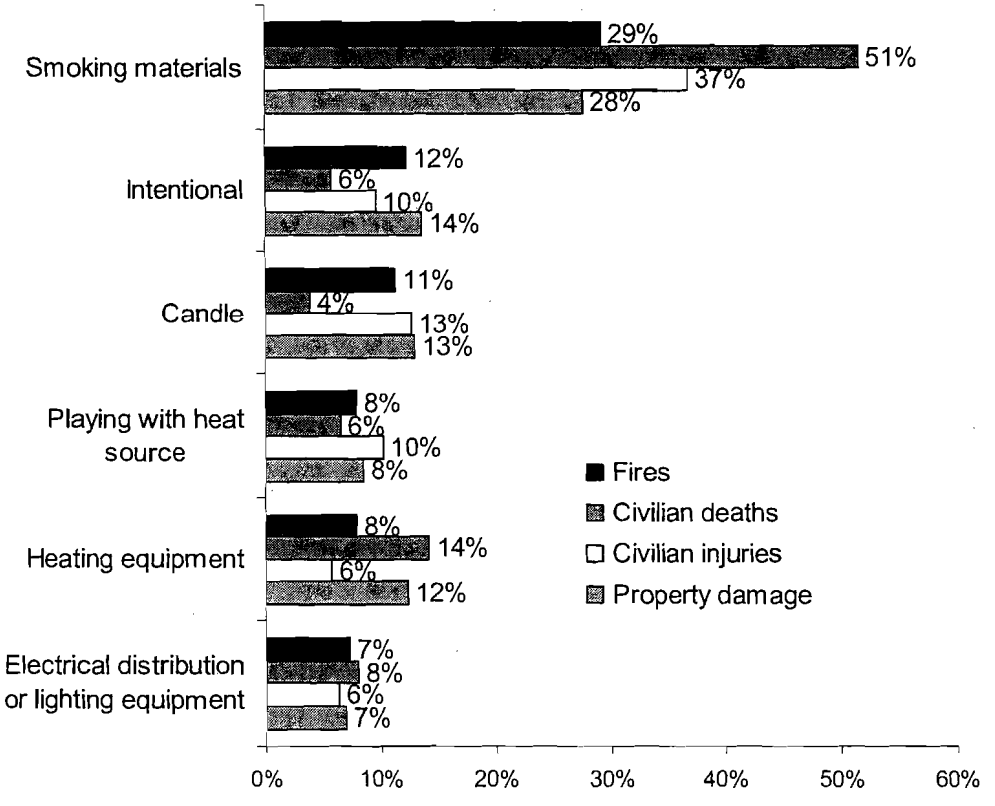
When the item first ignited was upholstered furniture, the item contributing most to flame spread was also upholstered furniture in 71% of the fires, 62% of the deaths, 70% of the injuries, and 56% of the direct property damage.

When the item contributing most to flame spread was upholstered furniture, the item first ignited was upholstered furniture in 66% of the fires and injuries, 75% of the deaths, and 59% of the direct property damage.

Smoking materials are the leading cause of upholstered furniture fires and associated losses.

Smoking materials were the heat source in an average of 2,220, or 29%, of the home structure fires that began with upholstered furniture per year. These fires resulted in an annual average of 310 (51%) civilian deaths, 340 (37%) of the civilian injuries, and $85 million (28%) in direct property damage.

Figure 4. Major Causes of Home Structure Fires that Began with Upholstered Furniture: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

Figure 4 shows the leading causes of fires in these properties with data summarized from several NFIRS fields. In some cases, the equipment involved in ignition is most relevant; heat source, the field "cause" (as opposed to this summary of "major causes" from multiple fields) and factor contributing to ignition also provide relevant information. The causal factors shown in this graph are not mutually exclusive when they have been pulled from different fields.

More detailed information on details from the cause of ignition field may be found in Table 5, factor contributing to ignition in Table 6, more information on heat source is shown in Table 7, and additional information on equipment involved in ignition is found in Table 8. More detailed information on the definitions and methodology used to create this graph is found in Appendix C.

Appendix B includes a collection of previously published incident descriptions grouped by scenario. Examples are included of fires started by smoking materials, open flames, heating equipment, electrical distribution or lighting equipment, and other causes. In most of these cases, upholstered furniture was the item first ignited. In others, the fire spread to upholstered furniture. These incidents are included to show what *can* happen, not what is typical. The incidents that are included are more likely to be serious than the typical fire. However, narratives can provide more detailed information about how different heat sources actually ignite the furniture.

Twelve percent of the home upholstered fires were intentionally set.
On average, 930 (12%) of the home upholstered furniture fires were intentionally set per year. These incidents caused an average of 30 (6%) of the associated civilian deaths, 90 (10%) of the civilian injuries, and $42 million (14%) in direct property damage.

Candles started 11% of these fires.
Candles were the heat source in an average of 860 (11%) home upholstered furniture fires per year, resulting in an average of 20 (4%) civilian deaths, 120 (13%) of the civilian injuries, and $40 million (13%) in direct property damage per year.

Someone playing with fire started 8% of the home upholstered furniture fires.
Six hundred (8%) home upholstered furniture fires per year, on average, were caused by someone, typically a child, playing with fire or other heat source. These fires caused an average of 40 (6%) civilian deaths, 90 (10%) civilian injuries, and $26 million (8%) in direct property damage per year. As mentioned earlier, factors from different fields overlap. Roughly one-third of the upholstered furniture fires started by playing were intentionally set. The share was comparable for the associated losses.

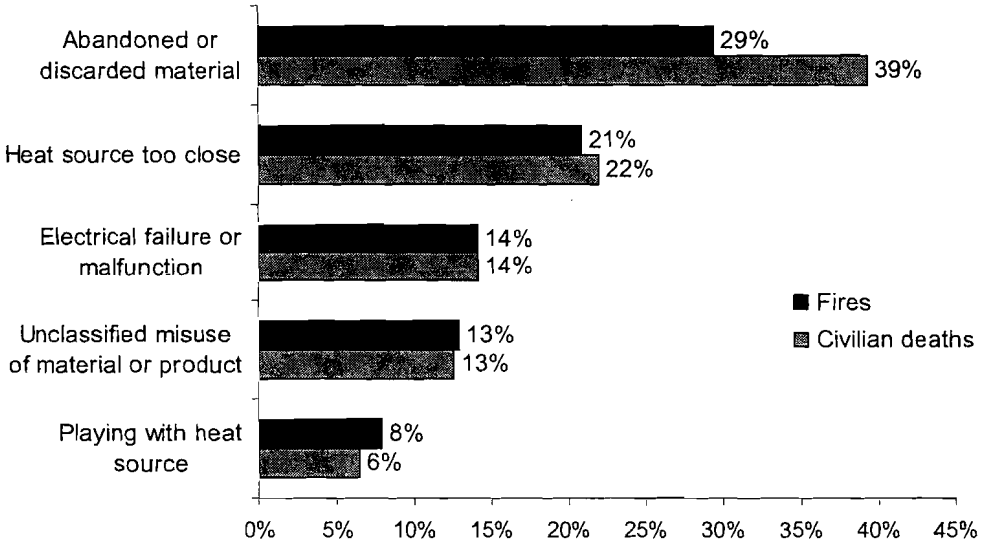
Portable or fixed space heaters were involved in 12% of the home upholstered furniture fire deaths.
Heating equipment, including unclassified heating and ventilation equipment, was involved in an estimated average of 600 (8%) home upholstered furniture fires per year. These fires caused an average of 80 (14%) civilian deaths, 50 (6%) civilian injuries, and $38 million (12%) in direct property damage. Portable and fixed space heaters, including

wood stoves, were involved in an annual average of 440 (6%) upholstered furniture fires. These fires caused 70 (12%) of the associated deaths.

Electrical distribution or lighting equipment was involved in 7% of the home upholstered furniture fires.
Electrical distribution or lighting equipment was involved in an annual average of 560 (7%) reported home fires that began with upholstered furniture. These fires caused an average of 50 (8%) civilian deaths, 60 (6%) civilian injuries, and $22 million (7%) in direct property damage. Cords and plugs accounted were involved in an average of 200 of these fires and 30 of the associated deaths per year. Lamps and other lighting equipment were also involved in an average of 200 fires per year, but only 10 deaths year. Wiring, switches or outlets were involved in an average of 120 of these fires and 10 associated deaths a year.

Abandoned or discarded material is the leading factor contributing to ignition.
The field "factor contributing to ignition" explains how the heat source interacted with the fuel source to start a fire. Figure 5 and Table 6 show that the leading factor for home upholstered furniture fires was abandoned or discarded material. This factor is often used to describe discarded cigarettes. Upholstered furniture was too close to a heat source such as a candle or heater in roughly one-fifth of the fires and deaths. Electrical failures or malfunctions from all types of equipment powered by electricity, not just electrical distribution or lighting equipment, were factors in 14% of home structure fires that began with upholstered furniture per year as well as 14% of the associated civilian deaths.

Figure 5. Home Structure Fires that Began with Upholstered Furniture By Leading Factor Contributing to Ignition: 2002-2005

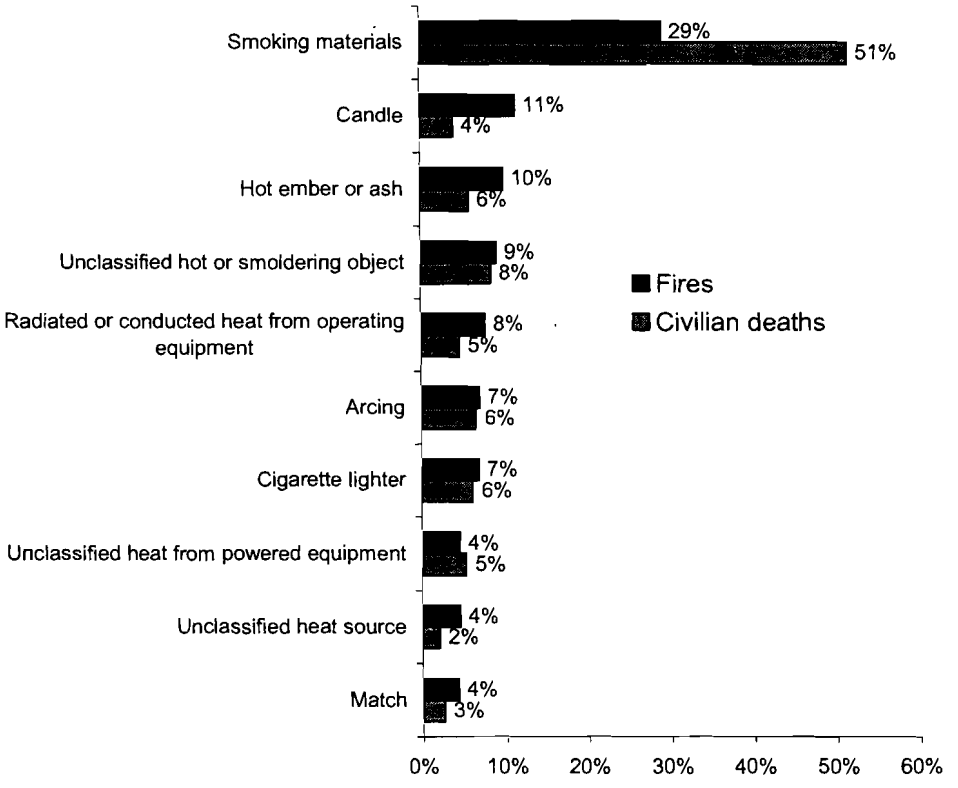


Source: NFIRS 5.0 and NFPA survey.

A wide variety of heat sources started these fires.
Figure 6 and Table 7 show that a wide variety of heat sources are involved in home upholstered furniture fires. As mentioned previously, smoking materials were the leading heat source in upholstered furniture fires and all associated loss measures. Candles

started 11% of the incidents. Hot embers or ashes started 10% of the fires; these resulted in 6% of the associated deaths. The source of embers or ashes is not specified. Nine percent of the fires were started by unclassified hot or smoldering objects. Together, candles, matches and lighters were involved in 22% of the fires and 12% of the deaths.

Figure 6. Home Structure Fires that Began with Upholstered Furniture By Leading Heat Sources: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

Fires Started by Smoking Materials vs. Candles, Matches or Lighters

Existing and proposed flammability requirements for upholstered furniture focus on fires started by either smoking materials or small open flames. This part of the analysis focuses on the circumstances of the two categories. Because the numbers are smaller than in the category as a whole, casualties are rounded to the nearest one. Because their share of the problem differs, the estimated annual average number of fires or deaths (including projections and allocation of unknown data and projections) is shown in the non-trend graph legends.

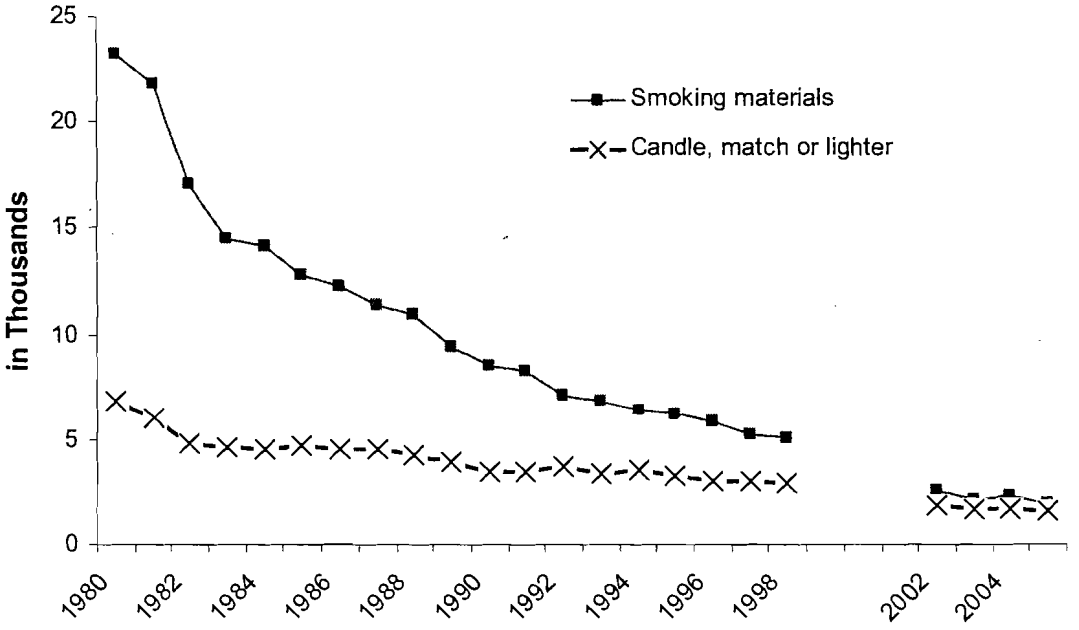
The 2,220 home upholstered furniture fires started by smoking materials resulted in an annual average of 309 deaths. On average, one of every seven such fires resulted in death.

In 2002-2005, candles, matches and lighters started an estimated average 1,690 home upholstered furniture fires annually, resulting in an average of 75 deaths per year. On average, one of every 23 such fires resulted in death.

Twelve times as many upholstered furniture fires were started by smoking materials in 1980 as in 2005.

Figure 7 and Table 9 show that home upholstered furniture fires started by smoking materials fell 92% from a high of 23,300 in 1980 to a low of 2,000 in 2005. Figure 8 and Table 10 show that home upholstered furniture fires started by candles, matches or lighters fell 76% from a high of 6,900 in 1980 to a low of 1,600 in 2005. In the early 1980s, more than three times as many upholstered furniture fires were started by smoking materials as by candles, matches or lighters. That gap narrowed considerably over time.

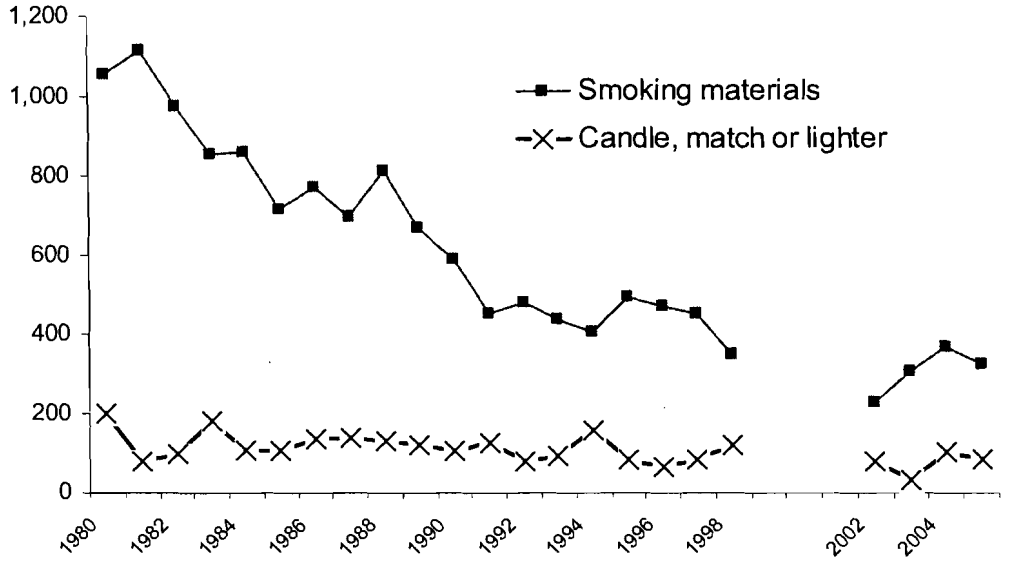
Figure 7. Home Upholstered Furniture Fires Started by Smoking Materials and Candles, Matches and Lighters, by Year: 1980-2005



Source: NFIRS and NFPA survey.

Figure 8 shows that the 330 deaths resulting from home upholstered furniture fires started by smoking materials in 2005 was 69% lower than the 1,060 such deaths in 1980. No clear pattern is seen for deaths resulting from upholstered furniture fires started by candles, matches or lighters. However, the number of these deaths is much lower than the number from smoking materials.

Figure 8. Civilian Deaths Resulting from Home Upholstered Furniture Fires Started by Smoking Materials and Candles, Matches and Lighters, by Year: 1980-2005

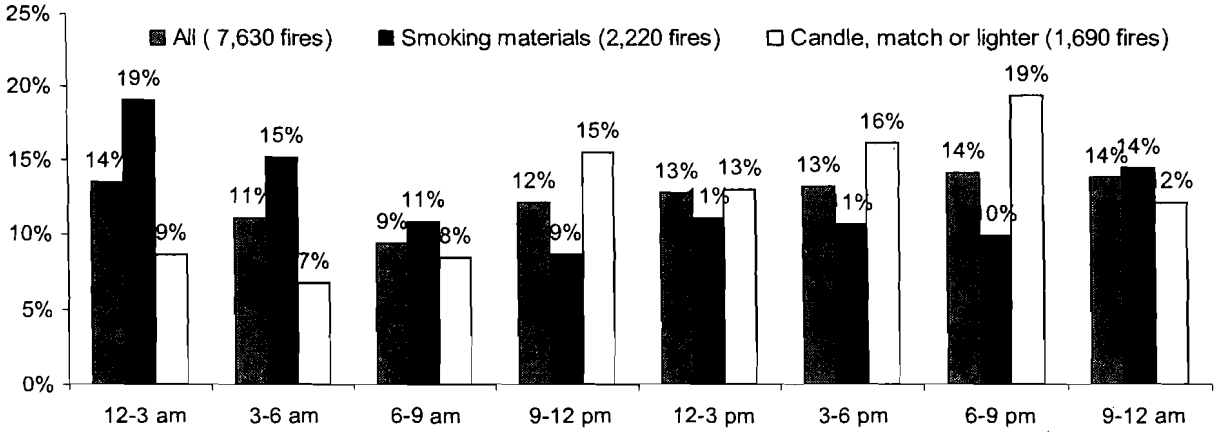


Source: NFIRS and NFPA survey.

Time patterns differ by heat source.

Figure 9 shows that upholstered furniture fires started by smoking materials were more common late at night and in the early morning, while fires started by candles, matches or lighters were less common during those hours.

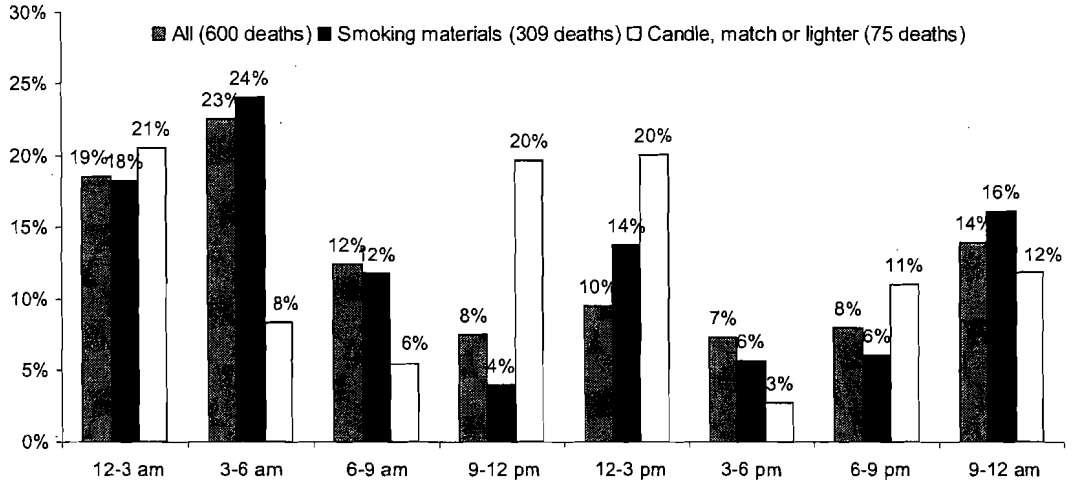
Figure 9. Home Upholstered Furniture Fires by Time of Alarm and Smoking Materials vs. Candles, Matches and Lighters: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

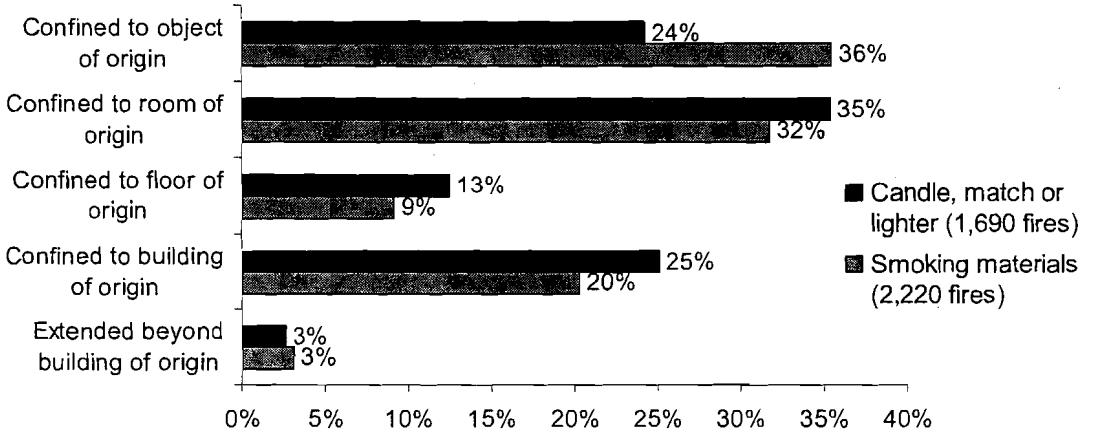
A similar pattern is seen for deaths resulting from these fires. Deaths from fires started by smoking materials peak in the early morning hours, while deaths from upholstered furniture fires started by candles, matches and lighters peak between 9:00 am and 3:00 p.m.

Figure 10. Home Upholstered Furniture Fire Deaths by Time of Alarm and Smoking Materials vs. Candles, Matches and Lighters: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

Figure 11. Home Upholstered Furniture Fire Deaths by Extent of Flame Damage and Smoking Materials vs. Candles, Matches and Lighters: 2002-2005



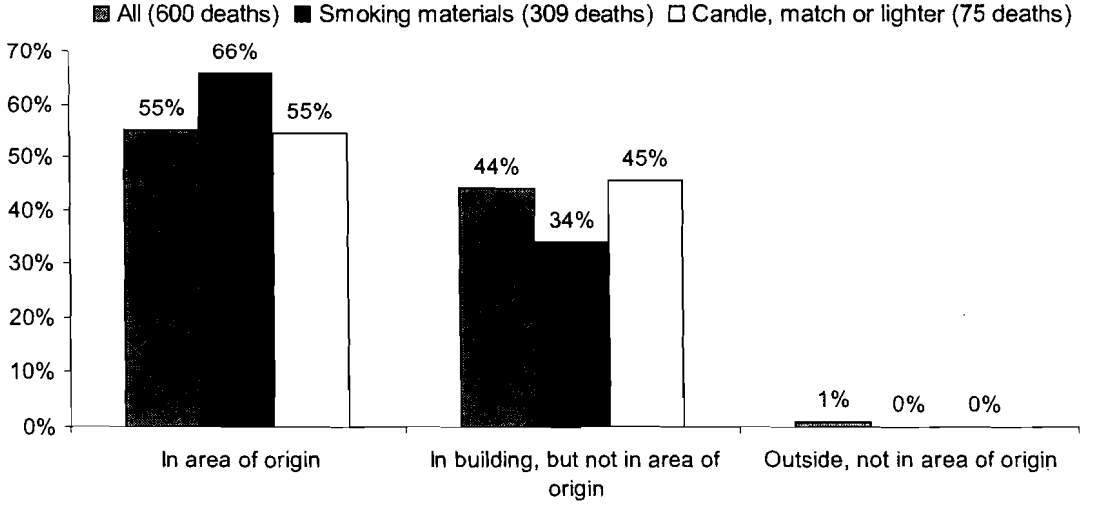
Source: NFIRS 5.0 and NFPA survey.

More than one-third of smoking material deaths from upholstered furniture fires resulted from fires with flame damage limited to the room of origin.
Tables 11 and 12 show that there is relatively little difference in extent of flame damage in fires started by the two different categories of heat source. However, Figure 11 shows that flame damage was confined to the object or room of origin in 37% of the deaths from upholstered furniture fires started by smoking materials compared to only 11% of the deaths resulting from fires started by candles, matches or lighters.

A wider variety of factors contributing to ignition is seen for fires started by candles, matches or lighters.
Table 13 shows that abandoned or discarded materials or products were contributing factors in almost two-thirds of the home upholstered furniture fires started by smoking materials. Table 14 shows that playing with heat source was a factor in one-third of the upholstered furniture fires started by candles, matches and lighters, and 57% of the associated deaths. A heat source too close to the furniture was a factor in 31% of these fires and 21% of the associated deaths.

Only 2% of the upholstered fires started by smoking materials were intentionally set. These fires caused 1% of the associated deaths. In contrast, 24% of the upholstered material fires started by candles, matches or lighters were intentionally set. These incidents caused 27% of the associated fatalities. However, playing with heat source was a contributing factor in three-quarters of these intentional fires and two-thirds of the associated deaths.

Figure 12. Home Upholstered Furniture Fire Deaths by Victim's Location at Time of Fatal Injury and Smoking Materials vs. Candles, Matches and Lighters: 2002-2005



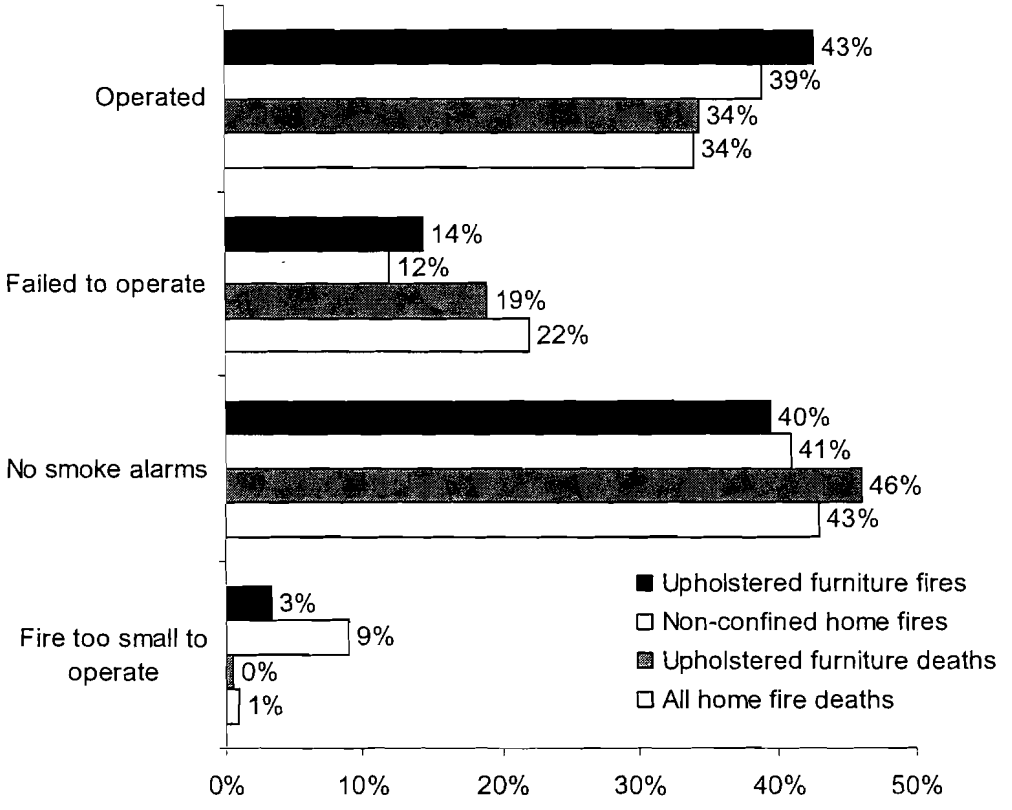
Source: NFIRS 5.0 and NFPA survey.

Victims of upholstered furniture fires started by smoking materials were more likely to have been in the room of origin.
Figure 12 shows that 66% of the fatalities in upholstered furniture fires started by smoking materials were in the area of origin when fatally injured compared to only 55% of the victims of fires started by candles, matches or lighters.

Smoke Alarms and Home Upholstered Furniture Fires

Little difference is seen between smoke alarm status in upholstered furniture fires vs. home fires overall.
Figure 13 and Table 15 shows that smoke alarms were present and operated in 43% of the home upholstered furniture fires and 34% of the associated deaths. They failed to operate in 14% of the fires and 19% of the deaths. In overall home fires, excluding the confined fires discussed on p. 1, smoke alarms were present and operated in 39% of the fires and 34% of the deaths. They were present but failed to operate in 12% of the non-confined home fires and 22% of the deaths.[4]

Figure 13. Smoke Alarm Status in Home Upholstered Furniture Fires and All Non-Confined Home Fires: 2002-2005

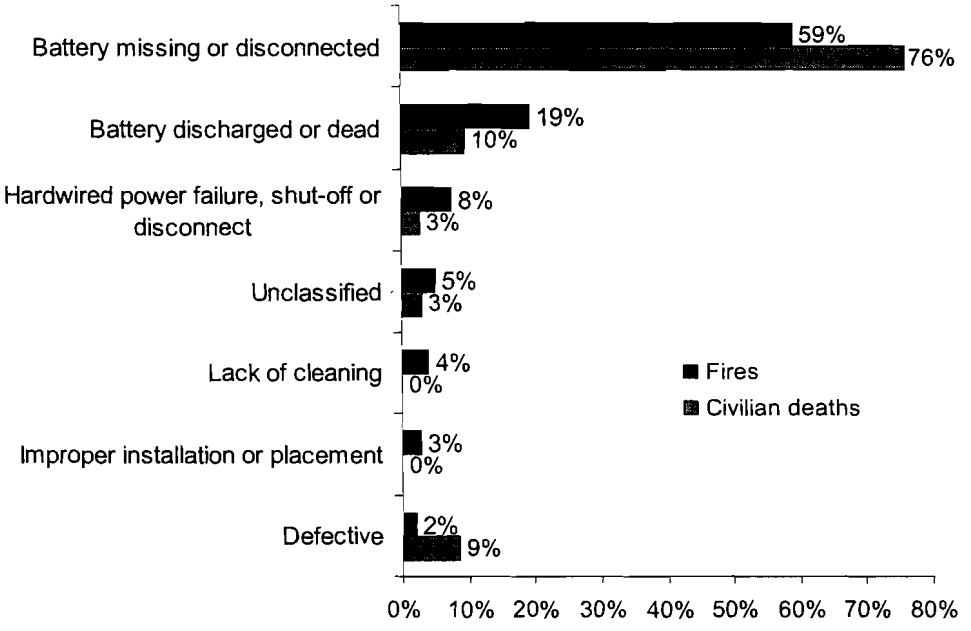


Source: NFIRS 5.0 and NFPA survey.

[4] Marty Ahrens. *U.S. Experience with Smoke Alarms and Other Fire Detection Equipment*, Quincy, MA: National Fire Protection Association, April 2007, p. 24.

Figure 14 shows that when smoke alarms were present but failed to operate in home upholstered furniture fires, smoke alarm batteries were missing or disconnected in 59% of the fires and 76% of the deaths. In all types of home fires, missing or disconnected batteries accounted for 54% of the failures in fires and 75% in deaths.

Figure 14. Reason for Failure when Smoke Alarms Did Not Operate in Home Upholstered Furniture Fires: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

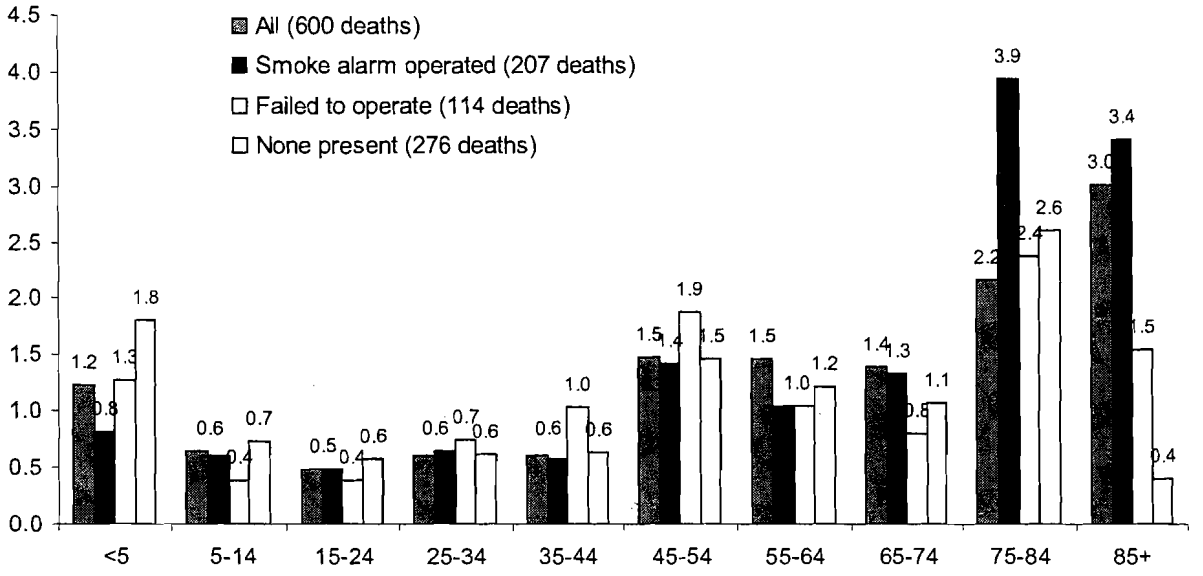
Older adults appear to receive less benefit from the operating smoke alarms in upholstered furniture fires.

Figure 15 shows that adults 75 and older face the highest relative risk of death from upholstered furniture fires. Relative risk compares the risk of one group to the risk of the total population. Relative risk of fire death is calculated by dividing the percentage of the population in each age group by the percentages of fire deaths in each group. A relative risk of one means the percentage of deaths for that age group is equal to the percentage of people in that age group in the general population.

Figure 15 and Tables 16-18 also show that compared to other age groups, older adults faced a much higher risk of dying in a home upholstered furniture fire with a working smoke alarm. Bruck and Thomas found that adults over 75 were at increased risk of sleeping through high-pitched signal currently used by most smoke alarms. They speculate that this is due to the loss of ability to hear high-pitched sounds that often accompanies aging.[5]

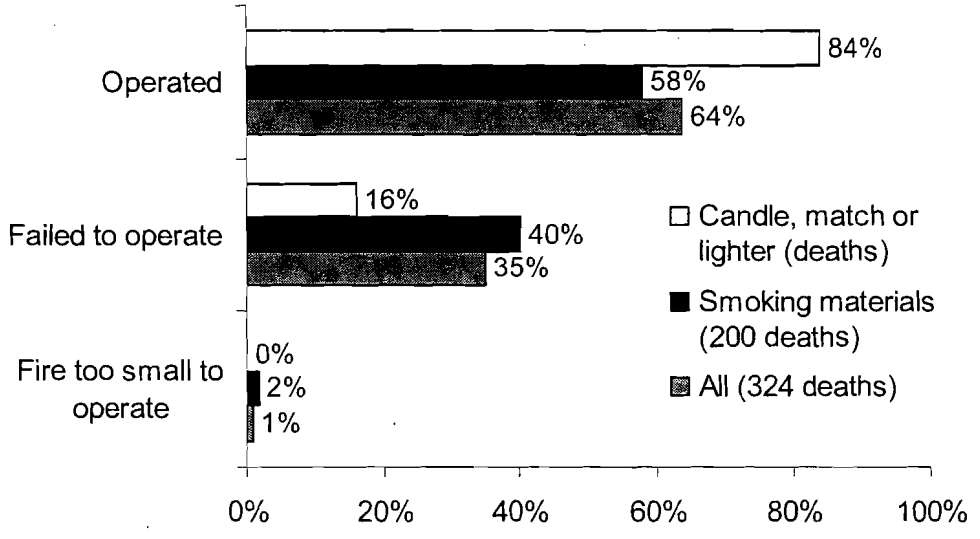
[5] Dorothy Bruck and Ian Thomas. "Comparison of the Effectiveness of Different Fire Notification Signals in Sleeping Older Adults." *Fire Technology,* 44, 15-38, 2008, DOI: 10.1007/s10694-007-0017-5.

Figure 15. Relative Risk of Death by Age Group and Smoke Alarm Status in Home Upholstered Furniture Fires: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

Figure 16. Home Upholstered Furniture Fire Deaths from Fires with Smoke Alarms Present by Smoke Alarm Operation and Smoking Materials vs. Candles, Matches and Lighters: 2002-2005



Source: NFIRS 5.0 and NFPA survey.

Working smoke alarms were less common in deaths from upholstered furniture fires started by smoking materials.
Tables 19 and 20 show that smoke alarms operated in half of the home upholstered furniture fires started by candles, matches or lighters and 46% started by smoking materials. Smoke alarms were present, but failed to operate in 17% of the fires started by smoking materials compared to 14% started by candles, matches or lighters. None were present in one-third of both types of fires.

Figure 16 shows a bigger discrepancy in terms of fire deaths and smoke alarm operation. When smoke alarms were present, they operated in 84% of the deaths resulting from home upholstered furniture fires started by candles, matches or lighters, but only 58% of the deaths from fires started by smoking materials.

Follow-up after a New Zealand smoke alarm installation program discovered that working smoke alarms were more likely to be found in homes without smokers or pre-school children compared to homes with smokers or pre-school children.[6] Follow-up in a U.K. smoke alarm installation study also found that working smoke alarms were less likely in households with smokers.[7] The Consumer Product Safety Commission's (CPSC's) National Smoke Detector Project found that unwanted activations caused the largest share of disabled smoke alarms.[8]

In their tests of nuisance alarm sources and smoke alarm performance, researchers at the National Institute of Standards and Technology (NIST) conducted two tests in which two smokers seated in a manufactured home's kitchen area smoked one cigarette each over a period of about four minutes. No alarm thresholds were reached in the first test, but in the second, two thresholds were reached in the ionization alarm closest to the smokers. They also noted that: "The mass concentrations during both tests appear to be approaching threshold levels for photoelectric alarms, suggesting repeated smoking, or more smokers, could produce threshold level values." [9]

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[6] Mavis Duncanson, Katherine Lawrence, Jean Simpson and Alistair Woodward, *Follow-up Survey of Auahi Whakatupato Smoke Alarm Installation Project in the Eastern Bay of Plenty,* New Zealand Fire Service Commission Research Report Number Seven, University of Otago, August 2000, from http://www.fire.org.nz/research/reports/reports/report_7.htm.

[7] Diane Rowland, Caroub GiGuisseppi, Ian Roberts, Katherine Curtis, Helen Roberts, Laura Ginnelly, Mark, Sculpher, and Angela Wade. "Prevalence of Working Smoke Alarms in Local Authority Inner City Housing: Randomised Controlled Trial, "*BMJ* 2002; 325:998-1001, online at http://www.bmj.com/cgi/reprint/325/7371/998.

[8] Charles L. Smith, *Smoke Detector Operability Survey – Report on Findings*, Bethesda, MD: U.S. Consumer Product Safety Commission, November 1993, p. 12.

[9] Richard W. Bukowski, Richard D. Peacock, Jason D. Averill, Thomas G. Cleary, Neslon P. Bryner, William D. Walton, Paul A. Reneke, and Erica D. Kuligowski, NIST Technical Note 1455, *Performance of Home Smoke Alarms: Analysis of the Response of Several Available Technologies in Residential Fire Settings,* Washington, DC: U.S. Department of Commerce, National Institute of Standards and Technology, revised February 2008, p. 194, available at http://smokealarm.nist.gov/HSAT.pdf.

Additional Information

Vytenis Babrauskas' chapter "Upholstered Furniture and Mattresses" in 20th edition of NFPA's *Fire Protection Handbook* provides information on materials used in upholstered furniture, flammability standards, smoldering vs. flaming heat sources, and testing.

NFPA has two standards related to flammability testing of upholstered furniture:

NFPA 260, *Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture*, and

NFPA 261, *Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes.*

Safety Tips

- If you smoke, choose "fire-safe" cigarettes that will self-extinguish if they are not inhaled for a few minutes. If you smoke, smoke outside. Be careful when smoking around upholstered furniture. Use large, deep, sturdy ashtrays and do not rest them on a sofa or chair. When lighting cigars, pipes, or cigarettes, make sure sparks from matches do not land on the couch or chair. In addition, whenever there has been smoking in a room, check under cushions and in cracks for discarded butts before going to bed or leaving the home. Do not smoke when drowsy, intoxicated or medicated. Never smoke where medical oxygen is used.

- Cigarette ignition-resistant upholstered furniture is more common now, but be aware of potential higher fire risk when purchasing antique or used furniture from the mid-1960s or before.

- Keep heaters and upholstered furniture at least three feet (1 meter) away from each other. See the manufacturer's instructions for how to operate and install the appliance safely.

- Do not place furniture near a fireplace or wood stove. Leave adequate space for ventilation. The furniture should be at least three feet (1 meter) away from a heat source.

- Eight percent of upholstered furniture fires were begun by someone, usually a child, playing with fire. Children should not be left unsupervised – particularly young children, sometimes as young as two, who play with fire but do not understand the consequences of it. Keep matches and lighters up high, out of the reach of children, preferably in a locked cabinet. Encourage children to tell an adult when they find matches and lighters.

- Extinguish all candles when leaving the room or going to sleep. Make sure candles are placed on a stable piece of furniture in sturdy holders that won't tip over.

Table 1. Home Structure Fires that Began with Upholstered Furniture, by Year 1980-2005

Reporting Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Loss in Millions of 2005 Dollars
1980	36,900	1,360	2,970	$220	$521
1981	33,800	1,360	2,630	$218	$468
1982	27,500	1,190	2,530	$272	$550
1983	24,600	1,100	2,700	$200	$392
1984	24,100	1,090	2,310	$217	$407
1985	23,100	930	2,330	$225	$408
1986	22,100	1,070	2,200	$234	$417
1987	20,800	1,030	2,150	$196	$337
1988	20,200	1,100	2,290	$223	$369
1989	18,100	880	2,120	$229	$361
1990	16,400	870	2,050	$257	$384
1991	16,200	680	2,050	$290	$416
1992	15,200	630	1,660	$188	$262
1993	14,300	650	1,960	$231	$312
1994	14,000	670	1,710	$234	$308
1995	13,300	660	1,680	$239	$307
1996	12,800	650	1,610	$249	$311
1997	11,800	660	1,440	$213	$259
1998	11,600	540	1,430	$225	$269
*1999**	*8,100*	*490*	*870*	*$255*	*$298*
2000	*9,000*	*580*	*1,390*	*$363*	*$412*
2001	*9,500*	*620*	*1,080*	*$313*	*$346*
2002	8,600	530	970	$284	$308
2003	7,500	650	960	$294	$313
2004	7,600	700	820	$290	$301
2005	7,100	530	930	$365	$365

* Estimates for 1999-2005 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 697, "Purchasing Power of the Dollar: 1950 to 2006," U.S. Census *Bureau's Statistical Abstract of the United States: 2008,* 127th Edition, 2007.

Table 2. Home Structure Fires that Began with Upholstered Furniture by Type of Material First Ignited 2002-2005 Annual Averages

Type of Material	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Fabric, fiber, or finished goods made of cotton, blends, rayon or wool	5,550	(73%)	450	(76%)	710	(78%)	$225	(73%)
Unclassified fabric, textile or fur	1,070	(14%)	70	(12%)	100	(11%)	$46	(15%)
Multiple types of material	210	(3%)	20	(3%)	30	(4%)	$9	(3%)
Plastic	170	(2%)	10	(1%)	20	(2%)	$5	(1%)
Unclassified type of material	140	(2%)	10	(1%)	10	(1%)	$4	(1%)
Plastic-coated fabric	100	(1%)	0	(0%)	10	(1%)	$4	(1%)
Sawn wood, including finished lumber	70	(1%)	20	(3%)	10	(1%)	$3	(1%)
Unclassified processed wood or paper	40	(1%)	0	(0%)	0	(0%)	$1	(0%)
Unclassified natural product	40	(1%)	0	(0%)	0	(0%)	$2	(1%)
Other known type	230	(3%)	20	(3%)	20	(2%)	$10	(3%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the type of material first ignited was unknown or not reported were allocated proportionally among fires with known type of material first ignited. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 3. Home Structure Fires that Began with Upholstered Furniture by Area of Origin 2002-2005 Annual Averages

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Living room, family room or den	2,990	(39%)	340	(56%)	440	(48%)	$127	(41%)
Unclassified function area	1,700	(22%)	150	(25%)	220	(24%)	$73	(24%)
Bedroom	1,110	(15%)	50	(8%)	120	(13%)	$33	(11%)
Unclassified structural area	240	(3%)	10	(2%)	20	(2%)	$9	(3%)
Unclassified area of origin	180	(2%)	20	(3%)	10	(1%)	$6	(2%)
Garage or vehicle storage area*	160	(2%)	0	(0%)	10	(1%)	$5	(2%)
Exterior balcony, unenclosed porch	160	(2%)	0	(0%)	20	(2%)	$9	(3%)
Crawl space or substructure space	120	(2%)	0	(1%)	10	(1%)	$6	(2%)
Kitchen or cooking area	120	(2%)	10	(2%)	10	(1%)	$3	(1%)
Lobby or entrance way	70	(1%)	0	(0%)	10	(1%)	$2	(1%)
Wall assembly or concealed space	70	(1%)	0	(0%)	0	(0%)	$3	(1%)
Ceiling/floor assembly or concealed space	70	(1%)	0	(0%)	0	(0%)	$2	(1%)
Courtyard, terrace or patio	60	(1%)	10	(1%)	0	(0%)	$4	(1%)
Exterior wall surface	60	(1%)	0	(0%)	0	(0%)	$1	(0%)
Multiple areas of origin	50	(1%)	0	(0%)	0	(0%)	$7	(2%)
Unclassified outside area	50	(1%)	0	(0%)	0	(0%)	$1	(0%)
Unclassified means of egress	40	(1%)	0	(0%)	10	(1%)	$1	(0%)
Unclassified storage area	40	(1%)	0	(0%)	0	(0%)	$1	(0%)
Other known area	350	(5%)	0	(1%)	30	(3%)	$15	(5%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

* Does not include dwelling garages coded as a separate property.

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the area of origin was unknown or not reported are allocated proportionally among fires with known area of origin. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 4. Home Structure Fires that Began with Upholstered Furniture By Extent of Flame Damage 2002-2005 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined to object of origin	1,970	(26%)	40	(6%)	150	(16%)	$23	(7%)
Confined to room of origin	2,570	(34%)	150	(25%)	280	(30%)	$58	(19%)
Confined to floor of origin	790	(10%)	70	(12%)	120	(13%)	$40	(13%)
Confined to building of origin	2,040	(27%)	270	(46%)	310	(34%)	$154	(50%)
Extended beyond building of origin	260	(3%)	70	(11%)	50	(6%)	$33	(11%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

Source: NFIRS 5.0 and NFPA survey.

Table 5. Home Structure Fires that Began with Upholstered Furniture, by Cause 2002-2005 Annual Averages

Cause	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unintentional	5,780	(76%)	520	(87%)	760	(83%)	$233	(75%)
Intentional	930	(12%)	30	(6%)	90	(10%)	$42	(14%)
Failure of equipment or heat source	660	(9%)	30	(5%)	60	(7%)	$27	(9%)
Unclassified	230	(3%)	10	(1%)	10	(1%)	$5	(2%)
Act of nature	40	(0%)	0	(1%)	0	(0%)	$2	(1%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the extent of flame damage or cause was undetermined, under investigation or not reported were allocated proportionally among fires with known extent of flame damage or cause. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 6. Home Structure Fires that Began with Upholstered Furniture by Factor Contributing to Ignition 2002-2005 Annual Averages

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage	
Abandoned or discarded material	2,250	(29%)	240	(39%)	310	(33%)	$88	(29%)
Heat source too close	1,600	(21%)	130	(22%)	190	(20%)	$71	(23%)
Electrical failure or malfunction	1,080	(14%)	80	(14%)	80	(9%)	$48	(15%)
Unclassified misuse of material or product	980	(13%)	80	(13%)	140	(16%)	$36	(12%)
Playing with heat source	600	(8%)	40	(6%)	90	(10%)	$26	(8%)
Unclassified factor	570	(7%)	40	(7%)	80	(9%)	$20	(7%)
Equipment unattended	150	(2%)	0	(0%)	10	(1%)	$7	(2%)
Collision, knock down, or turn over	90	(1%)	0	(0%)	10	(1%)	$4	(1%)
Unclassified mechanical failure or malfunction	80	(1%)	0	(0%)	0	(0%)	$2	(1%)
Exposure fire	60	(1%)	0	(1%)	10	(1%)	$2	(1%)
Unclassified operational deficiency	50	(1%)	0	(0%)	10	(1%)	$3	(1%)
Equipment overloaded	50	(1%)	10	(1%)	20	(2%)	$2	(1%)
Accidentally turned on or not turned off	50	(1%)	10	(1%)	10	(1%)	$2	(1%)
Rekindle	50	(1%)	0	(0%)	0	(0%)	$0	(0%)
Fire spread or control, other	50	(1%)	0	(0%)	10	(1%)	$4	(1%)
Flammable liquid used to kindle fire	40	(1%)	0	(0%)	0	(0%)	$2	(1%)
Animal	40	(1%)	0	(0%)	0	(0%)	$3	(1%)
Other known factor	280	(4%)	10	(1%)	30	(3%)	$15	(5%)
Total entries*	8,080	(106%)	630	(106%)	1,000	(109%)	$335	(108%)
Total fires	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the factor contributing to ignition was undetermined, coded as "none," or not reported were allocated proportionally among fires with known factor contributing to ignition. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 7. Home Structure Fires that Began with Upholstered Furniture by Heat Source 2002-2005 Annual Averages

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Smoking materials	2,220	(29%)	310	(51%)	340	(37%)	$85	(28%)
Candle	860	(11%)	20	(4%)	120	(13%)	$40	(13%)
Hot ember or ash	750	(10%)	30	(6%)	90	(10%)	$22	(7%)
Unclassified hot or smoldering object	680	(9%)	50	(8%)	60	(7%)	$26	(9%)
Radiated, conducted heat from operating equipment	580	(8%)	30	(5%)	60	(6%)	$24	(8%)
Arcing	520	(7%)	40	(6%)	40	(5%)	$24	(8%)
Cigarette lighter	510	(7%)	40	(6%)	90	(10%)	$26	(8%)
Unclassified heat from powered equipment	340	(4%)	30	(5%)	20	(2%)	$15	(5%)
Unclassified heat source	330	(4%)	10	(2%)	20	(2%)	$12	(4%)
Match	320	(4%)	20	(3%)	40	(4%)	$13	(4%)
Spark, ember or flame from operating equipment	130	(2%)	20	(3%)	10	(1%)	$5	(2%)
Multiple heat sources including multiple ignitions	70	(1%)	0	(0%)	10	(1%)	$4	(1%)
Flame or torch used for lighting	60	(1%)	0	(0%)	10	(1%)	$3	(1%)
Molten or hot material	40	(1%)	0	(0%)	0	(0%)	$1	(0%)
Incendiary device	40	(1%)	0	(1%)	0	(0%)	$2	(1%)
Fireworks	40	(1%)	0	(0%)	0	(0%)	$1	(0%)
Other known heat source	120	(2%)	0	(0%)	10	(1%)	$4	(1%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the heat source was undetermined or not reported were allocated proportionally among fires with known heat source. Sums may not equal due to rounding errors. The estimates of matches, lighters, smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 8. Home Structure Fires that Began with Upholstered Furniture by Equipment Involved in Ignition 2002-2005 Annual Averages

Equipment Involved	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
No equipment involved	5,870	(77%)	440	(74%)	720	(78%)	$224	(72%)
Fixed or portable space heater	440	(6%)	70	(12%)	40	(4%)	$28	(9%)
Lamp or lighting	200	(3%)	10	(1%)	30	(3%)	$7	(2%)
Cord or plug	200	(3%)	30	(5%)	20	(2%)	$8	(3%)
Wiring, switch or outlet	120	(2%)	10	(1%)	10	(1%)	$5	(2%)
Air conditioner	80	(1%)	0	(0%)	10	(1%)	$1	(0%)
Unclassified heating, ventilation or air conditioning	80	(1%)	10	(2%)	10	(1%)	$5	(2%)
Cigarette or pipe lighter	70	(1%)	10	(2%)	40	(4%)	$6	(2%)
Office, electronic or entertainment equipment	70	(1%)	10	(1%)	10	(1%)	$3	(1%)
Unclassified personal or household equipment	60	(1%)	10	(1%)	10	(1%)	$2	(1%)
Unclassified equipment involved in ignition	50	(1%)	0	(0%)	10	(1%)	$1	(0%)
Heating pad	40	(1%)	0	(0%)	0	(0%)	$2	(1%)
Fan	40	(0%)	0	(0%)	0	(0%)	$2	(0%)
Other known equipment	320	(4%)	10	(1%)	40	(4%)	$14	(4%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the equipment involved in ignition was undetermined or not reported were allocated proportionally among fires with known equipment involved in ignition. Fires in which the equipment involved in ignition was entered as none but the heat source indicated equipment involvement or the heat source was unknown were also treated as unknown and allocated proportionally among fires with known equipment involved. Sums may not equal due to rounding errors. The estimates of matches, lighters, smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 9. Home Upholstered Furniture Fires Started by Smoking Materials by Year: 1980-2005

Reporting Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Loss in Millions of 2005 Dollars
1980	23,300	1,060	2,050	$127	$300
1981	21,800	1,120	1,890	$136	$292
1982	17,100	980	1,710	$187	$378
1983	14,500	850	1,800	$110	$216
1984	14,100	860	1,480	$124	$233
1985	12,800	720	1,470	$122	$220
1986	12,300	770	1,320	$120	$213
1987	11,400	700	1,370	$100	$172
1988	11,000	810	1,420	$114	$188
1989	9,400	670	1,170	$112	$177
1990	8,500	590	1,220	$141	$211
1991	8,200	450	1,140	$131	$187
1992	7,100	480	850	$74	$102
1993	6,900	440	1,060	$107	$145
1994	6,400	410	920	$103	$136
1995	6,200	490	860	$109	$140
1996	5,900	470	920	$95	$119
1997	5,300	450	740	$90	$110
1998	5,100	350	750	$89	$107
*1999**	*3,100*	*360*	*190*	*$113*	*$132*
2000	*3,100*	*330*	*500*	*$123*	*$139*
2001	*3,100*	*390*	*470*	*$122*	*$135*
2002	2,600	230	280	$70	$76
2003	2,200	310	390	$77	$82
2004	2,300	370	310	$79	$82
2005	2,000	330	360	$112	$112

* Estimates for 1999-2005 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. These statistics include proportional shares of fires in which the item first ignited or heat source was undetermined or not reported. The 1999-2005, estimates also include proportional shares of fires in which the heat source was an unclassified open flame or smoking material.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 697, "Purchasing Power of the Dollar: 1950 to 2006," U.S. Census Bureau's *Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 10. Home Upholstered Furniture Fires Started by Candles, Matches or Lighters, by Year: 1980-2005

Reporting Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Loss in Millions of 2005 Dollars
1980	6,900	200	570	$36	$86
1981	6,000	80	460	$35	$76
1982	4,800	100	430	$29	$59
1983	4,700	180	500	$36	$71
1984	4,600	110	480	$39	$73
1985	4,700	110	450	$44	$79
1986	4,500	130	500	$47	$84
1987	4,500	140	450	$45	$77
1988	4,300	130	430	$43	$72
1989	3,900	120	480	$46	$73
1990	3,500	110	520	$48	$73
1991	3,400	130	560	$63	$90
1992	3,800	80	480	$43	$60
1993	3,400	90	470	$53	$71
1994	3,600	160	510	$64	$84
1995	3,300	80	460	$59	$76
1996	3,000	70	390	$58	$72
1997	3,000	80	520	$63	$77
1998	3,000	120	390	$59	$71
1999*	2,400	0	620	$80	$93
2000	1,900	40	470	$89	$101
2001	2,100	90	280	$77	$85
2002	1,900	80	330	$73	$79
2003	1,700	30	220	$71	$76
2004	1,700	100	210	$76	$78
2005	1,600	80	240	$95	$95

* Estimates for 1999-2005 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. These statistics include proportional shares of fires in which the item first ignited or heat source was undetermined or not reported. These statistics include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported, as well as proportional shares of fires 1980-1998 in which the form of heat of ignition was an unclassified or unknown-type open flame or spark, and in 1999-2005, in which the heat source was an unclassified open flame or smoking material.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 697, "Purchasing Power of the Dollar: 1950 to 2006," *U.S. Census Bureau's Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 11. Home Upholstered Furniture Fires Started by Smoking Materials By Extent of Flame Damage 2002-2005 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined to object of origin	790	(36%)	37	(12%)	78	(23%)	$6	(7%)
Confined to room of origin	710	(32%)	77	(25%)	106	(31%)	$19	(22%)
Confined to floor of origin	200	(9%)	46	(15%)	35	(10%)	$13	(15%)
Confined to building of origin	450	(20%)	130	(42%)	94	(28%)	$41	(48%)
Extended beyond building of origin	70	(3%)	19	(6%)	24	(7%)	$7	(8%)
Total	2,220	(100%)	309	(100%)	337	(100%)	$85	(100%)

Source: NFIRS 5.0 and NFPA survey.

Table 12. Home Upholstered Furniture Fires Started by Candles, Matches or Lighters by Extent of Flame Damage 2002-2005 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined to object of origin	410	(24%)	0	(0%)	32	(13%)	$6	(8%)
Confined to room of origin	600	(35%)	8	(11%)	59	(24%)	$14	(17%)
Confined to floor of origin	210	(13%)	22	(29%)	33	(13%)	$13	(17%)
Confined to building of origin	430	(25%)	42	(57%)	112	(45%)	$42	(53%)
Extended beyond building of origin	40	(3%)	2	(3%)	13	(5%)	$4	(5%)
Total	1,690	(100%)	75	(100%)	248	(100%)	$79	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the extent of flame damage was undetermined or not reported were allocated proportionally among fires with known extent of flame damage. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 13. Home Upholstered Furniture Fires Started by Smoking Materials by Factor Contributing to Ignition 2002-2005

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage	
Abandoned or discarded materials or products	1,420	(64%)	212	(69%)	205	(61%)	$58	(68%)
Unclassified misuse of material or product	430	(20%)	30	(10%)	74	(22%)	$14	(17%)
Heat source too close to combustibles	230	(10%)	48	(15%)	34	(10%)	$10	(12%)
Unclassified factor contributed to ignition	140	(6%)	23	(7%)	28	(8%)	$6	(7%)
Playing with heat source	20	(1%)	0	(0%)	0	(0%)	$0	(0%)
Unclassified operational deficiency	10	(1%)	0	(0%)	1	(0%)	$0	(0%)
Other known factor	50	(2%)	7	(2%)	12	(3%)	$2	(2%)
Total entries*	2,310	(104%)	319	(103%)	354	(105%)	$90	(106%)
Total*	2,220	(100%)	309	(100%)	337	(100%)	$85	(100%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the factor contributing to ignition was undetermined, coded as "none," or not reported were allocated proportionally among fires with known factor contributing to ignition. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 14. Home Upholstered Furniture Fires Started by Candles, Matches or Lighters, by Factor Contributing to Ignition 2002-2005

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage	
Playing with heat source	570	(33%)	43	(57%)	92	(37%)	$29	(37%)
Heat source too close to combustibles	530	(31%)	15	(21%)	60	(24%)	$19	(24%)
Unclassified misuse of material or product	210	(12%)	6	(8%)	39	(16%)	$12	(16%)
Abandoned or discarded materials or products	180	(10%)	4	(5%)	35	(14%)	$10	(12%)
Unclassified factor contributed to ignition	120	(7%)	10	(13%)	34	(14%)	$5	(6%)
Equipment unattended	40	(3%)	0	(0%)	3	(1%)	$2	(2%)
Collision, knock down, or turn over	40	(3%)	0	(0%)	5	(2%)	$3	(3%)
Animal	30	(2%)	0	(0%)	2	(1%)	$2	(3%)
Fire spread or control, other	10	(1%)	0	(0%)	0	(0%)	$1	(1%)
Flammable liquid or gas spilled	10	(1%)	0	(0%)	3	(1%)	$0	(0%)
Improper container or storage	10	(1%)	0	(0%)	0	(0%)	$0	(0%)
Flammable liquid used to kindle fire	10	(1%)	0	(0%)	1	(1%)	$0	(0%)
Other known factor	40	(3%)	0	(0%)	8	(3%)	$1	(1%)
Total entries*	1,800	(106%)	78	(104%)	282	(114%)	$84	(106%)
Total	1,690	(100%)	75	(100%)	248	(100%)	$79	(100%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the factor contributing to ignition was undetermined, coded as "none," or not reported were allocated proportionally among fires with known factor contributing to ignition. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 15. Home Structure Fires that Began with Upholstered Furniture, by Smoke Alarm Status 2002-2005 Annual Averages

Smoke Alarm Status	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Smoke alarms present	4,610	(60%)	320	(54%)	650	(71%)	$211	(68%)
Operated	*3,270*	*(43%)*	*210*	*(34%)*	*450*	*(49%)*	*$168*	*(54%)*
Failed to operate	*1,090*	*(14%)*	*110*	*(19%)*	*180*	*(20%)*	*$41*	*(13%)*
Fire too small to operate	*250*	*(3%)*	*0*	*(0%)*	*10*	*(2%)*	*$1*	*(0%)*
No smoke alarms	3,020	(40%)	280	(46%)	270	(29%)	$98	(32%)
Total	7,630	(100%)	600	(100%)	920	(100%)	$309	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and civilian injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. All types of detection equipment are grouped together as "smoke alarms." These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which detection equipment presence or operation was undetermined or not reported were allocated proportionally among fires with known presence or operation. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 16. Victims of Home Upholstered Furniture Fires with Operating Smoke Alarms, by Age Group 2002-2005 Annual Averages

Age Group	Civilian Deaths		Relative Death Risk	Civilian Injuries		Relative Injury Risk	Population (in Millions)	
0-4	12	(6%)	0.8	13	(3%)	0.4	19.9	(7%)
5-14	17	(8%)	0.6	22	(5%)	0.3	40.8	(14%)
15-24	14	(7%)	0.5	69	(15%)	1.1	41.4	(14%)
25-34	18	(9%)	0.6	71	(16%)	1.2	39.9	(14%)
35-44	18	(9%)	0.6	82	(18%)	1.2	44.3	(15%)
45-54	41	(20%)	1.4	73	(16%)	1.1	41.2	(14%)
55-64	21	(10%)	1.0	46	(10%)	1.0	28.5	(10%)
65-74	17	(8%)	1.3	32	(7%)	1.1	18.4	(6%)
75-84	36	(17%)	3.9	30	(7%)	1.5	12.9	(4%)
85 and older	12	(6%)	3.4	13	(3%)	1.8	4.8	(2%)
Total	207	(100%)	1.0	451	(100%)	1.0	292.3	(100%)

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as "smoke alarms." These statistics include a proportional share of fires in which the item first ignited, detection presence or detection operation was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Sources: NFIRS 5.0 and NFPA survey. Population estimates were based on Table No. 7, "Resident Population by Age and Sex: 1950 to 2006," U.S. Census Bureau's *Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 17. Victims of Home Upholstered Furniture Fires with Smoke Alarms that Did Not Operate, by Age Group 2002-2005 Annual Averages

Age Group	Civilian Deaths		Relative Death Risk	Civilian Injuries		Relative Injury Risk	Population (in Millions)	
0-4	10	(9%)	1.3	21	(12%)	1.7	19.9	(7%)
5-14	6	(5%)	0.4	3	(1%)	0.1	40.8	(14%)
15-24	6	(5%)	0.4	36	(20%)	1.4	41.4	(14%)
25-34	12	(10%)	0.7	35	(19%)	1.4	39.9	(14%)
35-44	18	(16%)	1.0	34	(19%)	1.2	44.3	(15%)
45-54	30	(26%)	1.9	21	(12%)	0.8	41.2	(14%)
55-64	12	(10%)	1.0	19	(11%)	1.1	28.5	(10%)
65-74	6	(5%)	0.8	6	(3%)	0.5	18.4	(6%)
75-84	12	(11%)	2.4	5	(3%)	0.6	12.9	(4%)
85 and older	3	(3%)	1.5	1	(1%)	0.4	4.8	(2%)
Total	114	(100%)	1.0	182	(100%)	1.0	292.3	(100%)

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as "smoke alarms." These statistics include a proportional share of fires in which the item first ignited, detection presence or detection operation was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Sources: NFIRS 5.0 and NFPA survey. Population estimates were based on Table No. 7, "Resident Population by Age and Sex: 1950 to 2006," U.S. Census Bureau's *Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 18. Victims of Home Upholstered Furniture Fires with No Smoke Alarms Present, by Age Group 2002-2005 Annual Averages

Age Group	Civilian Deaths		Relative Death Risk	Civilian Injuries		Relative Injury Risk	Population (in Millions)	
0-4	34	(12%)	1.8	24	(9%)	1.3	19.9	(7%)
5-14	28	(10%)	0.7	14	(5%)	0.4	40.8	(14%)
15-24	22	(8%)	0.6	47	(17%)	1.2	41.4	(14%)
25-34	23	(8%)	0.6	45	(17%)	1.2	39.9	(14%)
35-44	26	(10%)	0.6	42	(16%)	1.0	44.3	(15%)
45-54	57	(21%)	1.5	55	(20%)	1.4	41.2	(14%)
55-64	33	(12%)	1.2	15	(5%)	0.6	28.5	(10%)
65-74	19	(7%)	1.1	15	(6%)	0.9	18.4	(6%)
75-84	32	(12%)	2.6	12	(4%)	1.0	12.9	(4%)
85 and older	2	(1%)	0.4	2	(1%)	0.5	4.8	(2%)
Total	276	(100%)	1.0	271	(100%)	1.0	292.3	(100%)

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as "smoke alarms." These statistics include a proportional share of fires in which the item first ignited or detection presence was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Sources: NFIRS 5.0 and NFPA survey. Population estimates were based on Table No. 7, "Resident Population by Age and Sex: 1950 to 2006," U.S. Census Bureau's *Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 19. Home Upholstered Furniture Fires Started by Smoking Materials By Smoke Alarm Status: 2002-2005 Annual Averages

Smoke Alarm Status	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Smoke alarms present	1,490	(67%)	200	(65%)	251	(75%)	$61	(72%)
Operated	*1,020*	*(46%)*	*116*	*(38%)*	*177*	*(53%)*	*$46*	*(54%)*
Failed to operate	*380*	*(17%)*	*80*	*(26%)*	*66*	*(20%)*	*$15*	*(17%)*
Fire too small to operate	*100*	*(4%)*	*4*	*(1%)*	*8*	*(2%)*	*$0*	*(0%)*
No smoke alarms	730	(33%)	109	(35%)	86	(25%)	$24	(28%)
Total	2,220	(100%)	309	(100%)	337	(100%)	$85	(100%)

Source: NFIRS 5.0 and NFPA survey.

Table 20. Home Upholstered Furniture Fires Started by Candles, Matches or Lighters, by Smoke Alarm Status 2002-2005 Annual Averages

Smoke Alarm Status	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Smoke alarms present	1,140	(67%)	41	(55%)	193	(78%)	$59	(75%)
Operated	*840*	*(50%)*	*35*	*(47%)*	*144*	*(58%)*	*$48*	*(61%)*
Failed to operate	*230*	*(14%)*	*7*	*(9%)*	*47*	*(19%)*	*$11*	*(14%)*
Fire too small to operate	*60*	*(3%)*	*0*	*(0%)*	*2*	*(1%)*	*$0*	*(0%)*
No smoke alarms	560	(33%)	33	(45%)	55	(22%)	$20	(25%)
Total	1,690	(100%)	75	(100%)	248	(100%)	$79	(100%)

Note: These are national estimates of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. All types of detection equipment are grouped together as "smoke alarms." These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which detection equipment presence or operation was undetermined or not reported were allocated proportionally among fires with known presence or operation. Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Appendix A.
How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit http://www.nfirs.fema.gov/. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/_download/nfirspaperforms2007.pdf.

Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; and (3) information on the type of community protected (e.g., county

versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database - the NFPA survey - is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission have developed the specific analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at http://www.nfpa.org/osds or through NFPA's One-Stop Data Shop.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others.

Figure 1.

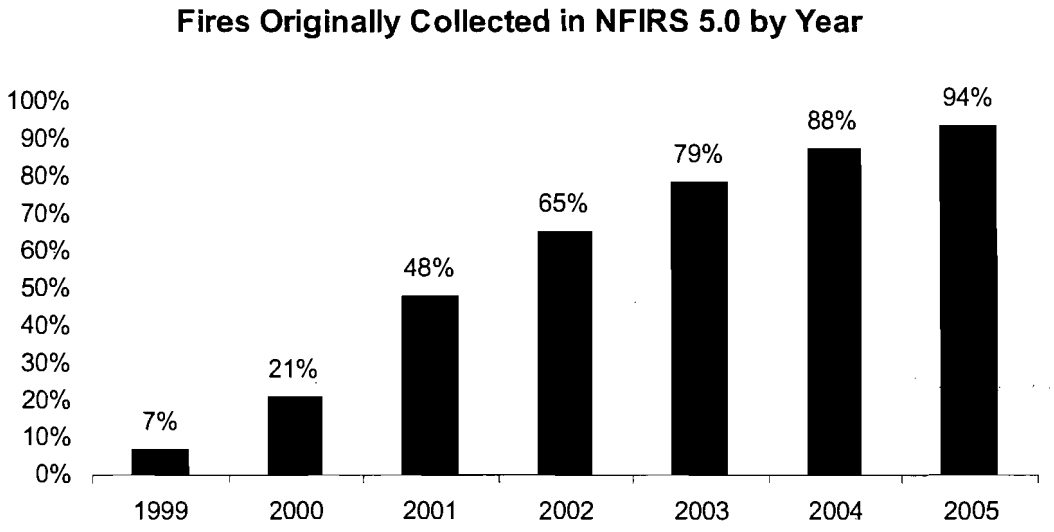


Figure 1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

For 2002 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

NFPA survey projections
NFIRS totals (Version 5.0)

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

A second option is to omit year estimates for 1999-2001 from year tables.

NFIRS 5.0 has six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. In order for that limited detail to be used to characterize the confined fires, they must be analyzed separately from non-confined fires.

Otherwise, the patterns in a factor for the more numerous non-confined fires with factor known will dominate the allocation of the unknown factor fires for both non-confined and confined fires. If the pattern is different for confined fires, which is often the case, that fact will be lost unless analysis is done separately.

For most fields other than Property Use, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields.

For Factor Contributing to Ignition, the code "none" is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for "not reported" when no factors are recorded. "Not reported" is treated as an unknown, but the code "none" is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Groupings for this field show all category headings and specific factors if they account for a rounded value of at least 1%.

Type of Material First Ignited (TMI). This field is required only if the Item First Ignited falls within the code range of 00-69. NFPA has created a new code "not required" for this field that is applied when Item First Ignited is in code 70-99 (organic materials, including cooking materials and vegetation, and general materials, such as electrical wire, cable insulation, transformers, tires, books, newspaper, dust, rubbish, etc..) and TMI is blank. The ratio for allocation of unknown data is:

$$\frac{\text{(All fires – TMI Not required)}}{\text{(All fires – TMI Not Required – Undetermined – Blank))}}$$

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: "Heat from open flame or smoking material, other." NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

61. Cigarette,
62. Pipe or cigar,
63. Heat from undetermined smoking material,
64. Match,
65. Lighter: cigarette lighter, cigar lighter,
66. Candle,
67 Warning or road flare, fusee,
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11)
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

$$\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}$$

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping "smoking materials" includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to "the piece of equipment that provided the principal heat source to cause ignition." However, the 2006 data is not yet available and a large portion of the fires coded as no equipment involved (NNN) have heat sources in the operating equipment category. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by

$$\frac{\text{All fires}}{\text{(All fires – blank – undetermined –[fires in which EII =NNN and heat source <>40-99])}}$$

Additional allocations may be used in specific analyses. For example, NFPA's report about home heating fires treats Equipment Involved in Ignition Code 120, fireplace, chimney, other" as a partial unknown (like Heat Source 60) and allocates it over its related decade of 121-127, which includes codes for fireplaces (121-122) and chimneys (126-127) but also includes codes for fireplace insert or stove, heating stove, and chimney or vent connector. More general analyses of specific occupancies may not perform as many allocations of partial allocations. Notes at the end of each table describe what was allocated.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100%, even if the rounded number entry is zero. Values that appear identical may be associated with different percentages, and identical percentages may be associated with slightly different values.

Appendix B.
Previously Published Upholstered Furniture Fire Incidents

Published incidents provide information about what can happen, not what is typical. Articles from NFPA publications about specific incidents illustrate some of the ways in which upholstered fire catches fire or is involved in fire. These incidents were taken from the "Firewatch" columns and annual studies of catastrophic fires in *NFPA Journal.* These incidents tend to be more serious than the typical fire.

Smoking Materials

Cigar Ignites Upholstered Chair in Fatal Fire, Maryland

An 80-year-old man whose upholstered chair ignited shortly after he lit a cigar suffered burns that led to his death nearly a month later.

The fire occurred in an 11-story, fire-resistive apartment building measuring 100 feet (30 meters) by 100 feet (30 meters). The structure, which had concrete floors and walls and a masonry exterior, was protected by a wet-pipe sprinkler system and a smoke detection system.

The victim said he lit a cigar while sitting in the chair in his eighth-floor apartment, and the next thing he saw was a flash. When the fire spread from the chair to the victim's shirt, he took off the burning shirt and dropped it to the floor, allowing the fire spread to the carpet. Although burned, he managed to go to a neighbor's apartment for help.

Responding firefighters, who received the 911 call at 4:19 p.m., found that a sprinkler had already extinguished the fire by the time they arrived. Investigators determined that dropped or discarded smoking materials ignited the inside of the chair.

The victim suffered second- and third-degree burns to his upper torso, face, and head. He lived for almost a month before succumbing to his injuries. The apartment, valued at $200,000, sustained a $30,000 loss; its contents, valued at $30,000, sustained damages of $10,000

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, May/June, 38.

Carelessly Discarded Cigarette Leads to Fatal Fire, Nebraska

A cigarette carelessly discarded in an overstuffed chair started a fire that killed a 46-year-old woman in her apartment.

The two-story, four-unit apartment building, which was 60 feet (18 meters) long and 30 feet (9 meters) wide, had brick exterior walls. There were smoke alarms in each unit, but they weren't part of a monitored fire-detection system. There were no sprinklers.

At 10:12 p.m., firefighters received a call from a neighbor who thought she heard a smoke detector sounding. Fire crews arrived minutes later and were directed to a smoke-filled, second-floor unit, where they found the unconscious woman. Paramedics transported her to the local hospital.

The fire was confined to the living room chair, although smoke damaged other parts of the apartment. Investigators found cigarette butts, empty cigarette packages, and burn marks throughout the apartment and determined that the victim had dropped a cigarette, which ignited the chair. The woman, who died of smoke inhalation, had a chronic illness that may have prevented her from escaping.

Although the unit of origin suffered heavy smoke damage, the rest of the building had only moderate smoke and heat damage. Losses to the building, valued at $160,000, were estimated at $5,000. Its contents, valued at $10,000, sustained a $5,000 loss.

Kenneth J. Tremblay, 2002, "Firewatch," *NFPA Journal*, November/December 18.

Cigarette Started Catastrophic Upholstered Furniture Fire, Michigan

In May 1999, a Michigan fire department was alerted at 4:45 a.m. to a fire in a two-story, single-family dwelling of unprotected wood-frame construction. Six people died in this fire.

A discarded cigarette ignited a couch in an enclosed porch that was used as a family room. The occupants thought they'd extinguished the fire, but it continued to smolder, burst into flames, and spread throughout the house.

The house had smoke alarms that worked on all levels. There was no alarm in the room of fire origin, though it wasn't required. Two of the victims were disabled and three others, who were visitors, were asleep and intoxicated.

Excerpted and adapted from Robert S. McCarthy, 2000, "1999 Catastrophic Fires," *NFPA Journal*, September/October, 56.

Open Flame or Intentional

Candles Ignite Deadly Fire, New Jersey

Several candles used for illumination and located throughout the home are believed to have started a deadly fire that killed a woman and two children. The utility company disconnected electrical power to the home earlier in the afternoon due to non-payment. The homeowner stated they were using candles about the house, but that all were extinguished before they retired for the evening. The single-family, one-story home did not have smoke alarms or sprinklers.

A dog woke an occupant who opened her bedroom door and found smoke and heat within the home. She called her daughter who responded and then exited the home using a rear door. The daughter called back to her mother that she couldn't make it out, as the mother tried to re-enter the home.

The fire department received the alarm at 2:11 a.m. and responded within nine minutes to find the home well involved, especially the living area. After the fire was controlled they found a 9-year old boy in one bedroom, a 28-year old female, and a 2-year old boy together in another bedroom.

Investigators believe that a candle on a wall-mounted holder fell and ignited a couch. Fire traveled horizontally throughout the house and trapped three of the occupants who succumbed of smoke inhalation. Three firefighters also received injuries during suppression. The estimated losses and the home's value were not reported.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, July/August 27-28.

Child Ignites Fire in Apartment that Kills Four People, Georgia

Four people died in a fire that started when a child playing with a lighter ignited a sofa. The first-floor apartment fire quickly involved the entire unit when the fire department arrived. Firefighters entered a bedroom, performed a search, and quickly left when the fire got worse.

The two-story apartment building measured 30 feet (9 meters) by 60 feet (18 meters) and contained four units. It was a wooden-frame building with a brick veneer and a wooden-decked roof covered by asphalt shingles. Investigators were unable to locate any smoke detection equipment. There were no sprinklers.

The fire was detected by an occupant who called 911 at 7:56 p.m. Firefighters arrived five minutes later and found fire coming from windows and doors at the front and rear of the building. Witnesses reported several people trapped, as the first arriving crew entered a front bedroom window to do a quick search. Two 1-3/4-inch hose lines were advanced into the front door to extinguish the fire.

During the overhaul, firefighters found the bodies of two boys, 8 and 5, and a 9-year-old girl. Details of an adult who also died at the scene are unavailable. There were no firefighter injuries.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, May/June 34.

Candle Fire in Basement Apartment Kills Man, Nebraska

A candle left burning on the floor in a rented basement room that had no smoke alarm started a fire that eventually burned itself out, but not before fatally injuring the room's occupant.

The fire occurred in a single-story, wood framed house with two living units on the first floor. Each unit also had a bedroom in the basement that was rented out to a single occupant. The only smoke alarm in the unsprinklered house, which measured 50 feet (15.2 meters) by 20 feet (6 meters), was in the first-floor hallway near sleeping areas. One of the basement renters smelled smoke and alerted the other occupants before calling the fire department at 6:08 a.m. He did not know whether the other basement renter, a 28-year-old man, was home at the time but told first responders he might be.

Fire crews arriving six minutes later found light smoke coming from the building but could see no fire. When they searched the lower level, they found that the blaze in the victim's room had nearly extinguished itself. Searching further, they found the man leaning against a clothes dryer in his room, overcome by smoke.

Investigators determined that the candle ignited a sofa and that the fire spread to a table and other combustibles, producing heavy smoke. The coroner's report stated that the victim died of severe carbon monoxide poisoning and had levels of an illegal substance and alcohol in his blood at the time of his death. All the house's other occupants, who were sleeping at the time, escaped unharmed.

Damage to the $200,000 structure was approximately $6,000.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, January/February, 18.

Child-Playing Fire Kills Two Family Members, New York

A 6-year-old playing with fire ignited a couch, and the resulting blaze trapped his mother and two younger siblings in their apartment. Although the fire was primarily confined to the foam-filled sofa, it created enough smoke to block their exit. The child who started the fire got out of the apartment unharmed.

The fire occurred in a seven-story, 80-unit apartment building of fire resistive construction that measured 250 feet by 150 feet (76 by 46 meters). The building had a hardwired fire detection system that provided only a local alarm.

A call to 911 at 6:44 p.m. alerted the fire department, and firefighters were advancing hose lines to the unit of origin on the sixth floor within a few minutes of their arrival. They quickly controlled the fire and rescued the 41-year-old mother and her 3- and 5-year-old children within 8 to 10 minutes of dispatch or an estimated 16 to 18 minutes after ignition. Firefighters were able to revive the mother, but the two children died of smoke inhalation.

The fire began when the 6-year-old ignited some toilet paper while playing with the kitchen stove and carried it into the living room. When his mother entered the apartment from the rear, the boy hid the burning paper, either under a sofa cushion or under the sofa. The flames ignited the couch. The boy ran from the apartment, as his mother went to try to rescue her two younger children, who were trapped in a back room.

Damage to the building, valued at $2.5 million, was estimated at $10,000. Damage to its contents came to $2,000. Two firefighters were injured fighting the fire. One suffered a knee injury and the other a back injury.

Kenneth J. Tremblay, 2000, "Firewatch," *NFPA Journal*, September/October 22-23.

Heating Equipment

Heater Starts Fatal Fire, Ohio

A six-year-old boy died of smoke inhalation in a fire that began when a heater ignited a couch on the screened porch of his single-family, wood-frame home. The two-story house, which had an asphalt roof, was 50 feet (15 meters) long and 30 feet (9 meters) wide. It had no smoke alarms.

The residents awoke at some point during the fire and tried to extinguish the flames using water from the kitchen before someone finally called 911 at 3:25 a.m. Firefighters arrived to find the room of origin totally involved in flames.

The location of the boy was not reported. The house, valued at $65,000, and its contents, valued at $10,000, were nearly destroyed.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, November/December, 21.

Portable Heater Fire Kills Occupant, New York

A 65-year-old man died when a portable electric heater placed too close to the recliner in which he was sleeping ignited the chair or his blanket.

The two-story, wood-frame single family home, which was 36 feet (11 meters) long and 25 feet high (8 meters), had no smoke alarms or sprinklers.

At 4 a.m. a passerby called 911 after seeing flames 4 feet (1.2 meters) long coming from the windows of the house.

At some point during the fire, the victim tried to escape. He was found on the floor behind a door where he had succumbed to smoke inhalation and burns.

The house, valued at $9,000, and its contents, valued at $20,000, were destroyed.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, January/February, 20.

Furniture on Floor Furnace Ignites Fatal Fire, California

A 29-year-old man died and a woman was injured in an early-morning fire that began after a sofa placed over a floor furnace in the man's single-family home ignited and burned undetected. The one-story, wood-frame house, which measured 36 feet (11 meters) by 40 feet (12 meters), had no smoke alarms or sprinklers.

Firefighters responding to the 3:34 a.m. 911 call found the woman outside the burning house from which she had escaped by crawling through a bedroom window, sustaining numerous lacerations. Fire crews who entered the house in search of the other occupant found him in the bathtub, dead of smoke inhalation. Apparently, he had become aware of the fire but went to look for his cat rather than escape. The cat was found dead in one of the bedrooms.

Investigators found that the furnace's thermostat had been turned up and determined that the heat had caused the sofa to ignite. The fire burned in a V-pattern from the living room to other areas of the home and down to a crawl space below.

Damage to the house, valued at $700,000, was estimated at $200,000. Its contents, valued at $400,000, were destroyed.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, September/ October, 32.

Smoke Alarm Alerts Occupant, Rhode Island

Smoke from a fast-moving fire in the living room of an apartment in a three-family house activated a smoke alarm, alerting the structure's occupant.

The three-story, wood-frame dwelling measured 30 feet (9 meters) by 26 feet (8 meters). Battery-operated smoke alarms had been installed in the apartment of origin, but there were no fire sprinklers.

The fire began around 10 a.m. when radiant heat from a portable electric space heater on a living room coffee table ignited the fabric of two couches. A smoke alarm alerted the occupant, who tried to control the fire with a portable fire extinguisher until smoke forced him from the room. The fire caused the apartment's windows to fail, and the exterior wood siding ignited before the fire department arrived.

Fire companies used master streams to knock down the heavy fire, then completed extinguishment using several hose lines on each floor. The $200,000 building and its contents, valued at $40,000, were destroyed. There were no injuries.

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, January/February 15.

Kerosene Heater ignited Upholstered Chair in Catastrophic Fire, North Carolina

In April 1999, a North Carolina fire department was notified at 11:55 a.m. of a fire in a single-family manufactured home of unprotected wood-frame construction. Five people died in this fire, including one child under age six.

An unvented kerosene heater ignited an upholstered chair in the living room, and the resulting fire spread throughout the home. There were no smoke alarms to warn the victims, who were all asleep when the fire broke out.

Excerpted and adapted from Robert S. McCarthy, 2000, "1999 Catastrophic Fires," *NFPA Journal,* September/October, 58.

Electrical Distribution or Lighting Equipment

Extension Cord Involved in Sofa Ignition Catastrophic Fire, North Carolina

In March 2006, a North Carolina fire department was notified at 4:00 a.m. of a fire in a 1½-story, single-family home of unprotected ordinary construction. Five people died in this fire, including one child under age six.

The fire originated in the living room. A couch was positioned against an extension cord plug. Pressure from the arm support flattened the plug causing a short circuit in the wiring. The short circuit ignited the couch. Fire burned into the fabric and foam cushion, producing heavy black smoke. Four of the victims were located in a first-story bedroom with doors closed. The fifth victim was found near the doorway. He had attempted to extinguish the fire with water from a sink.

There was a delay in reporting the fire, and one occupant attempted to extinguish the fire rather than evacuate. The remains of a smoke alarm was found, with battery installed, but it is undetermined if it activated.

Excerpted and adapted from Stephen G. Badger, 2007, "U.S. Multiple-Death Fires for 2006," *NFPA Journal,* September/October, 58.

Damaged Extension Cord Started Catastrophic Fire, Pennsylvania

In March 2006, a Pennsylvania fire department was notified at 2:30 a.m. of a fire in a two-story, single-family row house of unprotected ordinary construction. Five people died in this fire, including two children under age six. No smoke alarms or sprinklers were present.

An extension cord to a space heater was under a chair and was damaged by the weight of the chair. The damaged overloaded cord ignited the chair. The fire spread to a nearby

sofa then vented out the first-story front room. The fire also extended up an open stairway to the second-story hallway.

A heavy security screen and security storm door hindered escape of the victims and delayed the firefighters in their fire attack and rescue. The only exit was a front door. One victim had jumped and was found outside, while another was located on the first-story, and the other three were in a second-story bedroom.

Excerpted and adapted from Stephen G. Badger, 2007, "U.S. Multiple-Death Fires for 2006," *NFPA Journal,* September/October, 58 (adapted).

Overheated Power Strip Ignited Couch in Catastrophic Fire, Michigan

In July 2003, a Michigan fire department was notified at 10:00 p.m. of a fire in a two-story single-family dwelling of unprotected ordinary construction. The fire killed six people, including four children under the age of six. No smoke alarms or sprinklers were present.

A power strip for a window air-conditioning unit was pinned between a wall and couch. It overheated and ignited the couch, window treatments, and penetrated the joist space. The victims were in bed in second-story bedrooms and had no warning of the fire.

Excerpted and adapted from Stephen G. Badger, 2004, "Catastrophic Multi-Death Fires of 2003," *NFPA Journal,* September/October, 68-69.

Other or Undetermined Sources of Upholstered Furniture Ignition or Fire Spread to Upholstered Furniture

Sprinklers Douse High-Rise Fire, Minnesota

Two sprinklers activated and extinguished a fire in an apartment in a 20-story apartment building. At the time of the fire, the occupant of the second-floor apartment was not at home.

Each floor of the 149-unit building covered about 15,000 square feet (4,572 square meters) and was protected by a sprinkler system and fire detection system.

Firefighters received the alarm at 5:54 a.m. and responded to the apartment to find that the fire had already been extinguished. A small burned area in the living room contained the melted remains of a portable box-type fan and an upholstered swivel chair.

The apartment's occupant told investigators that the fan had been operating normally when he left the apartment about five hours earlier. The investigator determined that it malfunctioned and tipped over, igniting the carpeting and chair.

Losses were estimated at $10,000. There were no injuries.

Kenneth J. Tremblay, 2006, Firewatch, *NFPA Journal*, July/August, 27.

Smoke Detectors Save Occupants From Fast-Moving Fire, Pennsylvania

Seven people owe their lives to an automatic fire detection system installed in a single-family home used for student housing. An intentionally set fire on the first floor quickly traveled up the stairs to the second and third floors, blocking the primary exit for the occupants. Four occupants on the second floor had no choice but to fall from second floor windows to escape. Two third-floor occupants were trapped and suffered smoke inhalation injuries.

The three-story wooden-frame dwelling measured 55 feet (16 meters) by16 feet (4 meters) and had an asphalt-shingle roof. An automatic smoke detection system provided coverage in the bedrooms and common hallways. There were no sprinklers.

An occupant used an open flame device to ignite a blanket resting on top of an upholstered couch. The fire spread to the couch and throughout the living room before advancing vertically to upper floors. Two occupants of the second floor suffered trauma; two others from the same floor had smoke inhalation. The first-floor occupant also suffered smoke inhalation. The building, valued at $100,000, was a total loss.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, May/June 32-33.

Porch Fire Spreads into House, Massachusetts

Smoking materials dropped on a couch on the porch of a single-family house started a fire that spread into the home, trapping and killing an 89-year-old man. A passerby rescued three other occupants, and firefighters responding to a 911 call from the house saved a fourth.

The two-story, wood-frame house, which was 34 feet (10.4 meters) long and 24 feet (7.3 meters) wide, was unsprinklered. Smoke alarms had been installed in the basement and on the second floor, but their operation during the fire was not reported.

Investigators determined that the carelessly disposed of smoking materials ignited a couch on the porch. The fire then spread to other furnishings, aerosol cans, and a 20-pound (9-kilogram) propane cylinder, the contents of which contributed to the fire spread into the house.

The house, valued at $125,000, sustained structural losses of $80,000, and damage to its contents, valued at $80,000, came to $40,000.

The man firefighters rescued died of burns and smoke injuries about two months after the fire. The passerby who rescued the three occupants suffered smoke inhalation and burns, as did two firefighters.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, January/February, 18.

Intentional Porch Fire Spreads through Window to Ignite an Upholstered Couch in Catastrophic Fire, Pennsylvania

In November 2003, a Pennsylvania fire department was notified at 3:42 a.m. of a fire in a two-story single-family dwelling of unprotected ordinary construction. The fire killed five people, including one child under six. Two smoke alarms were present, but one had a dead battery and the other had no battery.

This fire was set on a porch at the front door and extended to the porch roof and into the house via a front window where it ignited a foam-padded sofa. Smoke and flames extended via the stairway to the second story. Four victims were found on the second story.

Excerpted and adapted from Stephen G. Badger, 2004, "Catastrophic Multi-Death Fires of 2003," *NFPA Journal,* September/October, 70.

Fireworks inside a Residence Ignite Deadly Fire, Missouri

A 6-year old boy and a 40-year old male died when fireworks ignited the interior of their home. Investigators believe hot embers from fireworks ignited an upholstered sofa and quickly spread, trapping the occupants. Firefighters fought through the fire and heavy smoke coming from the front door and quickly found one victim and later a second, but both had succumbed to smoke inhalation and burn injuries.

The single-family home was constructed of wood framing with a wooden roof and asphalt shingles. The 1,200-square-foot (111-square-meter) home lacked smoke alarms and sprinklers.

The fire department received a call from a passerby at 11:50 p.m. and arrived five minutes later to find police on scene reporting a person possibly trapped. As flames came out the front door and window, firefighters advanced a hose line into the front door knocking down the heavy fire as they went.

Within 10 feet (3 meters) of the door, the first victim was found and removed to the front lawn. Firefighters suppressed the fire and continued the primary search. A second victim was found in the kitchen and removed. The fire was contained to the first floor and the dwelling ventilated as the investigation began. Damages to the home were not reported.

Kenneth J. Tremblay, 2007, Firewatch, *NFPA Journal*, September/October 26.

Four Die in House Fire, West Virginia

A family of four died in an early-morning fire that spread from the first-floor living room to the upper floors. By the time firefighters arrived, the house was engulfed in flames, and the fire was threatening the houses on either side.

The single-family, wood-framed home was two stories high with wood siding and a metal roof. It was 30 feet (9 meters) wide. No smoke detection equipment was found, and there were no fire sprinklers.

A passerby discovered the fire, and woke the neighbors, and tried to get the occupants out of the house. The fire department received the 911 call at 3:08 a.m. Arriving firefighters established a water supply and used two 1 ¾-inch hose lines to protect the exposures. A second engine company also established a water supply and advanced additional hose lines to back up the first responders. They tried to enter the house, but heavy fire drove them out, and the incident commander ordered a defensive approach.

Investigators determined that the fire began in the living room couch, but they couldn't determine what started it.

A man and a woman, both 44, and two boys, ages 14 and 11, succumbed to smoke inhalation. The house, valued at $40,000 and its contents, valued at $15,000 were destroyed.

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, March/April 19.

No Injuries in Early Morning Apartment Fire, Michigan

Seventy-five residents of an apartment building for older adults were evacuated safely even though smoke and flames spread to two floors and the attic during an early morning fire. Firefighters and sprinklers were able to limit fire spread to one interior fire division.

The L-shaped, 72-unit apartment building contained 24 units per floor, and the two wings were connected by a central common area. Each wing had a center corridor nearly 142 feet (43 meters) long by 58 feet (18 meters) wide. The common areas, which measured 94 feet by 58 feet (29 meters by 18 meters), included a day room, a lobby, a mechanical room, and storage rooms. The apartments and common area had hard-wired smoke detectors monitored by a central station alarm company. Standpipes and a partial wet-pipe sprinkler system protected the hallways and common areas.

At 1:56 a.m., the fire department received a 911 call reporting smoke on the second floor. Arriving three minutes later, firefighters noted smoke coming from the roof and second floor and, with the help of police officers, began evacuating the building and rescuing occupants from balconies.

The first five responding firefighters were joined by roughly 270 other emergency workers. They provided numerous ambulances and dry school buses that transported the residents from a temporary staging area in a nearby parking lot to the hospital, where the cafeteria was used as a temporary processing center. Five residents were treated for smoke inhalation.

The blaze began in an unoccupied second-floor apartment, where an unknown heat source ignited an upholstered chair. The fire spread to nearby curtains and out the open patio door, allowing the flames to spread up the building's wall to a third-floor apartment and the attic.

Using numerous resources, including a fire partition in the attic and a pre-incident plan, firefighters stopped the blaze from spreading into the common area and the building's other wing. The activation of 20 sprinklers also helped prevent the fire from spreading and protected the hallways for evacuation.

The $1.6 million building suffered $850,000 in damage. Contents, valued at $1.5 million, sustained a $750,000 loss. No firefighters were injured.

Kenneth J. Tremblay, 2001, Firewatch, *NFPA Journal*, July/August 24.

Smoke Detectors Save Occupants From Fast-Moving Fire, Pennsylvania

Seven people owe their lives to an automatic fire detection system installed in a single-family home used for student housing. An intentionally set fire on the first floor quickly traveled up the stairs to the second and third floors, blocking the primary exit for the occupants. Four occupants on the second floor had no choice but to fall from second floor windows to escape. Two third-floor occupants were trapped and suffered smoke inhalation injuries.

The three-story wooden-frame dwelling measured 55 feet (16 meters) by16 feet (4 meters) and had an asphalt-shingle roof. An automatic smoke detection system provided coverage in the bedrooms and common hallways. There were no sprinklers.

An occupant used an open flame device to ignite a blanket resting on top of an upholstered couch. The fire spread to the couch and throughout the living room before advancing vertically to upper floors. Two occupants of the second floor suffered trauma; two others from the same floor had smoke inhalation. The first-floor occupant also suffered smoke inhalation. The building, valued at $100,000, was a total loss.

Kenneth J. Tremblay, 2007, Firewatch, *NFPA Journal*, May/June 32-33.

Sprinklers Extinguish Fire in Home Oxygen Unit, Arizona

Careless disposal of smoking materials contributed to the smoke-inhalation death of a woman in her single-family home, despite the activation of two sprinklers that extinguished the flames.

The single-story, wood-frame house, which measured 50 feet (15 meters) by 40 feet (12 meters), had a stucco exterior and a tile roof. The home had a wet-pipe residential sprinkler system and a local smoke alarm, but neither system was monitored, and the smoke alarm may not have activated during the fire.

Investigators believe that smoking materials carelessly disposed of in a wastebasket ignited paper. When the occupant discovered the fire, she moved the wastebasket to the sink to extinguish it, but not before the fire burned through plastic oxygen tubing running under the basket. Flames spread along the oxygen-enriched tubing, igniting an upholstered stool and the oxygen generator in the first-floor living room. The fire was finally extinguished by two sprinklers, which operated above each burning item.

Water flowing from under the garage alerted a neighbor, who called the fire department at 9:30 a.m. Responding firefighters discovered the woman in the bathroom, where she had succumbed to smoke inhalation.

The house and its contents, valued at $200,000, suffered an estimated loss of $40,000

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, November/December, 17.

Appendix C.
Methodology and Definitions Used in "Leading Cause" Tables

The cause table reflects relevant causal factors that accounted for at least 2% of the fires in a given occupancy. Only those causes that seemed to describe a scenario are included. Because the causal factors are taken from different fields, some double counting is possible. Percentages are calculated against the total number of structure fires, including both confined and non-confined fires. Bear in mind that every fire has at least three "causes" in the sense that it could have been prevented by changing behavior, heat source, or ignitability of first fuel, the last an aspect not reflected in any of the major cause categories. For example, several of the cause categories in this system refer to types of equipment (cooking, heating, electrical distribution and lighting, clothes dryers and washers, torches). However, the problem may be not with the equipment but with the way it is used. The details in national estimates are derived from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS). This methodology is based on the coding system used in Version 5.0 of NFIRS. The *NFIRS 5.0 Reference Guide*, containing all of the codes, can be downloaded from http://www.nfirs.fema.gov/documentation/reference/.

Cooking equipment and heating equipment are calculated by summing fires identified by equipment involved in ignition and relevant confined fires. Confined fires will be shown if they account for at least 1% of the incidents. **Confined cooking fires** (cooking fires involving the contents of a cooking vessel without fie extension beyond the vessel) are identified by NFIRS incident type 113;

Confined heating equipment fires include **confined chimney or flue fires** (incident type 114) and **confined fuel burner or boiler** fires (incident type 116). The latter includes delayed ignitions and incidents where flames caused no damage outside the fire box. The two types of confined heating fires may be combined or listed separately, depending on the numbers involved.

Contained trash or rubbish fires with no flame damage to structure or its contents are identified by incident type 118. No cause can be ascertained for these incidents, but they account for a substantial share of the incidents in some occupancies. When appropriate, these fires are generally shown at the bottom of a cause table.

Confined or contained fires (incident type 113-118) are excluded from the remaining estimates. Unknown data is allocated proportionally among non-confined fires.

Intentional fires are identified by fires with a "1" (intentional) in the field "cause." The estimate includes a proportional share of fires in which the cause was undetermined after investigation, under investigation, or not reported. All fires with intentional causes are included in this category regardless of the age of the person involved. Earlier versions of NFIRS included codes for incendiary and suspicious; both convert to intentional. Intentional fires were deliberately set; they may or may not be incendiary in a legal sense. No age restriction is applied.

Fires caused by **playing with heat source** (typically matches or lighters) are identified by code 19 in the field "factor contributing to ignition." Because of conversion issues, only data originally collected in Version 5.0 of NFIRS is used in the initial calculation. It appears that "none" is often being used in place of "unknown." Fires in which the factor contribution to ignition was undetermined (UU), entered as none (NN) or left blank are considered unknown and allocated proportionally. Because factor contributing to ignition is not required for intentional fires, the share unknown, by these definitions, is somewhat larger than it should be. After the Version 5.0 only data has been run for non-confined fires and the unknown data allocated, percentages are calculated for each code of Version 5.0 non-confined fires. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates. The final percentage of fires is calculated by dividing these estimates by the total number of confined and non-confined fires from all versions.

The heat source field is used to identify fires started by: **smoking materials** (cigarette, code 61; pipe or cigar, code 62; and heat from undetermined smoking material, code 63); **candles** (code 66), **lightning** (code 73); and **spontaneous combustion or chemical reaction** (code 72). Fires started by heat from unclassified open flame or smoking materials (code 60) are allocated proportionally among the "other open flame or smoking material" codes (codes 61-69) in an allocation of partial unknown data. This includes smoking materials and candles. This approach results in any true unclassified smoking or open flame heat sources such as incense being inappropriately allocated. However, in many fires, this code was used as an unknown.

The equipment involved in ignition field is used to find several cause categories. This category includes equipment that functioned properly and equipment that malfunctioned.

Identified cooking equipment refers to equipment used to cook, heat or warm food (codes 600, 620-649 and 654). Fire in which ranges, ovens or microwave ovens, food warming appliances, fixed or portable cooking appliances, deep fat fryers, open fired charcoal or gas grills, grease hoods or ducts, or other cooking appliances) were involved in the ignition are said to be caused by cooking equipment. Food preparation devices that do not involve heating, such as can openers or food processors, are not included here. Unclassified kitchen and cooking equipment (code 600) is included here because a larger share of the whole category involved cooking rather than kitchen equipment.

Identified heating equipment (codes 100 and 120-199) includes central heat, portable and fixed heaters (including wood stoves), fireplaces, chimneys, hot water heaters, and heat transfer equipment such as hot air ducts or hot water pipes. Heat pumps are not included. Unclassified heating, ventilation and air condition equipment (code 100) is included here because a larger share of the whole category involved heating rather than air conditioning or ventilation equipment.

Electrical distribution and lighting equipment (codes 200-299) include: fixed wiring; transformers; associated overcurrent or disconnect equipment such as fuses or circuit breakers; meters; meter boxes; power switch gear; switches,

receptacles and outlets; light fixtures, lamps, bulbs or lighting; signs; cords and plugs; generators, transformers, inverters, batteries and battery charges.

Torch, burner or soldering iron (codes 331-334) includes welding torches, cutting torches, Bunsen burners, plumber furnaces, blowtorches, and soldering equipment.

Clothes dryer or washer (codes 811, 813 and 814) includes clothes dryers alone, washer and dryer combinations within one frame, and washing machines for clothes.

Electronic, office or entertainment equipment (codes 700-799) includes: computers and related equipment; calculators and adding machines;, telephones or answering machines; copiers; fax machines; paper shredders; typewriters; postage meters; other office equipment; musical instruments; stereo systems and/or components; televisions and cable TV converter boxes,, cameras, excluding professional television studio cameras, video equipment and other electronic equipment. Older versions of NFIRS had a code for electronic equipment that included radar, X-rays, computers, telephones, and transmitter equipment. Because this code was so broad, it unfortunately converts to equipment involved undetermined.

Shop tools and industrial equipment excluding torches, burners or soldering irons (codes 300-330, 335-399) includes power tools; painting equipment; compressors; atomizing equipment; pumps; wet/dry vacuums; hoists, lifts or cranes; powered jacking equipment; water or gas drilling equipment; unclassified hydraulic equipment; heat-treating equipment; incinerators, industrial furnaces, ovens or kilns; pumps; compressors; internal combustion engines; conveyors; printing presses; casting, molding; or forging equipment; heat treating equipment; tar kettles; working or shaping machines; coating machines; chemical process equipment; waste recovery equipment; power transfer equipment; power takeoff; powered valves; bearings or brakes; picking, carding or weaving machines; testing equipment; gas regulators; separate motors; non-vehicular internal combustion engines; and unclassified shop tools and industrial equipment.

Medical equipment (codes 410-419) includes: dental, medical or other powered bed, chair or wheelchair; dental equipment; dialysis equipment; medical monitoring and imaging equipment; oxygen administration equipment; radiological equipment; medical sterilizers, therapeutic equipment and unclassified medical equipment.

Mobile property (vehicle) describes fires in which some type of mobile property was involved in ignition, regardless of whether the mobile property itself burned. Mobile property includes: highway-type vehicles such as cars, trucks, recreational vehicles, and motorcycles; trains, trolleys and subways; boats and ships; aircraft; industrial, agricultural and construction vehicles; and riding lawn mowers, snow removal vehicles and tractors. Because of conversion issues, only data originally collected in Version 5.0 of NFIRS is used in the initial calculation. The data was obtained by first running Version 5.0 non

confined fires only to identify vehicles that were involved in ignition whether or not they burned themselves (mobile property involved codes 2 and 3). After the unknown data was allocated, percentages are calculated for each code of Version 5.0 non-confined fires. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates. The final percentage of fires is calculated by dividing these estimates by the total number of confined and non-confined fires from all versions.

Exposures are fires that are caused by the spread of or from another fire. These include fires in which the exposure number is greater than 0; the factor contributing to ignition is property too close (code 71); or heat source is heat spreading from another fire via direct flame or convection current (code 80-89). Because exposures are identified by the older hierarchical sort, all non-confined fires with exposure number greater than zero are counted as exposures, but those identified by heat source and factor contributing to ignition include only fires that were not grouped in other categories such as cooking or heating equipment.

May 11, 2008

Office of the Secretary
Consumer Product Safety Commission
430 East West Highway
Bethesda, MD 20814

RE: Upholstered Furniture Notice of Proposed Rulemaking

Dear Commissioners:

Thank you for your work in developing the proposed rule "Standard for the Flammability of Residentail Upholstered Furniture" (16 CFR Part 1634). I believe that this proposed rule would appropriately balance fire protection with the environmental and health risks posed by brominated fire retardants.

However, I remain concerned that possibly toxic brominated fire retardants could be applied to the back-coating of upholstery fabric in order to meet the smoldering ignition performance standard. Any such use of chemical flame retardants should be required to be tested by the retardant manufacturer for possible effects on human health and the environment. CPSC should evaluate these test results and should require labeling of products should it be deemed necessary for them to employ brominated flame retardant.

Again thank you for your important decision to recognize the potential hazard of brominated fire retardants and appropriately balance their use against the risk they appear to present to human and environmental health.

Sincerely,

Robert Barish
3056 Castro Valley Blvd., #49
Castro Valley, CA 94546

National Fire Protection Association
1401 K Street, NW, Suite 500, Washington, DC 20005
Phone: 202-898-0222 • Fax: 202-898-0044 • www.nfpa.org

May 12, 2008

Office of the Secretary
Consumer Product Safety Commission
Room 502
4330 East-West Highway
Bethesda, MD 20814

RE: Upholstered Furniture NPR, 73 FR 11702

The National Fire Protection Association (NFPA) is pleased to have this opportunity to respond to the queries presented in U.S. Consumer Product Safety Commission (CPSC) notice of proposed rule (NPR), "Standard for the Flammability of Residential Upholstered Furniture" published in the Federal Register 73 FR11702, March 4, 2008. We are using this opportunity to provide some background on the larger issues associated with upholstered furniture fires, general comments on the proposed rule and the NFPA position, including a copy of our latest report on Home Fires That Began With Upholstered Furniture (enclosed).

Upholstered furniture has been the leading item first ignited in fatal home fires for as far back as we have had detailed fire statistics. For 2002-2005, NFPA's analysis – not limited to what CPSC calls "addressable" fires – showed an estimated average of 7,600 reported home structure fires beginning with ignition of upholstered furniture and associated life loss of 600 civilian fire deaths per year. Despite sharp declines over the past quarter century in the number of such fires and associated civilian fire deaths, upholstered furniture continues to be the leading item first ignited. Therefore, there is reason to explore additional changes and requirements that will improve safety, and NFPA commends CPSC for proposing a program to accomplish this goal.

A fire death can be avoided either by preventing the fire entirely or by slowing the growth of fire intensity and reducing the peak fire intensity so that potentially exposed occupants have enough time to escape safely. Ignition can begin with smoldering, with small open flame ignition, or with ignition by convective or radiative heat transfer, as from a nearby space heater. Mitigation involves changes to the fire performance of the product once ignited.

Which Ignition Scenarios to Address? The CPSC proposal focuses on the smoldering ignition scenario while setting aside the small open flame scenario that had been under consideration. (Ignition by convection or radiation has never been directly addressed by a proposal.) The rationale for CPSC's focus is the dominant role of smoldering ignitions, particularly cigarette ignitions, in upholstered furniture fires. CPSC's use of "addressable" fires makes this dominance appear even greater than it does when all upholstered furniture fires are included, but a complete analysis, such as NFPA has done, still shows well over half of all deaths in fires starting with upholstered furniture as beginning with cigarette ignition or other smoldering scenarios.

However, the dominance of cigarette ignitions has been declining steadily and dramatically over the past quarter century. In 1980-1983, cigarette ignitions were three to four times as frequent as small open flame ignitions, while by 2002-2005, they were only 30 percent more likely. The ratio for fire deaths was about seven to one in 1980-1983 but was down to about four to one as of 2002-2005. This trend, combined with the rapid introduction of so-called "fire-safe cigarette" laws in more than half the states, makes it likely that cigarette ignitions and smoldering scenarios generally will not be the dominant scenario much longer, even if CPSC does not regulate upholstered furniture.

Now that the majority of states have passed legislation requiring all cigarettes sold in these states to be "fire-safe," or more accurately, "reduced ignition propensity" cigarettes, manufacturers are starting to produce only cigarettes that meet these requirements. The CPSC must take steps to ensure that bed and furniture

flammability tests remain at least as challenging as they have been in the past. CPSC should develop and specify a standard test cigarette or other tool with the same ignition propensity as traditional test cigarettes.

Fire and associated losses can be prevented by reducing the ability of the heat source to ignite a fuel, making the fuel more resistant to ignition or continued burning, or changing the circumstances that allow the heat source and fuel to combine to start a fire. The "fire-safe" cigarette reduces the probability of cigarette ignition. Tests of upholstered furniture must continue to ensure that beds and upholstered furniture maintain a high level of fire resistance in order to effect a new reduction in fire deaths from fire standard compliant cigarettes.

NFPA recommends that CPSC reexamine the case for a small open flame requirement using a dynamic analysis of where fire trends are going to see whether their proposal will still make sense in the near future. We also request that CPSC analyze the effectiveness of the approaches for preventing ignition by convective or radiative heat transfer as from a space heater, inasmuch as this third mode of ignition also accounts for a significant share of fires and deaths. (By some estimates – that is, if radiated or conducted heat from operating equipment and unclassified heat from powered equipment both fit this scenario – its share of upholstered furniture home fire deaths (10 percent) is comparable to the share for candles, matches, and lighters (13 percent).)

How to Assure Resistance to Smoldering Ignition? In the CPSC analysis of the mid-1980s, done as part of the Cigarette Safety Act studies, CPSC staff demonstrated that cigarette ignitions are very unlikely if filling materials are not untreated cotton batting and cover materials are thermoplastic and not cellulosic. Both of these conditions were shown to be necessary to achieve prevention with confidence. (See, for example, Table C-1 in Expected Changes in Fire Damages from Reducing Cigarette Ignition Propensity, Technical Study Group, Cigarette Safety Act of 1984, October 1987.) CPSC proposes a protocol that would test only the covering fabric and test it against polyurethane foam filling material. It is not clear how such a test will assure prevention if the covering fabric were to be used with untreated cotton batting. It would seem more straightforward and more effective to establish a performance test that uses a mockup representing the entire product – covering fabric and filling material – as it will be sold. This would be true whether a barrier is used or not.

NFPA recommends that CPSC reexamine the specifics of their proposal to make sure that it will screen out products with unacceptable ignition potential, whether that potential resides in the covering fabric or the filling material.

How to Prevent Rapid Transition to Flashover? For mitigation, it is the burning performance of the upholstered furniture – and more specifically, the burning performance of the filling material, which constitutes most of the mass available as fuel in the product – that determines the speed and size of the threat. Upholstered furniture is one of the few items in the home that is capable of single-handedly taking a room to flashover, and most U.S. home fire deaths involve post-flashover fire conditions. NFPA statistical analysis indicates that upholstered furniture ranks second (to structural elements) on the scale of item contributing most to fire spread, in those fires where the item contributing most to fire spread is not the same as the first item ignited. Put another way, there are far more home fire deaths attributable in large part to the fire performance of upholstered furniture than one would conclude by focusing solely on fires where the product is the first item ignited. This fact adds to the importance of a direct examination of the effect of any proposed standard on the product's burning performance.

NFPA recommends that CPSC reanalyze its proposal to take account of the role of upholstered furniture as a principal second item ignited – and as such as an item that will often take a fire to flashover when the first ignited item could not. CPSC has a recent precedent that shows the value of such an analysis. Work with NIST and industry groups showed that the new requirement for mattresses, while designed as a small open flame resistance standard, also will provide additional benefit on product fire performance if ignition occurs. That same comprehensive examination of the impact of the proposed test should be conducted on this proposed upholstered furniture requirement.

Finally, NFPA recommends that CPSC release its detailed analysis, both the analysis supporting the current proposal and any new analysis along the lines recommended by NFPA above. The brief text summaries of CPSC's conclusions are not enough by themselves to permit a thorough independent review, which NFPA and others would like to perform and which will end up providing CPSC with the most complete and most useful commentary possible.

Is the Proposal Equal to the Problem and to This Moment of Opportunity? To sum up, upholstered furniture is a complex product that reacts to fire in complex ways. The best approaches to improvement in safety for such a product are comprehensive approaches or at least approaches that have been shown through a comprehensive and dynamic analysis to offer a real prospect for significant reductions in the fire toll. Through the Upholstered Furniture Action Council (UFAC), the industry has made great strides in improving the fire performance of its products, and nothing we say should be interpreted to minimize or to dismiss their accomplishments. Nevertheless, the continued large share of U.S. fire losses attributed to this product justifies further action. Although there has been substantial and continuing progress in reducing the annual number of fire deaths resulting from upholstered furniture fires, NFPA remains convinced that the numbers remain high enough to justify further action. NFPA believes that CPSC's proposed course of action as set forth in the proposed rulemaking properly emphasizes the most proven strategies directed at the largest part of the fire problem.

CPSC chooses to define match and lighter fires as non-addressable and they (and other analysts) cannot readily isolate the number of fire deaths resulting primarily from the secondary involvement of upholstered furniture in what would otherwise be small fires, consequently we believe that the relative importance of open flame ignitions of upholstered furniture may have been significantly understated. NFPA reserves the right to propose that CPSC revisit this issue if and when additional research provides a basis for doing so.

The estimated life safety benefits from making filling materials fire-retardant continue to be significant, therefore NFPA believes that it should be possible to identify fire-retardant alternatives for which health and environmental concerns are minimal and do not constitute a sufficient basis for rejecting an upholstery fire-retarding strategy.

NFPA commends CPSC for choosing to act for greater safety, but we urge CPSC to make sure that the action taken is equal to the problem being addressed. Upholstered furniture deaths are still numerous enough to justify additional strategies; we recommend that CPSC take full advantage of this opportunity, long in coming, to assure that America's upholstered furniture will be as safe as any in the world.

If you have any questions or require additional information concerning this matter, please do not hesitate to contact me at (202) 898 1229.

Sincerely,

Nancy McNabb

Nancy McNabb AIA
Director, Government Affairs
NFPA

Enclosure: NFPA report on Home Fires That Began With Upholstered Furniture

34

P R A X I S H R

May 12, 2008

Office of the Secretary
Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

To Whom It May Concern:

I am writing to express my concerns for the direction the CPSC is moving towards in response to fire safety standards on residential furniture. I am worried by the proposed measures the CPSC is considering.

Your proposal does not require products to be manufactured completely flame retardant and would lessen the existing fire safety standards. As I understand the current research flame retardant standards pose very little risk to individuals, while providing maximum protection during a fire related incident.

I strongly encourage the Commission to revisit the proposal and ensure that the fire safety of the American people is of the utmost importance.

Sincerely,

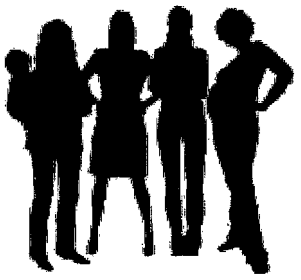
Jeff Turner

701 Fifth Avenue Suite 4200 Seattle, Washington 98104 206.262.8133 253.669.6367 FAX www.praxishr.com

35

Stevenson, Todd

From: Mary Brune [mary@safemilk.org]
Sent: Monday, May 12, 2008 4:43 PM
To: CPSC-OS
Subject: Upholstered Furniture NPR



Office of the Secretary
Consumer Product Safety Commission
4330 East West Highway,
Bethesda, MD 20814

RE: Upholstered Furniture NPR

To the Commission:

I am writing on behalf of Making Our Milk Safe (MOMS) to applaud your efforts to improve fire safety, and urge you to enact the "Standard for the Flammability of Residential Upholstered Furniture" (16 CFR Part 1634). As an organization founded by nursing mothers to address the presence of toxic chemicals in mother's milk, we have been watching this issue closely.

Halogenated fire retardants used in furniture and children's furnishings have been found to persist, accumulate and be potentially toxic. Halogenated fire retardant chemicals are accumulating in humans, wildlife, and the environment at alarming rates. U.S. women have some of the highest levels of fire retardants in their breast milk in the world, and babies have the highest levels of human exposure.

Health effects include the potential for bioaccumulation and persistence, especially in children, as well as endocrine disruption, carcinogenicity, and reproductive and neurological disorders. Recent U.S. EPA studies indicate areas of concern, as well as large data gaps for human health and environmental safety for all of the fire retardant chemicals currently used in furniture and many children's products.

A fire retardant known as chlorinated tris, or TDCP was removed from children's sleepwear 30 years ago by CPSC, but according to some sources, is currently the second most common fire retardant used in California furniture. Tris is both a mutagen and a probable human carcinogen. If tris were used in all furniture across the U.S., CPSC predicts up to 300 additional cases of cancer per million from human exposure or up to 1,200 cases of cancer annually in the U.S.

Dozens of scientific studies are now underway examining the relationship between previously used PBDE fire retardant chemicals and birth defects, autism, hyperactivity, reduced fertility including lowered sperm counts, and other reproductive and neurological conditions. In August of 2007, a

study conducted by U.S. EPA scientists linked fire retardant chemicals to the current epidemic of hyperthyroid disease in domestic cats.

We at Making Our Milk Safe (MOMS) urge you to enact the current draft standard as a way of preserving fire safety, while minimizing the impact of halogenated fire retardants on the environment and its inhabitants.

Mary Brune
Co-founder & Director
Making Our Milk Safe (MOMS)
1516 Oak St., Suite 320
Alameda, CA 94501
Phone: 510-814-0360
Fax: 510-814-0328

mary@safemilk.org

Sign the petition for toxic-free baby bottles.

36

Stevenson, Todd

From: Steve Gibbs [slgibbs@worldnet.att.net]
Sent: Tuesday, May 13, 2008 11:53 AM
To: CPSC-OS
Subject: Upholstered Furniture NPR.

May 13, 2008

Office of the Secretary

Consumer Product Safety Commission

4330 East West Highway

Bethesda, MD 20814

To Whom It May Concern:

I am writing to express my concerns for the direction the CPSC is moving towards in lessening fire safety standards on residential furniture, I think it is a mistake. Having completed successfully the Seattle Fire Department's emergency medical technician certification class and training with the SFD I am very interested in fire prevention issues.

The reduction in fire deaths over the years has been attributed to the use of approved and studied chemical flame retardants. To eliminate this important tool from the fire safety tool box will result in an increase in fire deaths and property damage. Chemical flame retardants are used to protect the foam as well as the covering fabric from both small open flames and smoldering ignition. While they do not put out fires, they do provide crucial added time for the occupants to leave the residence, thus saving lives.

The CPSC should reconsider the stakeholder agreement from 2004, designed to protect the fabric and the foam, resulting in a standard that will provide the maximum protection to the public. Our firefighters and emergency responders have tough enough jobs do not make them tougher.

Sincerely,

Steve Gibbs

1802 30th Avenue South

Seattle, WA 98144

May 13, 2008

Office of the Secretary
Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

To Whom It May Concern:

I am writing to express my concerns for the direction the CPSC is moving towards in lessening the fire safety standards on residential furniture.

Fire safety is of utmost importance to me. As a firefighter, I have dedicated my time and efforts to helping educate the citizens of my area about the dangers of residential fires and the steps they can take to help prevent them. When a residential fire does occur, every second is a matter of life and death.

Some of the most effective tools we have in residential fire safety are not ones we carry on our apparatus, but rather, the flame retardant products within the home. Fire retardants add crucial time for residents to leave a house during a fire, as well as assist in minimizing the potential spread of the flames. Retardants also create a more tenable environment in which we can work, give us more time to rescue trapped victims, and allow us a greater chance to protect the overall property by minimizing potential fire spread.

The CPSC holds the power to establish fire safety standards for residential products that can save the lives of both citizens and fire fighters. Unfortunately, it appears the Commission has chosen to move away from proven fire safety measures and is considering removing fire retardants from the foam in furniture.

As I understand it the Commission's most recent proposal deals only with the covering fabric and does not require the foam – which is the most flammable – to be treated with flame retardants. The proposal fails to acknowledge that the furniture is protected only as long as the integrity of the covering fabric lasts. If the barrier fails in any way (i.e. poor design/construction, damage by pets or children or any numerous other causes), the furniture is no longer flame retardant, and subject to the effects of fire.

The lives of fire-fighters and the citizens we strive to protect are at stake. The current flammability standards play a significant role in residential fire safety and should be revisited by the CPSC.

Sincerely,

Nate Peery
621 5th Ave N #404
Seattle, WA 98109

FOSTER LAW FIRM, L.L.P.
Attorneys and Counselors at Law

ROBERT PAUL FOSTER
rfoster@fosterfoster.com

PAUL J. FOSTER, JR.
1928-1999

May 13, 2008

Office of the Secretary
Consumer Product Safety Commission
4330 East West Highway
Bathesda, MD 20814

RE: Comments to the CPSC on Proposed Rule for the Flammability of Residential Upholstered Furniture. 16 CFR Part 1634

Dear Sir or Madam:

I am an attorney who has spent nearly 15 years litigating furniture flammability cases in 6 states in the Southeast to date. I have represented families whose lives have been forever changed by the flammability defects which exist in typical upholstered furniture sold in this country. In those cases, 24 loved ones, 20 of which were children, have died tragically. Twelve more were seriously injured, with medical costs in many cases exceeding one million dollars per person. I am writing this body for the second time on this subject, to express my concems about the Rule proposed by the CPSC to address a serious problem with the flammability of residential upholstered furniture.

CPSC Disregards Decades of Prior Progress towards a Meaningful Rule

First and foremost, the proposed rule, in my opinion, disregards decades of hard work by this body and many interested individuals, and simply sings the same old song sung by industry in the 1970's when the UFAC was formed – address smoldering cigarette ignition of furniture, not the flammability of the foam cushioning material, and that will be enough. That ignition source was addressed by UFAC primarily through the use of thermoplastic covering materials, which did reduce losses of this type. At the same time, however, these covering materials are among the worst choices to prevent open flame ignitions of upholstered furniture, exposing the most flammable and highest fuel load in the home to immediate ignition, and flashover in as little as three to five minutes. The Commission, while noting the reduction of fire losses from smoldering sources in its 1997 and 2001 briefings on the subject, also found that deaths from open flame ignition of upholstered furniture had remained constant for more than twenty years, according to their fire statistics. The Rule also completely disregards the 1994 Petition by the NASFM, to address small open flame ignition, which was specifically the portion of the petition granted by the CPSC. Why the CPSC would ignore the portion of the petition it granted is beyond rational reasoning.

864.242.6200 • FAX 864.233.0290
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Recent Industry Changes in Fire Loss Statistics Methodology

Industry recently hired and paid CRA International to "revamp" the methodology to assess furniture fire losses. According to this body's comment on the study in the April 25, 2007 AHFA flammability update, the company criticized CPSC's fire loss statistics and methodology when it "recommended two alternative methods to reduce estimated losses", and "recommended changes to reduce estimated benefits, increase estimated costs" from a possible standard.[www.cpsc.gov/library/foia/foia07/os/ahfa.pdf;(page 19)] The Commission then accepted these industry sponsored methods and criticisms without debate, and for the first time, concluded that the deaths from open flame ignitions of upholstered furniture were annualized at 20 per year, and were now "insignificant", and would not be addressed by the proposed rule.

I believe the industry method is an arbitrary attempt to reduce furniture fire losses to allow industry to limit the scope of a possible standard. I firmly believe this method serves to greatly underestimate open flame ignition related deaths. If the "new" approach estimates 20 deaths per year from this ignition scenario, then for the year 2003, Foster Law Firm represented six fatalities, or nearly 1/3 of the national yearly total. Those six children died in an upholstered sofa fire started by a child with a cigarette lighter July 9, 2003, in a mobile home outside the gates of Camp Lejune in Jacksonville, N.C. This ignition scenario was firmly established in the course of three years of discovery. The facts of the ignition scenario in civil cases are subject to thorough discovery through the use of experts, and prove to be extremely reliable. The complaint filed on behalf of the six estates is attached for the Commission's review. [Exh. 1] I would like to find out whether these six children appear in the database of open flame ignition related furniture deaths for the year 2003. I truly do not believe that I represented 1/3 of all persons killed in 2003 by this type of ignition scenario. I believe the estimates are arbitrarily low, and not "insignificant", as stated by this body.

I hope to bring the mother of these 6 children, who also had 4 other children who were seriously injured in the fire, as well as two other burn survivors, from other furniture fires, to appear before the Commission to share with this body how the flammability defect in their upholstered furniture has forever changed their lives.

I think it is helpful to change the focus on numbers, and to appreciate the fact that we are dealing with real people, innocent children, with names and faces, who have lost their lives tragically, and most importantly, that a comprehensive meaningful standard can change the status quo. Attached are names and photographs of some of the deceased children whose families I have represented, including the six death cases referenced above. [Exh. 2]

Noted NFPA fire researcher John Hall has studied child play fires occurring since 1980. [Exh. 3] In 1999, excluding intentional fires, children started 41,000 home fires. Lighter fires accounted for 7490 fires annually from 1994 through 1998. Matches accounted for 6970 per year for the same period. Upholstered furniture, along with mattresses and clothing, accounted one of the top three first items ignited, with 1300 fires that year. These statistics clearly demonstrate an ignition scenario that represents a very real hazard, which will not be addressed by the proposed standard. Any one of these 1300 ignitions could bring flashover conditions in as little as three to five minutes, costing more lives and injuries. A prudent Commission should address this hazard.

Controlling Fire Growth Rates and Heat Release Rates is Vital

As has been stated by experts much more learned than I, we must control the growth rate of upholstered furniture fires to prevent or slow the development of lethal conditions in a residence when an item of furniture is ignited, from any reasonably expected source. This control of the heat release rate gives the occupants more time to escape, and thereby saves lives. In fire emergencies, valuable additional seconds can make the difference between life and death.

A fire performance standard based on heat release rates and/or mass loss as a function of time, for burning furniture, is the more prudent approach, and will create substantial economic benefit in improvements in lowering rates of death and injury, as well as property damage, regardless of the ignition source. I have recently seen a number of cases where property damage, injury and death have resulted from electrical devices inside furniture which have caused furniture fires, including heaters, massagers, telephones and power lift mechanisms. Electrical ignition sources from outside the upholstered item, as well as those interior electrical sources, will not be addressed by the proposed standard. Electrical ignition sources have long been recognized by this body to be in the top three in terms of items first ignited in fire losses. [Exh. 4]

The Commission has in the past taken note of the marked improvement in fire loss statistics in the United Kingdom as a result of its 1988 fire safety regulation. [Footnote 1] That regulation implemented a performance based standard which also banned the use of non fire retardant foam. The furniture industry in the UK was able to implement measures to comply with the regulation to make furniture safer at minimal cost. [Exh. 5] Part of the reason for the higher level of fire safety is accomplished with construction materials, which control the heat release rates of burning furniture.

Although I am critical of the Commission's insertion, without time for public comment, of a preemption statement in the preamble of the mattress flammability rule passed last year, I applaud the Commission for passing a comprehensive performance based flammability standard using heat release rate/maximum heat release criteria. Many of the country's most respected fire scientists, some of whom I use as expert witnesses on behalf of victims of these fires, share this view of the new standard. It is my hope that this process of public input and debate will cause the approach to be a more comprehensive one.

Final Furniture Flammability Rule should have Similar Goal and Approach as the Final Mattress Flammability Rule

In the mattress rulemaking proceeding, the CPSC set forth some of the purposes, goals and approaches to achieve these in passing the final rule: "...the standard is intended to reduce deaths and injuries resulting from residential fires involving mattresses ignited by open flame sources. The Commission estimates that the standard will substantially reduce the incidence and cost of these fires by minimizing the possibility of or delaying the time for flashover conditions to occur." 71 Fed. Reg 13493 (March 15, 2006); "The goal of the standard is to minimize or delay flashover when a mattress is ignited in a typical bedroom fire." 71 Fed. Reg 13472 (March 15,2006); "The standard's limit on the early contribution of the mattress to the fire (15 MJ in the first 10 minutes) will help to maintain tenable conditions early in the fire and allow for timely discovery and escape from growing fire conditions." 71 Fed. Reg 13477 (March 15,

2006); "For virtually all of the fires started by children less than 15 years of age, the ignition was not witnessed by an adult (Boudreault and Smith, 1997). Reducing the likelihood of flashover in the first 30 minutes of the fire may therefore benefit children disproportionately, as it allows enough time for adults to detect the fire and save young children in close proximity to the fire. Also children between 5 and 9 who sometimes do not cooperate with adults and run away from adults to other parts of the occupancy will have enough time to be found and rescued by an adult." 71 Fed. Reg 13491 (March 15, 2006)

Why the same goals, purposes, and approaches would not be an important in promulgating a standard to reduce the hazards from upholstered furniture fires, the leading causes of fire deaths among all products under the CPSC's jurisdiction, including mattresses, defies logic. Hopefully, the public comment period, as well as a public hearing on the proposed rule, will cause this body to consider a comprehensive standard using concepts of preventing or delaying flashover as it did in enacting the final mattress rule.

Furniture Company Comments in Litigation Cases

The President of the 6th largest furniture maker Berkline-Benchcraft LLC, testified in a deposition in one of my cases that he was not proud to have his name associated with his furniture for its flammability short-comings, after he viewed the conflagration depicted in the full scale fire video of one of his sectional sofas ignited with an open flame, in a case in which killed 3 children and their mother in a 2000 fire in Louisville Ky., which started by a child with a lighter. [Exh. 6] This video is included on enclosed electronic media.[Exh. 7] This ignition would not be addresses in the proposed standard.

Another furniture company manager of product development with Bassett for 42 years, testified in a deposition in one of my cases that he was concerned for the American public who had bought its upholstered furniture with non fire retardant foam before the company switched to an all TB 117 foam in 2001. [Exh. 8]

One senior vice president of Mohasco Upholstered Furniture Co. testified that if his company was the only one who passed along the explicit flammability warnings given to him by his foam supplier, he didn't think he would do any business. This statement can be viewed in a video (entitled Extra Feb. 2000) on my firm's website (cited below) in the video fire gallery. I happen to see a furniture manufacturing company who did attach such an explicit warning recently in my stay in a S.C. hotel.

I have attached electronic media containing video footage of a number of full-scale fire tests of upholstered furniture, mostly performed in connection with furniture fire litigation.[Exh. 7] These and other full-scale fire tests can also be viewed on my law firm's web site, Foster Law Firm, LLP, at www.fosterfoster.com. These videos demonstrate open flame ignitions of upholstered furniture where heat release rates are not controlled. Clearly modern technology allows heat release rate to be tamed in a variety of ways to prudently address this serious problem.

Achieving Fire Safety using Fire Retardants

Commissioner Nord said February 1, 2008, in her statement about the proposal, that the objective is to avoid the use of fire retardant chemicals. Most of the public

information about brominated fire retardants and California's stand on them has caused some uninformed persons concern. We should not forget furniture industry based U.S. House Rep. Roger Wicker (Ms) and his efforts to derail CPSC's efforts to pass a standard in 1998, when he asked the U.S. taxpayers to fund a large GAO life safety study to determine the effects of fire retardant chemicals which were used, or could be used, to treat upholstered furniture components. The study concluded that at least eight such chemicals of the sixteen studied " would present a minimal risk, even under worst case assumptions about exposure". CPSC 2001 Briefing on Regulatory Options for Upholstered Furniture, p. 35, Tab G. The CPSC agreed those eight were safe for use in upholstered furniture. Id. The CPSC should not toss the efforts of the taxpayer sponsored study (cost of $500,000) because of industry lobby efforts.
The CPSC has also stated in the final rule for mattresses: "In the view of the CPSC staff, there are inherently flame resistant materials and FR chemicals available that can be used to meet the standard and that are not likely to present a hazard to consumers, workers, or the environment. The CPSC and Environmental Protection Agency (EPA) staffs will continue to evaluate the potential effects of FR treatments to ensure that they do not present a hazard to consumers, workers, or the environment." 71 Fed. Reg. 13479 (March 15, 2006).

Additionally, CPSC's comment in its November 2007 briefing stated: "inherent fire retardant interior barrier materials (as in mattress technology) can be used to protect filling materials." [cite quote] Even Commissioner Moore said in his February 2008 statement on the proposed rule, that the study, at great time and taxpayer expense, validated the fact that safe fire retardants are available to make furniture safer at "little or no health risk".

How can the use of fire retardant chemicals to make safe mattresses which we sleep on be justified in 2007 with the mattress standard, but not in 2008 when we are dealing with the identical issue with a product made of the same construction materials, posing similar flammability hazards? In that process the CPSC agreed [FR] chemicals studied were not expected to pose any appreciable risk of health effects to consumers who sleep on the mattresses. Nothing has changed since the passage of the mattress rule to justify such an about face. Hopefully, this process of public comment and debate will get the furniture flammability rule on a similar track as the case with the mattress rule, and injury and death can be minimized.

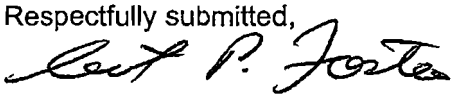
Federal Preemption of State Law Claims and other State Flammability Rules for Upholstered Furniture

I am also concerned that CPSC's passage of a rule that fails to address foreseeable fire hazards of upholstered furniture, such as small open flame ignition or electrical ignition, will allow furniture manufacturers to escape responsibility for deaths and injuries caused by these defects or hazards that are not addressed by a proposed standard that is not comprehensive. Federal preemption of state law remedies for these defects will be argued by furniture manufacturers to avoid responsibility for the tragedy caused by the fire hazards of upholstered furniture. In connection with the passage of the mattress flammability rule, the CSPS inserted a preemption clause in the rule's preamble two weeks before the vote, certainly requested by the industry to limit its responsibility. Commissioner Moore criticized the last minute move because it did not allow for public input or debate on an issue, which could potentially affect many victims of product defects.

Another possible consequence of a furniture rule which does not require the heat release rate of burning upholstered furniture to be controlled, could be the undoing of decades of progress the state of California has made in enacting and enforcing the TB 117 and TB 133 standards. Depending on the actual language of the final rule, a furniture maker could argue that the California standards are preempted and of no force and effect. In fact, the state of California was ready in 2002 to update the TB 117 standard for residential furniture to make furniture even safer, but suspended the process when this body in 2003 stated it was moving forward on a standard to address these issues. This aspect of the rulemaking process must be taken into consideration when deciding what is best for the American people as we move forward towards what we hope will be a meaningful comprehensive standard for upholstered furniture sold in this country.

In conclusion, I see the highly flammable foam used in 100% of upholstered furniture as a time bomb with a fuse, waiting for an ignition source. I believe that this time bomb explodes 2500 to 3500 times a year, killing and maiming American citizens who are totally unaware of the burning characteristics of the furniture in their homes. The current proposal seeks to prevent the lighting of the fuse from only one source, smoldering cigarettes, instead of disarming the bomb beneath the fuse. Since the NASFM petitioned this body in 1994 to develop a meaningful standard to reduce these hazards, 8000 people have died in upholstered fires. It is time for the Commission to develop and pass a meaningful performance based flammability standard which controls the heat release rates of burning upholstered furniture sold to the American public, and, to carefully consider the effect of any preemption clause which could be interpreted to deny victims' access to the courts.

Respectfully submitted,



Robert P. Foster
Foster Law Firm, L.L.P.
Post Office Box 2123
Greenville, South Carolina 29602
Ph: (864) 242-6200
rfoster@fosterfoster.com

Footnotes:

1) The Furniture and Furnishings (Fire) (Safety) Regs. 1988 (commonly referred to as BS 5852).

EXHIBIT 1

STATE OF NORTH CAROLINA

File No. 04 CVS 1714

Onslow County

In The General Court Of Justice
☐ District ☒ Superior Court Division

Name Of Plaintiff	
Boyd Tisdale	
Address	**CIVIL SUMMONS**
Post Office Box 1335	
City, State, Zip	☐ ALIAS AND PLURIES SUMMONS
Jacksonville, NC 28541	G.S. 1A-1, Rules 3, 4
VERSUS	
Name Of Defendant(s)	Date Original Summons Issued
Futuristic, Inc. and Oakwood Homes Corporation	Date(s) Subsequent Summons(es) Issued

To Each Of The Defendant(s) Named Below:

Name And Address Of Defendant 1	Name And Address Of Defendant 2
Futuristic, Inc. US Highway 11W Post Office Box 10 Bean Station, Tennessee 37708	Oakwood Homes Corporation 7800 McCloud Road Greensboro, North Carolina 27409

A Civil Action Has Been Commenced Against You!

You are notified to appear and answer the complaint of the plaintiff as follows:

1. Serve a copy of your written answer to the complaint upon the plaintiff or plaintiff's attorney within thirty (30) days after you have been served. You may serve your answer by delivering a copy to the plaintiff or by mailing it to the plaintiff's last known address, and

2. File the original of the written answer with the Clerk of Superior Court of the county named above.

If you fail to answer the complaint, the plaintiff will apply to the Court for the relief demanded in the complaint.

Name And Address Of Plaintiff's Attorney (If None, Address Of Plaintiff)	Date Issued	Time	
Scott M. Anderson 111 E. North Street Greenville, SC 29601	5/27/04	4:19	☐ AM ☒ PM
	Signature		
	☐ Deputy CSC ☒ Assistant CSC ☐ Clerk Of Superior Court		

☐ ENDORSEMENT
This Summons was originally issued on the date indicated above and returned not served. At the request of the plaintiff, the time within which this Summons must be served is extended sixty (60) days.

Date Of Endorsement	Time	
		☐ AM ☐ PM
Signature		
☐ Deputy CSC ☐ Assistant CSC ☐ Clerk Of Superior Court		

NOTE TO PARTIES: *Many counties have **MANDATORY ARBITRATION** programs in which most cases where the amount in controversy is $15,000 or less are heard by an arbitrator before a trial. The parties will be notified if this case is assigned for mandatory arbitration, and, if so, what procedure is to be followed.*

AOC-CV-100, Rev. 10/01

(Over)

STATE OF NORTH CAROLINA)
) IN THE GENERAL COURT OF JUSTICE
COUNTY OF ONSLOW) SUPERIOR COURT DIVISION
) File No.: 04 CvS _____

FILED
2004 MAR 27 P 4:19
ONSLOW COUNTY, C.S.C.

Boyd Tisdale, Administrator of the)
Estate of Amanda Leigh Ann Turner,)
Estate of Dorene Shavanet Oates,)
Estate of Jessie LaMont Oates, Jr.,)
Estate of QuaNesha Maria Lavette Oates,)
Estate of Diamond Faith Carol Perez, and)
Estate of Angela Lynette Avila,)
)
Plaintiffs,)
)
vs.) **COMPLAINT**
)
Futuristic, Inc., and)
Oakwood Homes Corporation,)
)
Defendants.)

The Plaintiff, Boyd Tisdale, Administrator for the Estate of Amanda Leigh Ann Turner, the Estate of Dorene Shavenet Oates, the Estate of Jessie LaMont Oates, Jr., the Estate of QuaNesha Maria Lavette Oates, the Estate of Diamond Faith Carol Perez, and the Estate of Angela Lynette Avila alleges:

PARTIES AND JURISDICTION

1. The Plaintiff's decedents, Amanda Leigh Ann Turner, Dorene Shavenet Oates, Jessie LaMont Oates, Jr., QuaNesha Maria Lavette Oates, Diamond Faith Carol Perez, and Angela Lynette Avila were citizens and residents of Onslow County, North Carolina.

2. The Defendant Futuristic, Inc., hereinafter referred to as Futuristic, is a corporation organized under the laws of the State of Tennessee and was, at all times relevant hereto, manufacturing and selling furniture to retailers in North Carolina and otherwise doing business in the State of North Carolina.

3. The Defendant Oakwood Homes Corporation is a corporation organized and existing in the State of North Carolina and was at all times relevant hereto, manufacturing and selling mobile homes in the State of North Carolina that were used in Onslow County, North Carolina and otherwise doing business in North Carolina.

4. Plaintiff is the duly authorized Administrator of the Plaintiff decedents, having been appointed December 11, 2003.

5. These causes of action are brought pursuant to N.C. Gen. Statute 99B-1(1), et seq.

FOR A FIRST CAUSE OF ACTION AGAINST FUTURISTIC, INC.
(Negligence)

6. On or about the 4th day of September, 1998, Mary Turner purchased a sofa recliner and loveseat from Monk's Furniture Warehouse, Inc., in LaGrange, North Carolina, an authorized Futuristic dealer. That the recliner sofa and loveseat were situated and placed in the den of Mary Turner's mobile home where she lived with her 10 children and 1 grandchild, including Plaintiff's decedents herein.

7. The recliner sofa and loveseat were manufactured by the Defendant Futuristic.

8. On or about July 9, 2003, at approximately 1:00 a.m. the decedents, Amanda Leigh Ann Turner, Dorene Shavanet Oates, Jessie LaMont Oates, Jr., QuaNesha Maria Lavette Oates, Diamond Faith Carol Perez, and Angela Lynette Avila were at their family residence in the County of Onslow, State of North Carolina, and were asleep when the subject recliner sofa was exposed to an ignition source from a candle.

9. At the time set out above, the decedents herein were killed when the described sofa easily caught fire and burned quickly, emitting huge volumes of thick, dense, black, toxic

smoke, as a direct and proximate result of the negligence and reckless conduct of the Defendant Futuristic.

10. The decedents were killed as a direct and proximate result of the negligent, careless, reckless, wilful, wanton, and intentional conduct of the Defendant Futuristic, and by its officers, employees, directors, and managers, in the following particulars:

a. In negligently producing, designing, manufacturing, advertising, distributing, and otherwise introducing into the stream of commerce a recliner sofa which contained extreme fire hazards known to Futuristic, but unknown to the intended users thereof;

b. In negligently manufacturing, designing, producing, advertising, distributing, selling and otherwise introducing into the stream of commerce furniture which by its defective and negligent construction was unreasonably dangerous, which easily ignited when exposed to foreseeable uses and ignition sources and extremely flammable when ignited, burning rapidly at high heat release rates, under ordinary and foreseeable uses;

c. In using fire retardant foam in some of its upholstered furniture products at negligible cost increase, but failing to incorporate fire retardant foam in the subject recliner sofa sold to the decedents' mother/grandmother, Mary Turner.

d. In failing to incorporate fire resistive barriers or fire retardant covering materials in the subject recliner sofa when same were commercially available at reasonable costs.

e. In receiving explicit flammability warnings from its polyurethane foam suppliers concerning the flammability characteristics of the foam, including the intense heat generated, thick dense black smoke and toxic byproducts of combustion generated as well as the consumption of available oxygen in a room or structure posing risks of suffocation, serious injury or death to occupants, and in failing to pass those warnings along to the ultimate consumer of the recliner sofa, the decedents' mother/grandmother.

f. In placing considerations of profits before safety in designing and constructing the subject recliner sofa;

g. In failing to properly and adequately warn users of the ignitability and flammability characteristics of the recliner sofa sold to purchasers such as decedents' mother/grandmother when defendant Futuristic knew of the extreme dangers of serious injury and death created when said product was exposed to an ignition source.

h. In failing to incorporate appropriate fire retardant foam and/or fire retardant coverings or fire resistive barriers or interliners when a reasonable manufacturer would have done so with respect to the subject recliner sofa.

i. In being aware of the incidence of serious injury and death in the United States from ignition of upholstered furniture in American homes and of prior lawsuits against Futuristic because of the design and construction of its upholstered furniture products similar to the subject sofa, and in failing

to take any steps whatsoever to improve the fire safety of its upholstered furniture products.

j. In being aware of the flammability characteristics of polyurethane when burning, which is to drip and flow, creating liquid pool fires, increasing the risk of spreading to other combustibles and enhancing the speed at which the furniture burns and in failing to warn or take steps to reduce those risks.

k. The Defendant Futuristic negligently inspected the previously described furniture so that it permitted to be introduced into the stream of commerce furniture which was unreasonably dangerous and subject to easily igniting and burning rapidly under ordinary use;

l. The Defendant Futuristic failed to exercise due care in the manufacture, design and supply of the recliner sofa and love seat in that it was reasonably foreseeable that the product would ignite and create a serious risk to human life;

m. The Defendant Futuristic negligently advertised furniture the same or similar to the furniture which is the subject of this lawsuit as being safe under ordinary use when it knew or should have known that such furniture was in fact unsafe and dangerous to human life under ordinary use, due to the tendency and proclivity of such furniture to catch fire quickly and burn rapidly, emitting large quantities of thick, black, toxic smoke;

n. The Defendant Futuristic negligently failed to recall its sofas, including the same recliner sofa which is the subject of this lawsuit, when due care and concern for human life imposed a duty upon said Defendant to recall such sofas; and

o. In failing to act in a reasonable manner in the design and manufacture of its products.

11. As a direct and proximate result of the negligence of the Defendant Futuristic described in this Complaint, the decedents inhaled toxic smoke and byproducts of combustion, and suffered burns to their bodies which caused the decedents' deaths on or about July 9, 2003.

12. Defendant Futuristic engaged and conducted the aforementioned negligent acts with conscious and intentional disregard of and indifference to the rights and safety of others, including but not limited to Plaintiff's decedents.

13. The decedents before the date of their death on July 9, 2003, were in good health, possessed good habits and other talents, and had life expectancies in accordance with N.C. Gen. Statute §8-46.

14. By reason of the wrongful death of the decedents, the Plaintiff Administrator in his representative capacity has been damaged and is entitled to recover from Defendant Futuristic actual damages in an amount sufficient to compensate the estate for their services, protection, care and assistance, society, companionship, security, comfort and kindly offices to their next of kin, and for funeral, hospital and medical bills, as well as pain and suffering of the decedents, for the excruciating injuries they received and which resulted in their deaths, as well as punitive damages, all in an amount greatly in excess of Ten Thousand Dollars ($10,000.00).

FOR A SECOND CAUSE OF ACTION AGAINST FUTURISTIC, INC.
(Breach of the Implied Warranty of Merchantability)

15. The Plaintiff, Boyd Tisdale, Administrator, hereby incorporates by reference Paragraphs 1-14 of this Complaint.

16. The Defendant Futuristic impliedly warranted and represented that the previously described recliner sofa was of merchantable quality and was reasonably fit for the purposes for which the sofa was intended.

17. The decedents, as resident relatives, family members and guests of the purchaser, and Mary Turner reasonably relied upon said Defendant's implied warranty of merchantability.

18. The previously described recliner sofa was not of merchantable quality, but instead was defective.

19. This defective condition constituted a breach of the implied warranty of merchantability. This Defendant also breached its implied warranty by its failure to provide proper and adequate warnings.

20. As a direct and proximate result of the breach of the implied warranty of merchantability with the previously described sofa, the sofa caught fire quickly, burning rapidly and intensely, with high rates of heat release and emitting massive quantities of thick black toxic smoke with deadly byproducts of combustion, including carbon monoxide, hydrogen cyanide and oxides of nitrogen.

21. As a direct and proximate result of the Defendant Futuristic's breach of the implied warranty of merchantability, the decedent suffered burns and injuries which caused their death and caused the decedents' estate to suffer extensive damages, the Plaintiff Administrator is entitled to recover of the Defendant Futuristic actual damages sufficient to compensate the estate for their services, protection, care and assistance, society, companionship, security, comfort and kindly offices to their next of kin, and for funeral, hospital and medical bills, as well as pain and

suffering of the decedents, for the excruciating injuries they received which resulted in their death, as well as punitive damages, all in an amount greatly in excess of Ten Thousand Dollars ($10,000.00).

FOR A THIRD CAUSE OF ACTION AGAINST FUTURISTIC, INC.
(Breach of Express Warranty)

22. The Plaintiff hereby incorporates by reference Paragraphs 1-21 of this Complaint.

23. The Defendant Futuristic made certain express warranties extending to the decedents, as resident relatives of the purchaser concerning the safety of the subject sofa. Included was an express warranty that the sofa was free of defects. Said warranties extend by law to the decedents.

24. The decedents, who were members of the purchaser's family and residents within her home, relied on these representation, and such reliance was reasonable.

25. The subject sofa was in fact defective in that it contained materials of construction including extremely flammable polyurethane foam which, when exposed to an ignition source, caused the sofa to ignite easily, burn rapidly and intensely, with a high rate of heat release, posing a great and lethal hazard to those nearby, including decedents.

26. These defects breached the express warranties which the Defendant Futuristic gave to the decedents' mother, Mary Turner.

27. As a direct and proximate result of such breach of express warranties, the previously described sofa ignited easily, burned rapidly and intensely, with high rates of heat release and emitting massive quantities of thick black toxic smoke with deadly byproducts of combustion, including carbon monoxide, hydrogen cyanide and oxides of nitrogen.

28. As a direct and proximate result of such breach of express warranties by Defendant Futuristic, the decedents suffered injuries which caused their death and caused the decedents' estate to suffer extensive damages, and the Plaintiff Administrator is entitled to

recover of the Defendant Futuristic actual damages in an amount sufficient to compensate the estate for their services, protection, care and assistance, society, companionship, security, comfort and kindly offices to their next of kin, and for funeral, hospital and medical bills, as well as pain and suffering of the decedents, for the excruciating injuries they received which resulted in their deaths, as well as punitive damages all in an amount greatly in excess of Ten Thousand Dollars ($10,000.00).

FOR A FOURTH CASE OF ACTION AGAINST OAKWOOD HOMES CORPORATION (Negligence)

29. Paragraphs 1-28 are reiterated herein as if repeated verbatim.

30. On or about the 4th day of September, 1998, Mary Turner purchased a sofa recliner and loveseat from Monk's Furniture Warehouse, Inc., in LaGrange, North Carolina, an authorized Futuristic dealer. That the recliner sofa and loveseat were situated and placed in the den of Mary Turner's mobile home in Onslow County, North Carolina, where she lived with her 10 children and 1 grandchild, including the decedents herein.

31. Mary Turner and the decedents resided in a mobile home manufactured by Defendant Oakwood Homes Corporation on or about August 28, 1998 and sold to the first buyer thereafter. The serial number for the home is HONCO3317344.

32. On or about July 9, 2003, at approximately 1:00 a.m. the decedents, Amanda Leigh Ann Turner, Dorene Shavanet Oates, Jessie LaMont Oates, Jr., QuaNesha Maria Lavette Oates, Diamond Faith Carol Perez, and Angela Lynette Avila were at their family residence in the County of Onslow, State of North Carolina, and were asleep when the Futuristic recliner sofa was exposed to an ignition source from a candle.

33. At the time set out above, the described sofa easily caught fire and burned quickly, emitting huge volumes of thick, dense, black, toxic smoke and intense heat.

34. The flames and smoke from the fire infiltrated the interior spaces of the mobile home including the attic space, which smoke and fire in the attic space moved horizontally and down into the bedrooms in combination with the smoke and heat entering such space from below the ceiling in the living space of said home.

35. The decedents were killed as a direct and proximate result of the negligence, careless, reckless, wilful, and wanton conduct of the Defendant Oakwood Homes Corporation and its officers, employees, directors and managers, in the following and other particulars:

a) That the mobile home was constructed with inadequate draftstops which were not in compliance with 24 CFR 3280.206 or with good engineering and construction practices.

b) That the mobile home contained smoke detectors which were defective and did not annunciate and/or were improperly located and wired and were not in accordance with manufacturer listing and with good engineering and construction practices.

c) That the bedroom emergency egress windows were defective in construction and contained inadequate warnings and instructions to users in the event of fire. That the windows were constructed in such a way as to make them extremely difficult to break out and were constructed of plate glass which, when shattered, created unusually large shards of glass which injure occupants as they try to escape.

36. As a result, the occupants did not receive timely notification of the fire, were faced with greater volumes of smoke, heat and products of combustion from the attic spaces, and whose escape through windows was impaired and delayed, which contributed to the decedents' death on or about July 9, 2003.

37. As a direct and proximate result of the negligence of the Defendant Oakwood Homes Corporation described in this Complaint, the decedents inhaled toxic smoke and

byproducts of combustion, and suffered burns to their bodies which caused the decedents' death on or about July 9, 2003.

38. The decedents before the date of their death on July 9, 2003, were in good health, possessed good habits and other talents, and had life expectancies in accordance with N.C. Gen. Statute §8-46.

39. By reason of the wrongful death of the decedents, the Plaintiff Administrator in his representative capacity, has been damaged and is entitled to recover from the Defendant Oakwood Homes Corporation actual damages in an amount sufficient to compensate the estate for their services, protection, care, assistance, society, companionship, security, comfort and kindly offices to their next of kin and for funeral, hospital and medical bills, as well as pain and suffering of the decedents, and for the excruciating injuries they received which resulted in their deaths, as well as punitive damages, all in an amount greatly in excess of Ten Thousand Dollars ($10,000.00).

FOR A FIFTH CAUSE OF ACTION AGAINST OAKWOOD HOMES CORPORATION
(Breach of the Implied Warranty of Merchantability)

40. The Plaintiff, Boyd Tisdale, Administrator, hereby incorporates by reference Paragraphs 1-39 of this Complaint.

41. The Defendant Oakwood Homes Corporation impliedly warranted and represented that the previously described mobile home was of merchantable quality and was reasonably fit for the purposes for which the mobile home was intended.

42. The decedents, as resident relatives of the purchaser, reasonably relied upon the Defendant's implied warranty of merchantability.

43. The previously described mobile home was not of merchantable quality, but instead was defective.

44. This defective condition constituted a breach of the implied warranty of merchantability. This Defendant also breached its implied warranty by its failure to provide proper and adequate warnings.

45. As a direct and proximate result of the breach of the implied warranty of merchantability with the previously described mobile home, the fire quickly spread, burning rapidly and intensely, with high rates of heat release and emitting massive quantities of thick black toxic smoke with deadly byproducts of combustion, including carbon monoxide, hydrogen cyanide and oxides of nitrogen.

46. As a direct and proximate result of the Defendant Oakwood Homes Corporation's breach of the implied warranty of merchantability, the decedents suffered burns and injuries which caused their death and caused the decedents' estate to suffer extensive damages, including lost future earnings and the Plaintiff Administrator is entitled to recover of the Defendant Oakwood Homes Corporation an amount of actual damages sufficient to compensate the estate for their services, protection, care, assistance, society, companionship, security, comfort and kindly offices to their next of kin, and for funeral, hospital and medical bills, as well as pain and suffering of the decedents, for the excruciating injuries they received which resulted in their deaths, as well as punitive damages, all in an amount greatly in excess of Ten Thousand Dollars ($10,000.00).

FOR A SIXTH CAUSE OF ACTION AGAINST OAKWOOD HOMES CORPORATION
(Breach of Express Warranty)

47. The Plaintiff hereby incorporated by reference Paragraphs 1-46 of this Complaint.

48. The Defendant Oakwood Homes Corporation made certain express warranties to the decedents, as resident relatives of the user, concerning the safety of the subject mobile home, including an express warranty that the mobile home was free of defects.

49. The decedents' relatives relied on these representations, and such reliance was reasonable.

50. The subject mobile home was in fact defective in that it contained materials of defective construction described in paragraph 34 above.

51. These defects breached the express warranties which said Defendant gave to the decedents' mother/grandmother, Mary Turner.

52. As a direct and proximate result of such breach of express warranties by Defendant Oakwood Homes Corporation, the decedents suffered injuries which caused their death and caused the decedents' estate to suffer extensive damages, and the Plaintiff Administrator is entitled to recover of the Defendant Oakwood Homes Corporation, an amount sufficient to compensate the estate for their services, protection, care and assistance, society, companionship, security, comfort and kindly offices to their next of kin and for funeral, hospital and medical bills, as well as pain and suffering of the decedents, for the excruciating injuries they received which resulted in their deaths, as well as punitive damages, all in an amount greatly in excess of Ten Thousand Dollars ($10,000.00).

THE PLAINTIFF DEMANDS A TRIAL BY JURY ON ALL ISSUES OF FACT.

WHEREFORE, the Plaintiff prays that he have and recover of the Defendants actual damages and punitive damages in excess of Ten Thousand Dollars ($10,000.00), the costs of this action, prejudgment interest on actual damages and any other relief which the Court deems equitable and proper.

RESPECTFULLY SUBMITTED,

ANDERSON LAW FIRM, P.A.

Scott M. Anderson (NC Bar # 17263)
111 East North Street
Greenville, South Carolina 29601
(864) 255-9255

May 26, 2004
Greenville, South Carolina

EXHIBIT 2

Dorene Oates

7/22/89 - 7/9/03 13 years old

Amanda Oates

6/22/88 - 7/9/03 15 years old

Quanesha Oates

10/27/92 - 7/9/03 10 years old

Jesse Oates, Jr.

8/15/90 - 7/9/03 12 years old

Diamond Faith Perez

4/26/03 - 7/9/03 2 ½ mos. old

Angela Lynette Avila

4/10/03 -7/9/03 3 mos. old


May 2003


ANNA TALLEY 7/31/96 to 6/

TWINS - JOSHUA & TIMOTHY WISTAFKE

Joshua David Wistafke
March 16, 1998 - June 14, 2000

EXHIBIT 3

CHILDREN PLAYING WITH FIRE

John R. Hall, Jr.
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org

November 2003

Patterns of Child-Playing Fires

In 1999, an estimated 41,900 child-playing fires were reported in the U.S., with associated losses of 165 civilian deaths, 1,901 civilian injuries, and $272 million in direct damage. The figures for 1999 fires, death and injuries are by far the lowest ever recorded. The steep declines began in 1995, the first full year for the child-resistant lighter standard of the U.S. Consumer Product Safety Commission (CPSC). (See Table 1 and Figures 1-3.) In any year, most reported child-playing fires are outdoor trash or brush fires, while most losses are in homes.

Table 2 provides comparable figures for Canada, Japan, and the United Kingdom. Canada's child-playing fires (546 in 1999) are much lower, relative to population, than the U.S. total. Canada also experienced a sharp decline in child-playing fire deaths in 1995, coinciding with the U.S. change in lighter requirements, which probably affected the Canadian market as well. Japan's child-playing fire problem is much lower than its U.S. counterpart, whether measured relative to population or measured as a share of its fire problem. Statistics in the United Kingdom are difficult to evaluate, because coding rule changes in 1994 resulted in a sharp increase in fire injuries generally but also a shift of most child-playing fires to malicious, which is their term for intentional, incendiary, or arson fires.

Most child-playing structure fires that are not in homes occur in properties associated with homes or, less often, in properties associated with children (e.g., schools). See Table 3. Buildings associated with homes include dwelling garages, tool sheds, barns, and stables. Also common are properties that are often left unsecured and unsupervised (e.g., vacant property, tool sheds, outbuildings, idle property).

Most child-playing home fires are started with lighters or matches. In 1999, Table 4 shows, lighters and matches accounted for 72% of child-playing home fires, 87% of associated civilian deaths, and 79% of associated civilian injuries. Child-playing candle fires have been increasing in numbers and as a share of the total child-playing fire problem, reflecting the substantial increases in candle usage and candle fires generally.

Table 5 shows that the decline in child-playing home lighter fires, which coincided with the introduction in 1994 of the CPSC child-resistant lighter standard, has coincided in time with an equally large and sustained decline in child-playing home match fires and losses. This may reflect a side effect of the lighter standard in heightening awareness of the child-playing fire problem. It may reflect growing success in public fire safety education programs, which provided more attention to child supervision and other steps to reduce the child-playing fire problem, and did so at the same time that the lighter standard was being introduced. It is also possible that there is significant miscoding of fire play with lighters as fire play with matches – or that there used to be.

When home fire play involves equipment, the most common type is the range, stove, or oven. Table 6 shows that space heaters and lamps are also objects of fire play in a substantial number of cases.

The items ignited by home fire play are principally mattresses, bedding, or clothing, followed by upholstered furniture, trash, and papers.
Table 7-9 show that mattresses and bedding dominate more in lighter play fires, while trash is more a factor in match play fires. However, fire play affects a wide diversity of items, which means that restrictions on burnable items are a much less effective way to attempt to reduce the fire play problem.

The majority of child-playing home fires begin in the bedroom.
Tables 10-12 show that this is especially true for lighter play and that other leading areas of origin are living rooms, family rooms, and dens; closets; and kitchens. Garages are coded both as areas of origin and as separate properties (in Table 3). If all such fires were combined, garages would rank just behind living room, family room or den for 1999 child-playing fires. If Tables 10 and 6 are compared, it can be seen that nearly half the 1999 kitchen child-playing fires involved the stovetop, oven, or range.

The median age of children who start reported fires by playing is 5 years old, compared to a median age of 3 years old for fatal victims and a median age in the early 20s for non-fatal injuries.
Table 13 shows the age distribution for fatal and non-fatal victims of child-playing fires – overall and for lighter and match fires, specifically, as well as death and injury rates for child-playing fires, by age group. It seems clear that non-fatal injuries often involve parents or other caregivers, but fatal injuries rarely do. Fewer than 20% of fatal injuries involve adults. The highest death rate among adults is for older adults (age 65 or older), who may be less likely to be primary caregivers but, not unexpectedly, face greater risks and greater difficulty in responding to fire if it occurs.

The U.S. Consumer Product Safety Commission (CPSC) conducted special studies of samples of 1986-88 child-playing residential fires involving lighters.* CPSC found that two-thirds of the victims of the lighter fires were not the children who were playing with the lighters. While both fire-starters and victims tended to be preschoolers – 90% of the children whose lighter play started the fires were under age six – the victims often were younger than those who started the fires. The CPSC special study found that the children playing with lighters were most likely to be three or four years old, slightly older than the typical ages of fatal victims of lighter play fires, as shown in Table 13.

Further data is provided by a study by Ditsa Kafry.** Kafry studied 99 randomly selected boys from grades K-4 in the Berkeley, California school district in the late 1970s and found that 45% had engaged in fireplay and 21% caused fires through their fireplay. Of the fires set, 18% were set by children who were aged two or younger when they set the fires. This supports the view that very young children can and do set fires (and unlike the CPSC study, this study dealt almost entirely in fireplay with matches).

*Beatrice Harwood, "Letter to the Editor," *Fire Journal*, July/August 1989, p. 86, and Beatrice Harwood and James F. Hoebel, "Notice of Proposed Rulemaking for Cigarette Lighters," Report to the U.S. Consumer Product Safety Commission, December 19, 1990

**Ditsa Kafry, "Playing with Matches: Children and Fire," *Fires and Human Behavior*, 2nd edition, London: David Fulton Publishers, 1990, Chapter 4.

Table 4. Child-Playing Home Fires, by Heat Source
Annual Average of Structure Fires Reported to U.S. Fire Departments

A. 1994-1998

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Lighter	7,490	(39.6%)	153	(51.9%)	1,071	(50.9%)	$109.4	(43.7%)
Match	6,970	(36.9%)	91	(30.8%)	656	(31.1%)	$89.3	(35.7%)
Candle	830	(4.4%)	5	(1.9%)	92	(4.3%)	$13.2	(5.3%)
Electric-powered equipment	600	(3.2%)	1	(0.3%)	36	(1.7%)	$3.2	(1.3%)
Gas-fueled equipment	530	(2.8%)	12	(4.0%)	61	(2.9%)	$3.2	(1.3%)
Lighted tobacco product	460	(2.4%)	2	(0.7%)	27	(1.3%)	$3.9	(1.6%)
Unknown-type open flame	450	(2.4%)	16	(5.3%)	61	(2.9%)	$7.9	(3.2%)
Fireworks	400	(2.1%)	1	(0.3%)	16	(0.8%)	$3.9	(1.6%)
Unclassified open flame	180	(0.9%)	6	(2.2%)	16	(0.8%)	$2.5	(1.0%)
Open fire	150	(0.8%)	2	(0.6%)	11	(0.5%)	$2.2	(0.9%)
Electric lamp	140	(0.8%)	0	(0.0%)	9	(0.4%)	$1.0	(0.4%)
Liquid-fueled equipment	80	(0.4%)	1	(0.3%)	8	(0.4%)	$0.8	(0.3%)
Other known heat source	620	(3.3%)	5	(1.7%)	42	(2.0%)	$9.7	(3.9%)
Total	18,910	(100.0%)	295	(100.0%)	2,107	(100.0%)	$250.3	(100.0%)

B. 1999

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Lighter	5,970	(40.5%)	82	(53.3%)	956	(57.0%)	$113.8	(45.6%)
Match	4,630	(31.4%)	51	(33.3%)	375	(22.4%)	$75.6	(30.3%)
Candle	1,090	(7.4%)	0	(0.0%)	127	(7.6%)	$22.9	(9.2%)
Operating equipment	1,010	(6.8%)	10	(6.7%)	85	(5.1%)	$7.2	(2.9%)
Unclassified or unknown-type open flame or smoking materials	560	(3.8%)	5	(3.3%)	64	(3.8%)	$11.1	(4.5%)
Fireworks	370	(2.5%)	5	(3.3%)	0	(0.0%)	$5.4	(2.1%)
Cigarette	240	(1.6%)	0	(0.0%)	7	(0.4%)	$2.0	(0.8%)
Other known heat source	860	(5.8%)	0	(0.0%)	64	(3.8%)	$11.9	(4.8%)
Total	14,740	(100.0%)	154	(100.0%)	1,679	(100.0%)	$249.8	(100.0%)

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and damages to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Totals may not equal sums because of rounding. Child-playing fires with heat source unknown have been proportionally allocated.

Source: National estimates based on NFIRS and NFPA survey.

Table 5. Child-Playing Home Fires Involving Matches or Lighters, 1980-1999

A. Fires

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Lighter	8,860	8,220	7,600	7,290	7,620	7,540	7,850	7,990	7,710	7,660	7,250	8,230	9,060	9,760
Match	25,330	21,180	16,110	15,260	14,750	13.710	13,240	12,810	12,740	11,520	9,870	9,500	9,880	9,030

	1994	1995	1996	1997	1998	1999
Lighter	10,420	7,920	7,020	6,350	5,730	5,970
Match	8,880	7,430	7,060	5,950	5,540	4,630

B. Civilian Deaths

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Lighter	219	96	98	116	62	119	171	171	196	157	128	226	193	154
Match	169	179	123	136	164	192	164	210	232	168	122	140	116	150

	1994	1995	1996	1997	1998	1999
Lighter	226	175	124	125	116	82
Match	141	96	82	67	69	51

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and damages to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Fires with heat source unknown have been proportionally allocated.

Source: National estimates based on NFIRS and NFPA survey.

Table 5. Child-Playing Home Fires Involving Matches or Lighters, 1980-1999 (Continued)

C. Civilian Injuries

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Lighter	781	551	702	757	734	849	920	975	1,016	1,065	1,058	1,396	1,488	1,569
Match	915	939	836	819	922	784	739	944	939	941	845	785	841	796

	1994	1995	1996	1997	1998	1999
Lighter	1,517	1,189	1,068	807	775	956
Match	739	679	620	699	544	375

D. Direct Property Damage (in Millions)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Lighter	$36.1	$35.7	$37.6	$45.3	$44.6	$57.7	$63.6	$66.4	$68.1	$81.1	$83.2	$118.9	$98.5	$136.3
Match	$75.3	$78.4	$69.0	$75.6	$80.2	$93.4	$87.0	$92.2	$98.8	$91.9	$83.5	$114.5	$72.6	$92.1

	1994	1995	1996	1997	1998	1999
Lighter	$134.6	$106.5	$109.7	$107.2	$89.2	$113.8
Match	$93.4	$94.6	$92.0	$96.5	$70.1	$75.6

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and damages to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Fires with heat source unknown have been proportionally allocated.

Source: National estimates based on NFIRS and NFPA survey.

Table 7. Child-Playing Home Fires, by Item First Ignited
Annual Average of Structure Fires Reported to U.S. Fire Departments

A. 1994-1998

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Mattress or bedding	6,650	(35.2%)	99	(33.5%)	903	(42.9%)	$96.6	(38.6%)
Clothing	2,130	(11.3%)	22	(7.6%)	242	(11.5%)	$27.0	(10.8%)
Upholstered furniture	1,300	(6.9%)	62	(21.0%)	253	(12.0%)	$27.4	(10.9%)
Trash	1,220	(6.4%)	11	(3.6%)	54	(2.6%)	$8.6	(3.4%)
Papers	860	(4.6%)	10	(3.4%)	66	(3.1%)	$10.7	(4.3%)
Curtain or drape	580	(3.1%)	8	(2.7%)	60	(2.9%)	$5.8	(2.3%)
Unclassified item	500	(2.6%)	4	(1.5%)	41	(1.9%)	$5.5	(2.2%)
Multiple items	420	(2.2%)	17	(5.7%)	45	(2.1%)	$10.9	(4.3%)
Floor covering	400	(2.1%)	5	(1.6%)	29	(1.4%)	$3.1	(1.2%)
Structural member or framing	380	(2.0%)	6	(2.2%)	23	(1.1%)	$5.0	(2.0%)
Box or bag	360	(1.9%)	9	(3.1%)	24	(1.1%)	$4.5	(1.8%)
Unclassified or unknown-type furniture	340	(1.8%)	4	(1.4%)	34	(1.6%)	$5.5	(2.2%)
Toy or game	330	(1.8%)	3	(1.2%)	44	(2.1%)	$3.0	(1.2%)
Exterior sidewall covering	310	(1.7%)	0	(0.0%)	5	(0.2%)	$2.1	(0.8%)
Interior wall covering	280	(1.5%)	3	(1.0%)	20	(1.0%)	$4.7	(1.9%)
Linen other than bedding	280	(1.5%)	1	(0.5%)	25	(1.2%)	$2.7	(1.1%)
Cooking materials	260	(1.4%)	0	(0.0%)	28	(1.3%)	$0.9	(0.4%)
Unclassified or unknown-type soft goods or clothing	260	(1.4%)	12	(4.1%)	32	(1.5%)	$3.9	(1.5%)
Other known item	2,040	(10.8%)	18	(6.0%)	181	(8.6%)	$22.7	(9.1%)
Total	18,910	(100.0%)	295	(100.0%)	2,107	(100.0%)	$250.3	(100.0%)

B. 1999

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Mattress or bedding	4,770	(32.4%)	57	(37.0%)	746	(44.5%)	$90.7	(36.3%)
Clothing	1,690	(11.5%)	29	(18.5%)	131	(7.8%)	$23.5	(9.4%)
Upholstered furniture	990	(6.7%)	17	(11.1%)	131	(7.8%)	$22.8	(9.1%)
Trash	850	(5.8%)	0	(0.0%)	33	(2.0%)	$8.8	(3.5%)
Papers	670	(4.6%)	0	(0.0%)	76	(4.6%)	$10.8	(4.3%)
Unclassified or unknown-type furniture	540	(3.7%)	6	(3.7%)	76	(4.6%)	$7.6	(3.0%)
Curtains, blinds, drapery, or tapestry	480	(3.2%)	6	(3.7%)	40	(2.4%)	$5.1	(2.1%)
Unclassified item	430	(2.9%)	11	(7.4%)	55	(3.3%)	$5.9	(2.3%)
Floor covering	360	(2.4%)	0	(0.0%)	36	(2.2%)	$3.7	(1.5%)
Unclassified or unknown-type clothing or soft goods	340	(2.3%)	0	(0.0%)	51	(3.0%)	$5.1	(2.0%)
Box or bag	330	(2.3%)	0	(0.0%)	25	(1.5%)	$8.5	(3.4%)
Multiple items	330	(2.2%)	17	(11.1%)	40	(2.4%)	$9.2	(3.7%)
Structural member or framing	320	(2.2%)	11	(7.4%)	22	(1.3%)	$5.8	(2.3%)
Exterior wall covering	270	(1.9%)	0	(0.0%)	0	(0.0%)	$6.8	(2.7%)
Toy or game	250	(1.7%)	0	(0.0%)	62	(3.7%)	$2.5	(1.0%)
Interior wall covering	250	(1.7%)	0	(0.0%)	18	(1.1%)	$3.8	(1.5%)
Other known item	1,840	(12.5%)	0	(0.0%)	135	(8.0%)	$29.2	(11.7%)
Total	14,740	(100.0%)	154	(100.0%)	1,679	(100.0%)	$249.8	(100.0%)

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and damages to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Totals may not equal sums because of rounding. Child-playing fires with unknown item first ignited have been proportionally allocated.

Source: National estimates based on NFIRS and NFPA survey.

Table 8. Child-Playing Home Fires Involving Lighters, by Item First Ignited
Annual Average of Structure Fires Reported to U.S. Fire Departments

A. 1994-1998

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Mattress or bedding	3,300	(44.1%)	55	(35.7%)	518	(48.3%)	$47.0	(42.9%)
Clothing	960	(12.9%)	12	(7.8%)	124	(11.6%)	$13.2	(12.1%)
Upholstered furniture	580	(7.7%)	31	(20.2%)	139	(13.0%)	$12.8	(11.7%)
Papers	320	(4.2%)	3	(1.8%)	32	(3.0%)	$4.4	(4.0%)
Curtain or drape	310	(4.2%)	4	(2.3%)	31	(2.9%)	$3.1	(2.8%)
Trash	280	(3.8%)	5	(3.3%)	22	(2.1%)	$2.8	(2.5%)
Unclassified or unknown-type furniture	150	(2.0%)	4	(2.5%)	17	(1.5%)	$2.5	(2.3%)
Unclassified item	140	(1.8%)	2	(1.2%)	14	(1.3%)	$2.0	(1.8%)
Box or bag	130	(1.7%)	6	(3.8%)	12	(1.1%)	$2.3	(2.1%)
Linen, other than bedding	130	(1.7%)	0	(0.0%)	13	(1.2%)	$1.4	(1.3%)
Multiple items	120	(1.6%)	9	(6.0%)	21	(1.9%)	$2.8	(2.5%)
Unclassified or unknown-type soft goods or clothing	110	(1.5%)	6	(4.1%)	15	(1.4%)	$1.7	(1.6%)
Floor covering	110	(1.5%)	1	(0.7%)	11	(1.1%)	$0.9	(0.8%)
Toy or game	100	(1.4%)	0	(0.0%)	18	(1.7%)	$1.3	(1.2%)
Interior wall covering	70	(1.0%)	0	(0.0%)	5	(0.4%)	$2.6	(2.4%)
Other known item	670	(9.0%)	16	(10.6%)	80	(7.5%)	$8.7	(7.9%)
Total	7,490	(100.0%)	153	(100.0%)	1,071	(100.0%)	$109.4	(100.0%)

B. 1999

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Mattress or bedding	2,350	(39.3%)	46	(56.3%)	451	(47.2%)	$50.2	(44.1%)
Clothing	730	(12.3%)	15	(18.8%)	76	(7.9%)	$12.7	(11.2%)
Upholstered furniture	480	(8.1%)	10	(12.5%)	101	(10.6%)	$11.5	(10.1%)
Unclassified or unknown-type furniture	280	(4.7%)	5	(6.3%)	61	(6.4%)	$3.7	(3.3%)
Curtains, blinds, drapery, or tapestry	250	(4.2%)	5	(6.3%)	36	(3.8%)	$3.1	(2.8%)
Papers	240	(4.1%)	0	(0.0%)	58	(6.0%)	$4.1	(3.6%)
Trash	220	(3.7%)	0	(0.0%)	14	(1.5%)	$2.5	(2.2%)
Unclassified or unknown-type clothing or soft goods	160	(2.6%)	0	(0.0%)	32	(3.4%)	$2.2	(1.9%)
Box or bag	130	(2.2%)	0	(0.0%)	0	(0.0%)	$6.7	(5.9%)
Unclassified item	120	(2.0%)	0	(0.0%)	22	(2.3%)	$0.7	(0.6%)
Floor covering	120	(2.0%)	0	(0.0%)	22	(2.3%)	$1.1	(1.0%)
Toy or game	110	(1.9%)	0	(0.0%)	32	(3.4%)	$1.2	(1.1%)
Multiple items	110	(1.8%)	0	(0.0%)	7	(0.8%)	$3.4	(3.0%)
Linen other than bedding	70	(1.2%)	0	(0.0%)	4	(0.4%)	$1.0	(0.9%)
Structural member or framing	70	(1.1%)	0	(0.0%)	4	(0.4%)	$1.0	(0.9%)
Exterior wall covering	70	(1.1%)	0	(0.0%)	0	(0.0%)	$3.6	(3.2%)
Interior wall covering	60	(1.0%)	0	(0.0%)	4	(0.4%)	$1.2	(1.1%)
Other known item	400	(6.8%)	0	(0.0%)	32	(3.4%)	$3.8	(3.3%)
Total	5,970	(100.0%)	82	(100.0%)	956	(100.0%)	$113.8	(100.0%)

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and damages to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Totals may not equal sums because of rounding. Fires with unknown heat source and child-playing lighter fires with unknown item first ignited have been proportionally allocated.
Source: National estimates based on NFIRS and NFPA survey.

Table 9. Child-Playing Home Fires Involving Matches, by Item First Ignited
Annual Average of Structure Fires Reported to U.S. Fire Departments

A. 1994-1998

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Mattress or bedding	2,490	(35.8%)	29	(31.8%)	281	(42.9%)	$36.4	(40.8%)
Clothing	810	(11.6%)	7	(7.9%)	75	(11.4%)	$9.2	(10.3%)
Trash	660	(9.5%)	2	(2.5%)	18	(2.8%)	$3.8	(4.3%)
Upholstered furniture	500	(7.2%)	23	(25.4%)	93	(14.1%)	$10.5	(11.7%)
Papers	350	(5.0%)	4	(4.2%)	25	(3.9%)	$4.5	(5.1%)
Multiple items	180	(2.6%)	7	(8.1%)	12	(1.8%)	$4.0	(4.5%)
Curtain or drape	180	(2.5%)	5	(5.2%)	23	(3.5%)	$2.0	(2.2%)
Floor covering	170	(2.4%)	1	(1.0%)	9	(1.4%)	$1.3	(1.4%)
Structural member or framing	160	(2.2%)	1	(1.5%)	8	(1.3%)	$1.6	(1.8%)
Box or bag	130	(1.9%)	4	(4.2%)	8	(1.3%)	$1.4	(1.5%)
Unclassified item	130	(1.8%)	0	(0.0%)	6	(1.0%)	$1.6	(1.7%)
Interior wall covering	120	(1.7%)	0	(0.0%)	5	(0.7%)	$1.1	(1.3%)
Exterior sidewall covering	120	(1.7%)	0	(0.0%)	0	(0.1%)	$0.5	(0.5%)
Unclassified or unknown-type furniture	100	(1.4%)	1	(0.7%)	9	(1.4%)	$1.8	(2.1%)
Linen other than bedding	80	(1.1%)	1	(1.5%)	8	(1.2%)	$0.8	(0.9%)
Plants	80	(1.1%)	0	(0.0%)	5	(0.7%)	$0.5	(0.5%)
Unclassified or unknown-type soft goods or clothing	70	(1.0%)	0	(0.0%)	12	(1.8%)	$1.0	(1.1%)
Toy or game	70	(1.0%)	2	(2.2%)	11	(1.7%)	$1.1	(1.3%)
Other known item	590	(8.5%)	4	(3.9%)	47	(7.2%)	$6.3	(7.0%)
Total	6,970	(100.0%)	91	(100.0%)	656	(100.0%)	$89.3	(100.0%)

B. 1999

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Mattress or bedding	1,630	(35.2%)	0	(0.0%)	171	(45.5%)	$28.4	(37.6%)
Clothing	630	(13.5%)	13	(25.0%)	30	(8.1%)	$7.1	(9.4%)
Trash	360	(7.7%)	0	(0.0%)	15	(4.0%)	$3.9	(5.2%)
Upholstered furniture	290	(6.3%)	6	(12.5%)	4	(1.0%)	$6.1	(8.1%)
Papers	220	(4.7%)	0	(0.0%)	15	(4.0%)	$2.8	(3.7%)
Floor covering	120	(2.6%)	0	(0.0%)	0	(0.0%)	$1.9	(2.5%)
Unclassified item	110	(2.5%)	13	(25.0%)	23	(6.1%)	$4.4	(5.8%)
Unclassified or unknown-type furniture	110	(2.5%)	0	(0.0%)	11	(3.0%)	$1.6	(2.2%)
Multiple items	110	(2.4%)	13	(25.0%)	34	(9.1%)	$3.8	(5.0%)
Structural member or framing	110	(2.4%)	6	(12.5%)	11	(3.0%)	$2.3	(3.0%)
Box or bag	100	(2.2%)	0	(0.0%)	27	(7.1%)	$0.6	(0.8%)
Unclassified or unknown-type clothing or soft goods	80	(1.7%)	0	(0.0%)	4	(1.0%)	$1.3	(1.7%)
Curtains, blinds, drapery or tapestry	80	(1.7%)	0	(0.0%)	4	(1.0%)	$0.3	(0.4%)
Interior wall covering	80	(1.7%)	0	(0.0%)	0	(0.0%)	$1.3	(1.8%)
Exterior wall covering	70	(1.5%)	0	(0.0%)	0	(0.0%)	$0.3	(0.5%)
Other known item	530	(11.5%)	0	(0.0%)	27	(7.1%)	$9.4	(12.4%)
Total	4,630	(100.0%)	51	(100.0%)	375	(100.0%)	$75.6	(100.0%)

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and damages to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Totals may not equal sums because of rounding. Fires with unknown heat source and match fires with unknown item first ignited have been proportionally allocated.

Source: National estimates based on NFIRS and NFPA survey.

EXHIBIT 4