

TABLE 1
RESIDENTIAL FIRES ASSOCIATED WITH HEATING DEVICES, BY KIND OF FUEL
DATA FROM 15 STATES, 1978

KIND OF HEATING EQUIPMENT	FIRES	DEATHS	DEAFES	DEATHS OR INJURIES PER 1,000 FIRES
<u>TOTAL, All Heating Equipment</u>	<u>19,373</u>	<u>1,293</u>	<u>122</u>	<u>66.7</u>
<u>Chimney, Flue, Chimney Connector</u>	<u>1,378</u>	<u>122</u>	<u>11</u>	<u>22.1</u>
Wood or Coal	1,356	87	10	11.3
All Other Fuels	22	2	—	*
Fuel Unknown	1,594	31	1	18.9
<u>Fixed, Local Heater (Stove)</u>	<u>3,988</u>	<u>188</u>	<u>12</u>	<u>28.2</u>
Wood or Coal	1,093	54	11	41.3
Gas	1,399	77	9	78.3
Electric	609	39	1	69.3
Oil or Kerosene	281	23	6	103.2
Fuel Unknown	906	65	11	33.3
<u>Fireplaces</u>	<u>1,453</u>	<u>179</u>	<u>11</u>	<u>56.3</u>
Wood or Coal	2,153	116	2	56.8
Other Fuel	90	5	—	*
Fuel Unknown	1,225	57	9	54.3
<u>Central Heating Unit</u>	<u>3,087</u>	<u>217</u>	<u>27</u>	<u>79.0</u>
Wood or Coal	136	5	1	103.4
Gas	1,103	108	6	16.3
Electric	737	11	1	109.4
Oil or Kerosene	530	50	3	49.3
Fuel Unknown	581	42	10	
<u>Water Heater</u>	<u>2,127</u>	<u>163</u>	<u>9</u>	<u>119.6</u>
Wood or Coal	1	—	—	121.3
Gas	1,464	194	3	*
Electric	131	3	—	159.1
Oil or Kerosene	38	14	—	100.1
Fuel Unknown	419	42	—	
<u>Portable Heater</u>	<u>317</u>	<u>124</u>	<u>19</u>	<u>177.6</u>
Wood or Coal	33	3	1	136.4
Gas	38	11	1	225.3
Electric	127	55	9	304.3
Oil or Kerosene	92	21	7	110.6
Fuel Unknown	227	23	1	
<u>Other or Unknown</u>	<u>341</u>	<u>50</u>	<u>13</u>	<u>116.5</u>
Electric	162	3	—	161.0
All Other Fuels	123	12	7	137.9
Fuel Unknown	251	30	6	
All Fires	103,842	3,513	304	30.7
All Fires Reporting Kind of Equipment	35,131	3,433	356	32.2
Heating Equipment Fires as Percent of all Fires	19.1%	14.0%	14.6%	
Heating Equipment Fires as Percent of all Fires Reporting Kind of Equipment	23.3%	18.5%	20.1%	

Source: Data obtained from U.S. Fire Administration, 1978 US Consumer Product Safety Commission, Hazard Identification & Analysis

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fueled devices^{1/}, presumably wood or coal. Chimneys/flues could have been attached either to fireplaces or to wood or coal stoves, but chimney connectors presumably refer primarily to wood or coal stoves, since fireplaces, except for free-standing units, do not have chimney connectors.

Fixed, local heaters or stoves accounted for the next largest number of fires, and of this group wood/coal stoves and gas stoves were the most numerous at about 1,100 fires each. The 1,093 fires reported from wood or coal stoves resulted in 54 injuries and 13 deaths. The kind of fuel used in fixed heaters or stoves did not affect the severity of reported fires remarkably, as measured by casualties per 1,000 fires, but was lowest in wood or coal stoves, highest in oil or kerosene heaters.

Fires in water heaters and in portable heaters, while not as numerous as others, were generally more hazardous than fires that started in other components of the heating system. That is, fires that started in these units were more likely to result in a casualty than fires that started in other components of the heating system.

^{1/}Fuel used was derived by tabulations on "Form of Heat of Ignition," as defined by the National Fire Protection Association's 901 Manual, "Uniform Coding for Fire Protection 1976."

- Wood or coal includes fires for which form of heat was reported as heat, spark, ember, or flame escaping from solid fueled equipment or as "hot ember, ash."
- Gas includes fires for which form of heat was reported as heat, spark, ember, or flame escaping from gas-fueled equipment.
- Electric includes fires for which form of heat was reported as heat from electrical equipment arcing or overloaded, heat from properly operating electrical equipment or heat from improperly operating electrical equipment.
- Oil or kerosene includes fires for which form of heat was reported as heat, spark, ember, or flame from liquid fueled equipment.
- Other or unknown includes fires for which form of heat was reported as open flame or spark, smoking materials, material source (sun, lightning, etc.), explosives, fireworks, hot object (except electrical equipment, hot ember or ash), heat spreading from another hostile fire, or heat from unknown or unspecified fuel fired equipment.

National Estimate:

Computation of the ratio of aggregated national estimates of fire losses published by the National Fire Protection Association (NFPA)^{1/2/} to the fire losses reported from 15 states makes it possible to derive rough national estimates for specific kinds of fires:

	<u>Fires</u>	<u>Deaths</u>
All residential fires	757,525	6,334
Residential fires from 15 states	103,342	904
Residential fires from 15 states for which equipment involved is identified	35,131	656
Ratio, all residential fires to fires from 15 states	7.3	7.6
Ratio, all residential fires to fires from 15 states for which equipment is identified	8.9	10.4

Therefore, a rough national estimate of fires can be derived by multiplying the number of fires reported in Tables 1 and 2 by about 7 or 8 and by multiplying the number of deaths by 3-10, depending on whether or not one wishes to assume that the fires for which equipment involved in ignition was not reported are in fact distributed similarly to those for which this variable was specified. National estimates derived in this manner come to about 8,000-9,000 fires and 100-130 deaths annually from wood or coal burning stoves, plus at least 6,000-7,500 fires and about 15-20 deaths associated with chimney connectors (to wood or coal units). An additional 23,000-28,000 fires and 60-80 deaths would be estimated from chimneys, although how many of these are from fireplaces and how many from wood stoves is not known.

These are rough estimates, but nevertheless useful, particularly in terms of relative risk. It may not be as important to know whether the true number of fire deaths associated with a certain product is 200 or 250 or even 300 as it is to know:

- (1) how that loss ranks with casualty estimates from comparable products
- (2) what the prospects are for reducing loss by appropriate regulatory or other Commission action.

^{1/} Karter, Michael, "The 1978 United States Fire Experience, Fire Journal," National Fire Protection Association, September 1979.

^{2/} Washburn, A. E. & Harlow, J. W., "United States Fire Fighter Deaths in the Line of Duty During 1978," Fire Command, National Fire Protection Association.

Ignition Factors:

In that connection, Table 2 shows a distribution of fires involving various kinds of fixed, local heaters and fires involving chimney connectors to solid-fueled equipment, by what caused the fire. For wood and coal stoves the primary factors were:

- 30% - installed too close to combustibles (27%) or other installation deficiency (3%).
- 15% - misuse of material ignited, including placing a combustible too close and improper fueling technique.
- 13% - operational deficiencies, which includes "overloaded" (probably overfiring), unattended, etc.
- 11% - mechanical failure, primarily "lack of maintenance, worn out," which apparently is related to creosote build-up.

By comparison, improper installation was not a major factor in fires from gas or electric heaters or in chimney fires. However, it was the primary factor in chimney connector fires, accounting for more than one-half of the total fires reported. As mentioned earlier, since fireplaces do not ordinarily have chimney connectors, these are assumed to be connections to wood or coal stoves.

Both gas and electric heater fires were associated primarily with misuse of material ignited or, less frequently, to a mechanical failure, while chimney fires were primarily from "lack of maintenance, worn out" and presumably involved failure to clean the chimney periodically, with resultant creosote build-up, or failure to inspect for cracks or other signs of wear.

Thus, fires that originate in wood or coal stoves or venting components of these stoves contribute significantly to the fire problem in this country. If chimney connectors are included, they are the leading cause of fires reported in stationary heating units, producing annual estimates of 14,000-17,000 fires and 115-150 deaths. Further, unlike fires in other stationary heating units, the major cause of these fires is reported to be improper installation, primarily the practice of installing them too close to combustibles. This is particularly the cause of fires involving chimney connectors.

Recent Increase in Reported Injury:

The number of persons treated in hospital emergency rooms for injuries involving wood or coal stoves or factory-built fireplaces remained relatively stable from 1974 until 1978, when a sharp increase was noted, both in thermal burn or anoxia injuries and in fire-related injuries. See Table 3. The estimate of fire-related injuries is based on a very small (10) sample size for any one year and constitutes a small proportion of total burn injuries.

Table 2.

IGNITION FACTORS ASSOCIATED WITH FIXED, LOCAL HEATING UNITS AND WITH
CHIMNEYS, FLUES OR CONNECTORS TO SOLID FUELED EQUIPMENT
DATA FROM 15 STATES - 1978

Ignition Factor	Wood or Coal Stove	Fixed Gas Heater	Fixed Electric Heater	Chimney, ^{a/} Flue	Chimney ^{a/} Connector	Fireplace
Number	1,093	1,099	609	3,120	838	2,153
Percent:	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>
<u>Design, Construction or Installation Deficiency</u>	<u>38.7</u>	<u>10.5</u>	<u>5.1</u>	<u>15.6</u>	<u>52.3</u>	<u>20.9</u>
Installed Improperly	29.7	6.2	2.8	9.1	38.3	10.0
Construction Deficiency	5.0	1.2	—	3.7	9.7	13.4
Other	4.0	3.1	2.3	2.8	4.3	7.5
<u>Mechanical Failure</u>	<u>11.2</u>	<u>25.6</u>	<u>32.8</u>	<u>57.4</u>	<u>20.8</u>	<u>19.6</u>
Part Failure, Leak, Break	2.1	12.2	4.3	—	3.5	2.0
Lack of Maintenance, Worn Out	7.8	4.9	2.6	54.1	15.5	15.7
Electrical Failure	—	—	18.7	—	—	—
Other	1.3	8.5	7.2	3.3	1.8	1.9
<u>Misuse of Material Ignited</u>	<u>15.4</u>	<u>43.8</u>	<u>64.0</u>	<u>5.0</u>	<u>6.1</u>	<u>11.0</u>
Combustible Too Close To Heat	6.7	35.8	39.9	1.4	2.6	4.2
Improper Fueling Technique	3.9	—	—	2.2	1.4	1.9
Other	4.8	8.0	4.1	1.4	2.0	4.9
<u>Misuse of Heat of Ignition</u>	<u>5.7</u>	<u>5.8</u>	<u>3.8</u>	<u>2.9</u>	<u>2.4</u>	<u>7.5</u>
<u>Operational Deficiency - Unattended, Overloaded, Overturned, etc.)</u>	<u>12.3</u>	<u>4.6</u>	<u>8.9</u>	<u>9.1</u>	<u>8.3</u>	<u>12.6</u>
<u>Other</u>	<u>5.9</u>	<u>6.6</u>	<u>3.3</u>	<u>4.4</u>	<u>3.7</u>	<u>7.7</u>
<u>Unknown</u>	<u>10.3</u>	<u>3.0</u>	<u>2.1</u>	<u>5.5</u>	<u>6.0</u>	<u>10.7</u>

^{a/} Includes devices for solid fueled equipment only, but does not identify kind of equipment or heating system (fireplace, stove, furnace, etc.)

Sources: Data obtained from U.S. Fire Administration - 1978
Alaska, California, Illinois, Maryland, Michigan, Minnesota, Missouri, Montana, New York, Ohio, Oregon,
Rhode Island, South Dakota, Utah, and Wisconsin.

U.S. Consumer Product Safety Commission/HIEA

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TABLE 3.

ESTIMATED COAL AND WOOD STOVE** RELATED INJURIES
TREATED IN HOSPITAL EMERGENCY ROOMS, 1974-1979

	1974	1975	1976	1977	1978	1979	% Change 1974-1979
Total Injuries	887	704	357	1,321	2,352	3,694	+ 542%
By Diagnosis:							
Burns	622	466	797	883	2,205	4,612	+ 641%
Anoxia	—	16	—	2	9	11	*
Other	265	222	60	436	538	1,071	+ 304%
Fires:							
Injuries with Fire Involvement	41	—	108	87	517	393	+ 859%
By Disposition:							
% Treated and Released	100%	99%	100%	99%	91%	95%	—
% Hospitalized	—	1%	—	1%	9%	5%	—

*Not Calculated.

**Product Codes:

- 0316 - Wood Burning Fireplaces, Factory Built
- 0332 - Wood Stoves
- 0333 - Coal Stoves
- 0367 - Coal or Wood Burning Stoves

SOURCE: U.S. Consumer Product Safety Commission
National Electronic Injury Surveillance System

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Thus, most of the burn injuries reported here appear to result from contact burns; that is, from falling against or accidentally contacting the surface of the stove. This increase obviously reflects the reported increase in the use of these devices both as primary and as supplemental heat sources.

During the fiscal year ending September 30, 1978, wood and coal stoves were the leading cause of heating equipment fires reported to the Commission via its consumer complaint and newspaper clipping file. These stoves accounted for 25 percent of the 1,401 incidents reported about heating equipment during that period, substantially more than the number reported for any other heating device. More than 90 percent of these reports were newspaper clippings. An additional 90 incidents (6%) involved fireplaces and 10 incidents (1%) involved chimneys. (A report specifying a fire in a chimney or flue to a wood or coal stove would have been reported under the stove itself.) See table 4.

Computerized data for the fiscal year ending September 30, 1979, and for the current fiscal year are not complete, but a hand count of reports received during October through December of the last 3 years is as follows:

October-December 1977	85
October-December 1978	91
October-December 1979	148

Although these numbers reflect only a part of the heating season, it is obvious that the number of reported incidents is increasing. Again, most of the incidents were reported by newspaper clippings.

Deaths

Table 5 shows a distribution of deaths involving wood or coal stoves (or factory-built fireplaces) by the reported cause of death, taken from the Commission's death certificate files. Over a 5-year period 31 deaths were identified, approximately three-fourths from fire/burn causes and one-fourth from carbon monoxide poisoning (absent a conflagration). The average was about 15 deaths a year. An increase was observed in 1978, but the numbers are still too small to confirm a definite trend. 1979 data are not yet available.

The ignition of clothing, usually while tending a fire and often associated with the use of flammable liquids, was a major contributor to fire deaths reported here.

A stove "explosion" was reported in 13 deaths. It is not clear exactly what was involved in these cases. Some may have referred to an explosion of flammable liquids. However, the instructions that accompanied one stove that was the subject of an in-depth investigation (790313CEP0640) warned against allowing the horizontal run of the chimney connector to tilt downward, as this

1/Computerized data in Table 4 are tabulated by the date of the incident rather than by the date the report was received by the Commission.

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TABLE 4.

CONSUMER COMPLAINTS OR NEWSPAPER CLIPPINGS ABOUT FIRE/BURN OR
INHALATION POISONING INCIDENTS INVOLVING WOOD OR COAL STOVES
FISCAL YEAR 1978

Heating Equipment	Fire/Smoke		Carbon Monoxide	
	No.	%	No.	%
<u>TOTAL**</u>	<u>1,401</u>	<u>100%</u>	<u>224</u>	<u>100%</u>
<u>Fixed or Portable Space Heaters</u>	<u>837</u>	<u>60%</u>	<u>103</u>	<u>46%</u>
Wood or coal stove	346	25%	15	7%
Gas heater	109	8%	77	34%
Electric heater	173	12%	—	—
Oil or kerosene heater	48	3%	6	3%
Heater, not otherwise specified	161	11%	5	2%
<u>Central Heating Unit</u>	<u>251</u>	<u>18%</u>	<u>96</u>	<u>43%</u>
Gas	24	2%	61	27%
Oil	64	5%	10	4%
Wood or coal	4	—	—	—
Electric	6	—	—	—
Not otherwise specified	153	11%	25	11%
<u>Water Heater</u>	<u>146</u>	<u>10%</u>	<u>21</u>	<u>9%</u>
Gas	32	2%	13	6%
Electric	10	1%	—	—
Not otherwise specified	104	7%	8	4%
<u>Fireplace</u>	<u>90</u>	<u>6%</u>	<u>—</u>	<u>—</u>
<u>Chimney</u>	<u>10</u>	<u>1%</u>	<u>—</u>	<u>—</u>
<u>Other</u>	<u>67</u>	<u>5%</u>	<u>4</u>	<u>2%</u>

*Includes floor furnaces.

**More than 90 percent of these are from newspaper clippings.

SOURCE: U.S. Consumer Product Safety Commission
Consumer Complaint and Newsclip File

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TABLE 5.

DEATH CERTIFICATES INVOLVING WOOD AND COAL STOVES
1974 - 1978

	Total		1974	1975	1976	1977	1978
	No.	%					
<u>TOTAL</u>	<u>81</u>	<u>100%</u>	<u>11</u>	<u>12</u>	<u>17</u>	<u>15</u>	<u>26</u>
<u>Fire/Burn</u>	<u>62</u>	<u>77%</u>	<u>9</u>	<u>7</u>	<u>14</u>	<u>13</u>	<u>19</u>
Clothing Ignited*	29	36%	6	5	9	4	5
Stove "Exploded"	13	16%	2	1	2	1	7
House Fire**	20	25%	1	1	3	8	7
<u>Carbon Monoxide</u>	<u>18</u>	<u>22%</u>	<u>1</u>	<u>5</u>	<u>3</u>	<u>2</u>	<u>7</u>
Faulty Flue or Damper	2	2%	—	—	1	—	1
Not Otherwise Specified	16	20%	1	5	2	2	6
<u>Fell Against, Struck Head</u>	<u>1</u>	<u>1%</u>	<u>1</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

* Usually while tending, and frequently involving use of flammable liquids.

** Of these house fires, 3 mentioned an overheated stove, 1 stated that a coal popped out, and 1 mentioned a combustible too close to the stove. The remaining 15 did not provide further information.

SOURCE: U.S. Consumer Product Safety Commission
Death Certificate Files

might allow the entrapment of volatile gases that could cause an explosion.

The rather high observed proportion of carbon monoxide deaths is somewhat misleading. Death certificates for carbon monoxide poisonings are much more likely to identify the product that was the source of CO than are death certificates for house fires to identify the source of the house fire. Thus, in 1977 the Commission's files identified an associated product for about 80 percent of all CO deaths reported, nationwide, but for only 13 percent of all fire deaths that occurred.

Overall, wood and coal stoves are not a large contributor to the CO problem, at least as reflected in deaths. In 1977, when 2 CO deaths were reported from wood and coal stoves, 123 were reported from gas heaters, 17 from other heaters, 55 from furnaces, 20 from charcoal grills, 6 from fireplaces, and 20 from miscellaneous other sources.²

Hazard Patterns:

A review of the Commission's in-depth investigations carried out in 1978 and 1979 (excluding those reporting contact burns only), are categorized as shown below. Note that the majority appear to involve the chimney or chimney connector (stove pipe):

• Ignition of clothing or fire related to rekindling stove, often involving use of flammable liquids.	9
• Improperly installed or defective flue and/or chimney, resulting in a fire that started in the wall or ceiling at the point where the stovepipe passed through it.	3
• Overheated stove. Fire started in chimney connector or in chimney. In one case coal was being burned in a wood stove; 3 fires involved the ignition of thermal insulation; 2 mentioned creosote build-up.	6
• Cracks or separation in connector or connector collar.	2
• "Explosion" or unknown cause.	2
• Improper installation, including one that "may have been installed too close to combustibles," without further amplification.	3
• Fire in metal chimney to a free-standing fireplace.	2
• No information about cause.	3
Total	34

²Harwood, B., "Carbon Monoxide Deaths from Unvented Gas-Fired Space Heaters," U.S. Consumer Product Safety Commission, Division of Program Analysis, October 1979

OTHER DATA:

A report prepared for DOE by Richard Peacock of the National Bureau of Standards^{1/} includes an analysis of fire and burn incidents related to wood-burning equipment. Combining data from several sources, he found the major causes of these incidents to include:

- . The use of unvented equipment inside a dwelling.
- . The installation of wood-burning equipment too close to combustible framing and furnishings.
- . Placement of flammable solids and liquids too close to woodburning equipment.
- . The use of flammable liquids to kindle a fire
- . Overloading of wood-burning equipment leading to operation well beyond design limits.
- . The ignition of clothing or other fabrics during loading, unloading, cleaning or use of wood-burning equipment.
- . Contact burns received from hot surfaces of wood-burning equipment.
- . The ignition of creosote and carbon deposits on the inside of chimneys leading to very hot chimney fires.

A study prepared for the National Bureau of Standards in November 1978 analyzed the cause of 104 wood stove fires that occurred during late 1977 through June 1978 in the State of Massachusetts^{2/}. About three-fourths of those that reported a cause (74) were attributed to unsafe installations and one-fourth to unsafe operation/maintenance. Less than 2 percent were attributed to a design defect in the stove itself. Of the 53 fires involving unsafe installations, 32 referred to the stove connector or stove chimney, 15 to the stove itself and 6 to no specific component.

^{1/}Peacock, Richard; "A Review of Fire Incidents, Model Building Codes and Standards Related to Wood-Burning Appliances, NBBIR 79-131, Center for Fire Research, National Bureau of Standards, April 1979

^{2/}Shelton, J. W., Analysis of Fire Reports on File in the Massachusetts State Fire Marshal's Office Relating to Wood and Coal Heating Equipment, prepared for the National Bureau of Standards, NBS-GCR-149, November 1978.

The State of Oregon reported 350 residential fires in wood-burning equipment during 1978 and an additional 187 during January and February of 1979 for a total of 537^{1/2}. Of these, 192 referred to woodstoves or fireplaces and 345 referred to chimneys or stovepipes. Among both groups improper installation was reported as the major cause, accounting for almost three-fourths of the total. Note that these results are similar to those reported in Massachusetts, i.e., improper installation was the major cause and stovepipes and chimneys the major component involved.

The Division of Program Analysis contacted several state and local fire officials informally to discuss their personal experience with the problem. They were all in general agreement regarding the primary causes of fires from coal and woodburning stoves:

- Poor installation - Stove too close to combustible materials including walls, floors, curtains. In addition, stove or flue connector was not properly insulated where it passed through the wall. Further, where the stove pipe was installed straight up through a floor or a ceiling, there was not enough protection from heat from the stove pipe. Finally, often people put protective bricks or tile on the walls and floor surrounding the stove, but did not allow air space between the protective material and the wall. This results in the combustible material carbonizing and eventually igniting.
- Poor maintenance - Not cleaning the chimney of creosote.
- Poor operation - Overloading stove with fuel and burning the wrong types of wood, i.e., soft wood, green wood and pine.
- Poor disposal of ashes - Putting hot ashes in plastic buckets and against combustible material, e.g., against a wooden shed.

All of the officials reported a recent increase in fires from these stoves.

^{1/}Unpublished data provided by Walter Stickney, Oregon State Fire Marshall.

Problems with triple-walled metal chimneys were reported from several sources, including a local fire official, an insurance official and a document published by the Cooperative Extension Service of Pennsylvania State University, which advised that these chimneys were not suitable for wood stoves because of the likelihood of excessive creosote formation.

Commission in-depth investigations provide no clear documentation of this problem. Eleven investigations of fires in wood stoves and two investigations of fires in free-standing fireplaces indicated that these appliances were connected to metal chimneys. In six of these cases, additional information was not provided. Two reports specified double-walled chimneys and two mentioned metal asbestos chimneys, which are presumably double walled with asbestos insulation sandwiched between. One chimney was single walled, Class 3, apparently not suitable for a wood stove, and one chimney was shared with a gas furnace and may also have been unsuited for a wood stove, although this was not stated.

One fire investigation did involve a triple-walled chimney. In this case a man bought a thermostatically controlled air draft wood stove from a local hardware store and a triple-walled chimney kit from a local chain store, and followed installation instructions included with each appliance. Creosote began to clog the chimney almost immediately. The man complained to the seller of the stove and eventually received a replacement stove. Nevertheless, the creosote problems continued, resulting in fire and smoke damage caused by burning liquid creosote. Investigators from the stove manufacturer said that the problem was primarily with the chimney, which they said was incompatible with the heater because it was improperly designed, with a "free-flowing or circulating middle air space which was not air-tight." The man replaced both stove and chimney with different models and has apparently had no further problems.

Discussion:

All data sources indicate without doubt that the improper installation and maintenance of solid-fueled heating appliances (i.e., wood or coal stoves or free-standing fireplaces) creates a substantial and increasing fire problem. Given the continuing nature of the nation's energy shortage and associated increases in heating costs, these problems are unlikely to subside by themselves.

The major areas that appear to need addressing on labels or other instructions aimed at preventing fires in these heaters include the following:

- Maintenance of proper clearance between the stove itself and combustibles and even more important, proper clearance between the chimney connector (stovepipe) and combustibles.
- Proper installation of the chimney connector where it passes through a combustible wall, including the appropriate "thimble" or collar to use to protect the wall.

- Choice of an appropriate chimney connector and chimney for the kind of stove that is used.
- Proper maintenance of the stove and connectors to prevent excessive creosote build-up that can cause a fire.
- Prudent operation of the stove, including cautions against using flammable liquids to kindle a fire and against over-firing.

All the information needed to install a stove properly will not fit on a permanently attached label. Appropriate detailed instructions must also accompany the stove. In view of the apparent importance of proper installation of the chimney connector and chimney, the Commission may also wish to consider a labeling rule for these components, when they are sold separately from the stove itself.

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UNITED STATES GOVERNMENT

U.S. CONSUMER PRODUCT
SAFETY COMMISSION

Memorandum

TO : John Liskey, Program Manager, NPI
THRU: Judith M. Pitcher, Director, HICS *JMP*
FROM : T. R. Karels, HICS *TRK*

DATE: April 2, 1981

SUBJECT: Gas-fired Appliance Position Paper

This is in response to your memorandum of March 11, 1981, in which you requested information about gas-fired appliances and their component parts and accessories. Given the diversity of products and suppliers involved, even a "brief description" of these industries, as you requested, would require much more time than we have. HICS has, however, gathered some background material on selected gas-fired appliances, which will illustrate the scope of these industries.

Industry Shipments (In Thousands of Units)

	<u>1979</u>	<u>Estimated 1980</u>
Gas-fueled Appliances:		
Clothes Dryers	768	674
Ranges (including ovens)	1,973	1,555
Water Heaters	2,887	2,752
Boilers	221	300
Furnaces	1,863	1,481
Unit Heaters and Duct Furnaces	186	233
Outdoor Grills	1,327	1,217

Source: Appliance, January 1981.

As can be seen, shipments of most of these articles have fallen off from 1979 to 1980; shipments of "unit heaters" have shown a slight increase from 1979 to 1980, as consumers purchased alternative heating sources. The fall in shipments is attributed to softened consumer demand for these articles during a recessionary period. This softened demand can best be described as a deferment of purchases of major appliances - at some point, replacement of these articles will be necessary. The replacement is determined, in large part, by the useful life of the product.

Many factors, such as frequency of use, maintenance, and abuse, affect the life expectancy of these products. An industry survey conducted in 1980, based on manufacturers estimates, projected the average product life for a number of appliances:

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Average Product Life (Years)

Dryers	12
Ranges	14
Water Heaters	11
Furnaces	16
Hydronic Heating (water circulating)	20
Room Heaters	9

Source: Appliance, September, 1980

Thus, it is apparent that those units purchased in 1981 will be in service for many years in the future. Further, as shown in the following table, sales of these gas-fired appliances are projected to increase significantly over the next 5 years. While gas boilers are expected to decline in popularity, other selected appliances are expected to experience continued growth from 1981-86. Outdoor gas grills are projected as the products with the greatest growth pattern; increasing by some 63 percent from 1981-86.

Selected Gas Appliances: Five-Year Statistical Forecast of Shipments
(In Thousands of Units)

	<u>1981</u>	<u>1982</u>	<u>1982</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Gas Dryers	700	780	816	841	870	891
Gas Ranges	1,605	1,758	1,866	1,934	2,008	2,076
Gas Water Heaters	2,975	3,165	3,342	3,482	3,605	3,774
Gas Boilers	275	220	215	210	205	200
Gas Furnaces	1,620	2,003	2,117	2,193	2,150	2,253
Gas Unit Heaters and Furnaces	255	271	290	300	260	260
Gas Outdoor Grills	1,350	1,503	1,627	1,820	2,033	2,200

Source: Appliance, January, 1981

A number of large corporations effectively control the market for several of these appliances. For example, four companies accounted for 67 percent of all shipments of gas ranges in 1980, three firms for 77 percent of water heater shipments, and one firm alone accounted for 40 percent of all gas clothes dryer shipments in 1980. It is common in this industry for major manufacturers to produce articles for sale under another brand name. One appliance manufacturer, for instance, does not market any product under its own brand, but produces strictly for other producers and marketers. For this reason, an accounting of all manufacturers producing appliances and components would be difficult.

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Home heating is the major household use for gas. The American Gas Association has estimated that, in 1979, about 55 percent of home heating was fueled by gas; an estimated 43.5 million homes were gas-heated in 1979. From 1975 to 1979, new hookups have grown at an annual rate of 1.5 percent; this rate of increase was influenced by restrictions on natural gas hookups in the middle to late 1970's.

While all of the above products can be aggregated, to some extent, into the "gas-fired" appliance category, it is important to note that these products include articles fueled by natural gas - the most common - propane, butane and LP gas. For this reason, it may not be possible to address all gas-operated appliances within the scope of a single analysis. Further, given the sales and frequency of use of these articles, it may be necessary to address each of these appliances separately.

Also included in your request for information were certain component parts and accessories of these appliances: gas tanks and fittings, gas pipe, pipe fittings and distribution systems, connectors and valves, and controls. These items are generally not produced within the scope of the appliance industries themselves, but rather are manufactured in the "Fabricated Metal Products" industry. They are used in business and manufacturing as well as in households; the portion of these products designated for household use is unable to be ascertained from available data.

A memo prepared by Arlen Slobodow of Economic Analysis, dated January 8, 1981, relating to gas valves is attached. This memo illustrates the problems inherent in defining "gas valves."

Any future study relating to these components and accessories will need to be more narrowly defined to allow the team to focus on a specific product or type of component.

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Arten

Nick Marchica, Project Manager, PSA Team

January 8, 1981

Arten Slobodow, HICS

Gas Valves

This is in response to your request for economic data relative to gas valves. During my search for valve data, I have discovered scores of different devices that could be used on gas appliances. In addition, my conversations with you and Chick Willis of Engineering leave me with the impression that the scope of this project has not yet been defined. In the interests of effective use of resources, and because of time constraints, I can only provide a sketch of the "valve" industry. I would be happy to provide some more definite data, should the group arrive at a more definite description of the "product" in question.

The Thomas Register provides 23 pages of valves. Each page lists roughly 30 manufacturers. Examples of types of valves include air release, angle, aluminum, automatic, back pressure, ball, breather, butterfly, check, control: hydraulic; temperature; and vacuum, gate, globe, high pressure, etc. There are no doubt dozens of products with different designs, not all of which are designed for gas use. There is a separate listing of over 125 gas valve suppliers.

The American Gas association publishes a listing of gas appliances and components which meet AGA certification. AGA has listings for gas valves, gas appliances, thermostats, automatic gas shutoff devices, and combination controls for gas appliances. The following chart relates type of device to American National Standards, which are the basis of AGA certification:

	Z21.15	Z21.18	Z21.20	Z21.21	Z21.22	Z21.23	Z21.35
Gas Valves	X						
Gas Appliance Thermostats						X	
Automatic Gas Shutoff Devices					X		
Combination Controls for Gas Appliances	X	X	X	X		X	X

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There is clearly overlap by AIA designated type of device. If, however, your office can designate the applicable standards, we could move further along in defining the scope of the project.

Once the scope of the project is defined, we can look to various data sources. Census data is one source. Census data are not directly applicable to combination controls for gas appliances or automatic valves. SIC 38220 20 corresponds to temperature responsive automatic controls. However, it includes all thermostats used for air conditioning, refrigeration and comfort heating appliances. Further breakdowns are not available. SIC 34947 relates to regulating and control type automatic valves, including sub categories by method of activation. While these categories are not specific to gas appliances, further research could yield more useful information.

HICS:ASlobodov:am:1/8/81

cc: Chron
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