

Grill Fires on Residential Properties

These topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. Also included are recent examples of fire incidents that demonstrate some of the issues addressed in the report or that put the report topic in context.

Findings

- Grill fires on residential properties result in an estimated average of 10 deaths, 100 injuries, and \$37 million in property loss each year.
- Almost half (49 percent) of grill fires on residential properties occur from 5 to 8 p.m.
- Over half (57 percent) of grill fires on residential properties occur in the 4 months of May, June, July, and August.
- Thirty-two percent of grill fires on residential properties start on patios, terraces, screened-in porches, or courtyards, while an additional 24 percent start on exterior balconies and unenclosed porches.
- The leading category of equipment power source is "gas fuels" (79 percent). Within this category, propane is the power source in 69 percent of all grill fires on residential properties.
- "Heat from powered equipment" is the leading heat source category for grill fires on residential properties (47 percent). Within this category, spark, ember, or flame from operating equipment accounts for 28 percent of all grill fires on residential properties.
- Thirty-seven percent of grill fires on residential properties with item first ignited determined fall under the "liquids, piping, filters" category which includes flammable liquid/gas and accelerants.
- The leading category of factors contributing to ignition is "mechanical failure, malfunction" (35 percent). Within this category, leaks or breaks of containers or pipes account for 23 percent of all grill fires on residential properties.

From 2006 to 2008, an estimated 5,700 grill fires on residential properties occurred annually in the United States.^{1,2,3} These fires resulted in an estimated average of 10 deaths, 100 injuries, and \$37 million in property loss each year. This report addresses the characteristics of grill fires on residential properties reported to the National Fire Incident Reporting System (NFIRS) between 2006 and 2008.

Grill fires on residential properties are defined as fires where a grill, hibachi, or barbecue is the principal equipment involved in ignition and the property use is residential. Of these fires, 45 percent are residential structure fires, 47 percent are outside fires, and 8 percent are other, unspecified fires.

Type of Fire

Grill fires on residential properties consist of two major categories of incidents: fires that are confined to specific types of equipment or objects (confined fires) and those that are not (nonconfined fires). Confined fires are small fire incidents that are limited in scope, confined to noncombustible

containers, rarely result in serious injury or large content losses, and are expected to have no significant accompanying property losses due to flame damage.^{4,5} Approximately 10 percent of grill fires on residential properties are confined fires.

NFIRS allows abbreviated reporting for confined fires and many reporting details of these fires are not required, therefore they are not reported. However, the majority of fire incident records coded as "confined" grill fires in NFIRS had sufficient data to be included in the overall analyses. As a result, this report addresses all grill fires on residential properties and does not distinguish between confined and nonconfined fires.

Loss Measures

Table 1 presents losses, averaged over this 3-year period, of all reported fires and grill fires on residential properties.⁶ On average, grill fires on residential properties result in more injuries and slightly higher dollar losses when compared to all other fires.

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Table 1. Loss Measures for Grill Fires on Residential Properties (3-year average, 2006–2008)

Measure	All Fires	Grill Fires on Residential Properties
Average Loss:		
Fatalities/1,000 Fires	2.0	2.2
Injuries/1,000 Fires	9.8	33.9
Dollar Loss/Fire	\$8,050	\$11,910

Source: NFIRS 5.0.

Note: Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed *per fire* and is rounded to the nearest \$10.

Property Use

Table 2 presents the percentage distribution of property use for grill fires on residential properties. Eighty-seven percent of grill fires on residential properties occur on one- or

two-family dwelling properties. Eleven percent of grill fires on residential properties occur on multifamily dwelling (apartments, rowhouses, town houses, condominiums, and tenements) properties, while 3 percent occur on other residential properties.

Table 2. Percentage Distribution of Property Use for Grill Fires on Residential Properties (3-year average, 2006–2008)

Property Use	Grill Fires on Residential Properties
One- or two-family dwelling properties	86.5%
Multifamily dwelling properties	10.9%
Other residential properties	2.6%
Total	100.0%

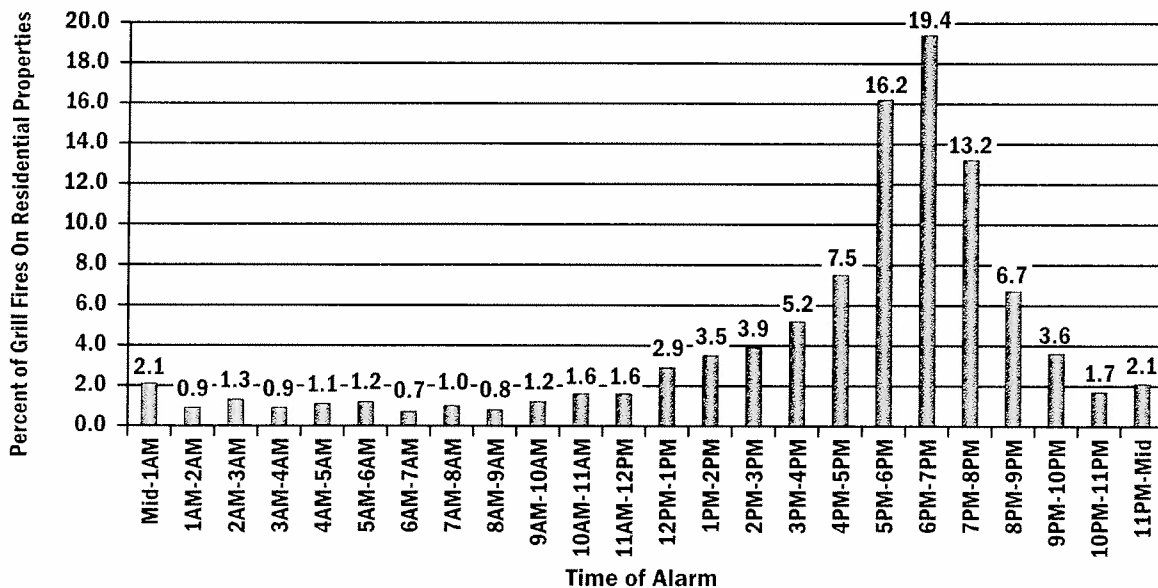
Source: NFIRS 5.0.

When Grill Fires on Residential Properties Occur

As shown in Figure 1, grill fires on residential properties occur mainly in the early evening hours, from 5 to 8 p.m., peaking from 6 to 7 p.m. at 19 percent. In fact, this 3-hour period accounts for almost half (49 percent) of grill fires on

residential properties. Sixty-three percent of grill fires on residential properties occur during the 5-hour period from 4 to 9 p.m. Fire incidence then declines, reaching and staying near the lowest point during the morning hours (12 a.m. to 12 p.m.), and steadily rises again in the afternoon hours until reaching its peak in the early evening hours.⁷

Figure 1. Grill Fires on Residential Properties by Time of Alarm (2006–2008)

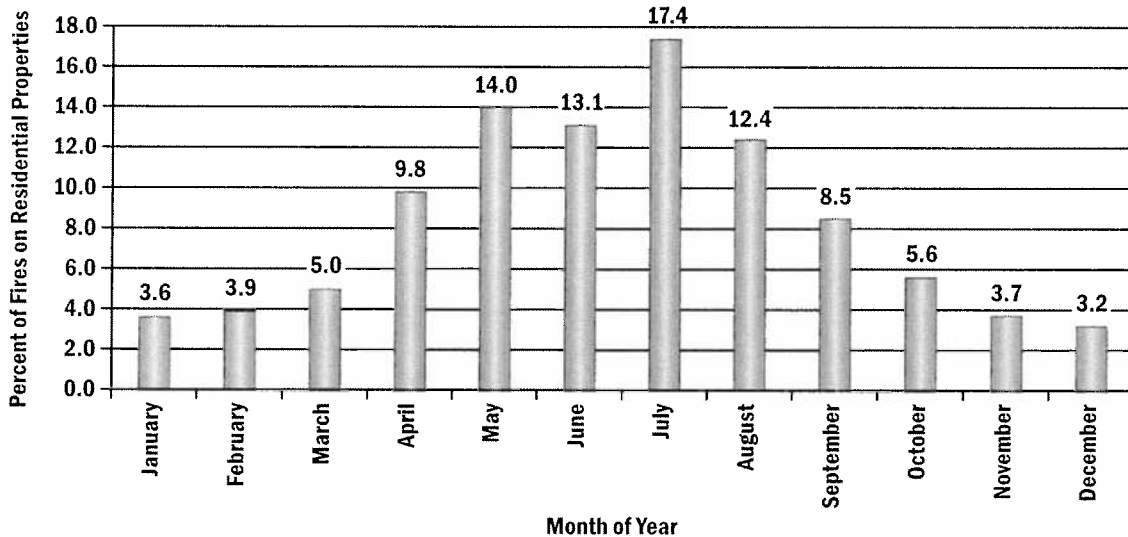


Source: NFIRS 5.0.

Figure 2 illustrates that, as expected, over half (57 percent) of grill fires on residential properties occur in the 4 months of May, June, July, and August. Fire incidence then begins to

decline reaching the lowest point in December, and steadily rises during the first 4 months of the year. This pattern correlates with warm-weather outdoor recreational activities.

Figure 2. Grill Fires on Residential Properties by Month (2006–2008)



Source: NFIRS 5.0.

Where Grill Fires on Residential Properties Start (Area of Fire Origin)

Five areas of fire origin account for 80 percent of grill fires on residential properties (Table 3). Thirty-two percent of grill fires on residential properties start on patios, terraces, screened-in porches, or courtyards. Another 24 percent

of these fires start on exterior balconies and unenclosed porches, while an additional 17 percent start in other, unspecified outside areas. Less common are grill fires on residential properties that start on exterior wall surfaces (4 percent) and outside open areas including lawns, farmland, fields, and vacant lots (4 percent).

Table 3. Leading Areas of Fire Origin in Grill Fires on Residential Properties (2006–2008)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Courtyard, patio, terrace, screened-in porch	32.0
Exterior balcony, unenclosed porch	23.7
Outside areas, other	16.6
Wall surface, exterior	4.2
Outside open areas	3.7

Source: NFIRS 5.0.

Power Sources of Equipment Involved in Grill Fires on Residential Properties

Table 4 shows the equipment power source categories of grill fires on residential properties. The leading category of equipment power source is “gas fuels” (79 percent). Within this category, propane is the power source in 69

percent of all grill fires on residential properties. The second leading equipment power source category is “solid fuels” (18 percent) which includes charcoal. For the remaining 3 percent of grill fires on residential properties, the equipment is powered by electrical, liquid, or other fuel sources.

Table 4. Equipment Power Sources of Grill Fires on Residential Properties by Major Category (2006–2008)

Equipment Power Source Categories	Percent (Unknowns Apportioned)
Gas Fuels	79.2
Solid Fuels	17.5
Electrical	1.7
Liquid Fuels	1.1
Other Power Sources	0.6
Total	100.0

Source: NFIRS 5.0.

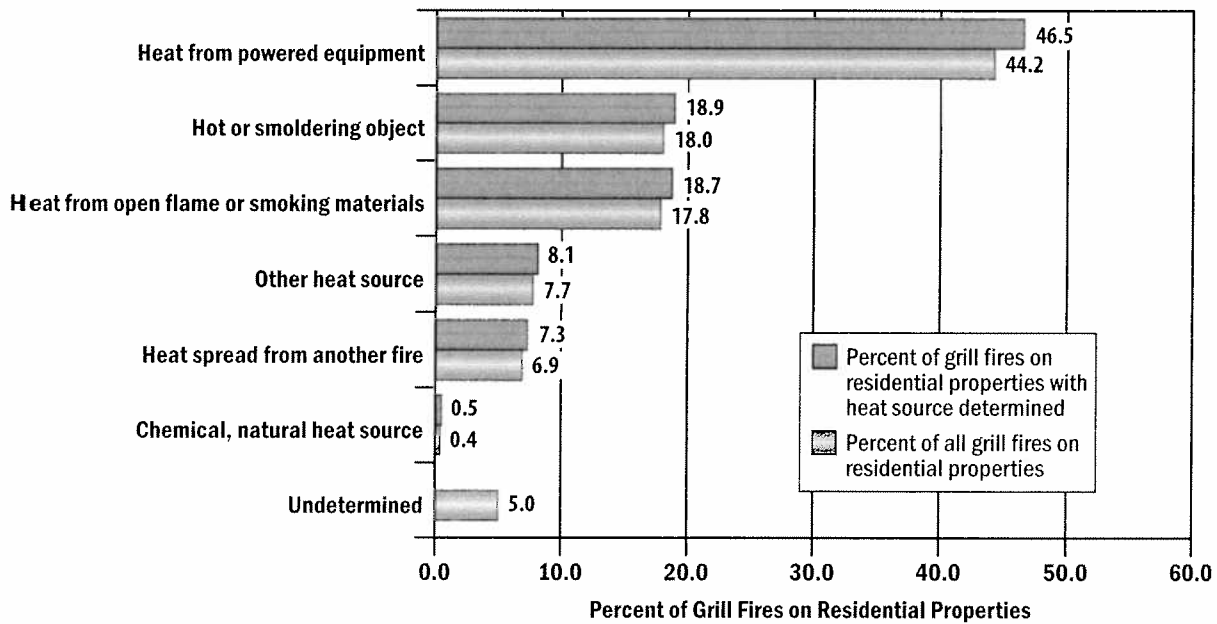
Note: Total may not add to 100 percent due to rounding.

How Grill Fires on Residential Properties Start (Heat Source)

Figure 3 shows sources of heat categories in grill fires on residential properties. The “heat from powered equipment” category accounts for 47 percent of grill fires on residential properties where the heat source was determined. Within this category, spark, ember, or flame from operating equipment accounts for 28 percent of all grill fires on residential properties, while radiated or conducted heat from operating equipment accounts for 14 percent of these fires.

The “hot or smoldering object” category accounts for 19 percent of grill fires on residential properties where the heat source was determined. This category includes hot coals, charcoal, or ashes. Additionally, the “heat from open flame or smoking materials” category also accounts for 19 percent of the grill fires. This category includes lighters and matches.

Figure 3. Sources of Heat in Grill Fires on Residential Properties by Major Category (2006–2008)



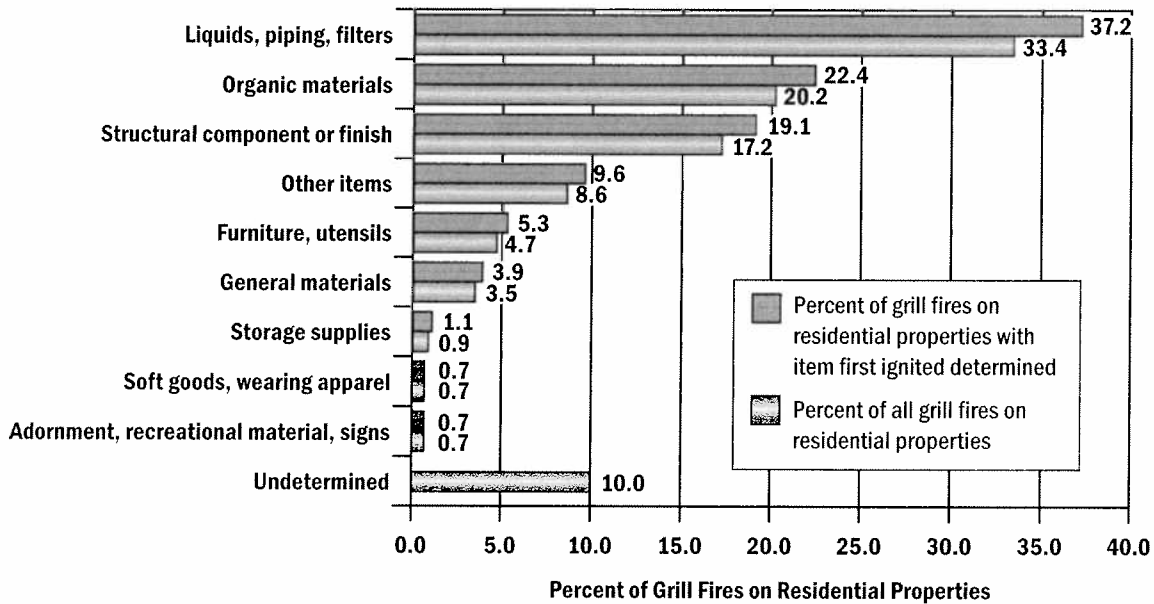
Source: NFIRS 5.0.

What Ignites First in Grill Fires on Residential Properties

Thirty-seven percent of grill fires on residential properties with item first ignited determined fall under the “liquids, piping, filters” category (Figure 4). This category includes flammable liquid/gas and accelerants. The second leading category, “organic materials,” accounts for 22 percent of grill fires on residential properties, while the third category,

“structural component or finish,” accounts for 19 percent of these fires. Flammable liquid/gas (34 percent), cooking materials (18 percent), other, unspecified items (10 percent), and exterior sidewall covering, surface, and finish (8 percent) are the specific items most often first ignited in grill fires on residential properties.

Figure 4. Item First Ignited in Grill Fires on Residential Properties by Major Category (2006–2008)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Grill Fires on Residential Properties

Table 5 shows the factors contributing to ignition categories of grill fires on residential properties. The leading category of factors contributing to ignition is “mechanical failure, malfunction” (35 percent). Within this category, leaks or breaks of containers or pipes account for 23 percent of all grill fires on residential properties.

The “misuse of material or product” category is a contributing factor in 30 percent of grill fires on residential properties. Within this category, heat source too close to combustibles accounts for 18 percent of all grill fires on residential properties. The third leading category of factors contributing to ignition is “operational deficiency” (26 percent). Within this category, unattended equipment (9 percent) and failure to clean (9 percent) account for 18 percent of all grill fires on residential properties. The “fire spread or control” category is the fourth leading factor at 10 percent.

Table 5. Factors Contributing to Ignition for Grill Fires on Residential Properties by Major Category (Where Factors Contributing to Ignition are Specified, 2006–2008)

Factors Contributing to Ignition Categories	Percent of Grill Fires on Residential Properties
Mechanical failure, malfunction	34.5
Misuse of material or product	29.5
Operational deficiency	26.4
Fire spread or control	9.8
Design, manufacture, installation deficiency	3.8
Other factors contributing to ignition	3.3
Natural condition	1.8
Electrical failure, malfunction	0.2

Source: NFIRS 5.0.

Notes: 1) Includes only incidents where factors that contributed to the ignition of the fire were specified.
2) Multiple factors contributing to fire ignition may be noted for each incident; total will exceed 100 percent.

Examples

The following are some recent examples of grill fires on residential properties reported by the media:

- March 2010: A home in Alton, IL, was badly damaged in a fire after a leak in a hose caused a propane gas grill to explode into flames. The incident occurred on the home's back porch with flames spreading from the porch to the rear of the house. The Alton Fire Department reported the resident of the home had turned on the grill when the propane from the leaking hose caused a small explosion and fire. The value of the house was given as \$45,000. Damage to the structure was estimated at \$20,000 and loss of contents at \$10,000.⁸
- July 2009: Investigators believe an overturned grill caused a house fire that destroyed a family's home in Central City, KY. The family had been outside grilling for the Fourth of July holiday near their back porch, and investigators suspect the grill overturned and sparked the blaze. No one was injured, but the home and the family's belongings were destroyed.⁹
- June 2009: Portland and Tualatin Valley Fire & Rescue crews responded to an outdoor grill fire that spread to a large house in Portland, OR, and necessitated a second alarm call. Investigators found the fire was caused by the improper use of a gas grill. The fire caused an estimated \$700,000 in damage to the structure and an additional \$700,000 to the contents.¹⁰
- May 2007: Hot charcoal ashes from a rooftop grill caused extensive damage to several apartments and a market in Madison, WI. Fire investigators found the cause of the fire accidental due to hot embers dropping

from a charcoal grill onto the roof. The grill did not have a tray to catch the embers. Fireworks were also thrown onto the grill. One person was treated and released at the scene of the fire. Fourteen people were displaced.¹¹

Conclusion

Grills, hibachis, and barbecues on residential properties continue to be a high fire risk and, on average, result in more injuries and slightly higher dollar losses when compared to all other fires. As a result, it is crucial that each household diligently practice fire safety when cooking on one of these pieces of equipment. Practicing fire safety can prevent these fires and their resultant injuries, deaths, and property loss. For grilling and other types of cooking fire safety, please visit http://www.usfa.fema.gov/citizens/all_citizens/home_fire_prev/cooking.shtm.

NFIRS Data Specifications for Grill Fires on Residential Properties

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2006, 2007, and 2008. Only version 5.0 data were extracted.

Grill fires on residential properties were defined as:

- Incident Type codes 100 to 123 and 140 to 173. Note that mobile property (vehicle) fire Incident Types 130 to 138 were excluded. In addition, Incident Type 110 was also excluded. Incident Type 110 is a conversion code for NFIRS 4.1 and is not a valid code for data collected in NFIRS 5.0. Incidents in the NFIRS 5.0 database with a 110 Incident Type are incidents collected under the NFIRS 4.1 system and are converted to NFIRS 5.0 compatible data.

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- Equipment Involved in Ignition code 643 (grill, hibachi, or barbecue).
- Property Use codes 400 to 464:
- Aid Types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.

Property Use Code	Description
419	One- or two-family dwelling
429	Multifamily dwelling
439	Boarding/Rooming house
449	Hotel/Motel, commercial
459	Residential board and care
460	Dormitory-type residence, other
462	Sorority house, fraternity house
464	Barracks, dormitory
400	Residential, other

To request additional information or to comment on this report, visit <http://www.usfa.fema.gov/applications/feedback/index.jsp>

Notes:

¹ National estimates are based on 2006-2008 native version 5.0 data from the National Fire Incident Reporting System (NFIRS) and fire loss estimates from the National Fire Protection Association's (NFPA's) annual surveys of fire loss. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest \$million.

² Residential properties include, but are not limited to, one- or two-family dwellings, multifamily dwellings, boarding houses or residential hotels, and commercial hotels.

³ When calculating national estimates, fires with equipment involved in ignition coded as none and having a heat source from the "heat from powered equipment" category (heat source codes 10-13) were grouped with fires where equipment involved in ignition were coded as unknown.

⁴ NFIRS distinguishes between "content" and "property" loss. Content loss includes loss to the contents of a structure due to damage by fire, smoke, water, and overhaul. Property loss includes losses to the structure itself or to the property itself. Total loss is the sum of the content loss and the property loss.

⁵ In NFIRS, confined fires are defined by Incident Type codes 113 to 118.

⁶ The average fire death and fire injury loss rates computed from the national estimates will not agree with average fire death and fire injury loss rates computed from NFIRS data alone. The fire death rate computed from national estimates would be $(1,000 \times (10/5,700)) = 1.8$ deaths per 1,000 grill fires on residential properties and the fire injury rate would be $(1,000 \times (100/5,700)) = 17.5$ injuries per 1,000 grill fires on residential properties.

⁷ For the purposes of this report, the time of the fire alarm is used as an approximation for the general time the fire started. However, in NFIRS, it is the time the fire was reported to the fire department.

⁸ Linda Weller, "Propane grill leak triggers home fire," [www.thetelegraph.com](http://www.thetelegraph.com/articles/fire-37441-house-rear.html), March 12, 2010, <http://www.thetelegraph.com/articles/fire-37441-house-rear.html> (accessed March 22, 2010).

⁹ Chad Shoulders, "Overturned grill believed to cause house fire," www.news25.us, July 5, 2009, <http://www.news25.us/Global/story.asp?S=10646519> (accessed March 22, 2010).

¹⁰ Kay Mitchell, "Grill sparks two-alarm fire at West Hills home," www.oregonlive.com, June 24, 2009, http://www.oregonlive.com/portland/index.ssf/2009/06/grill_sparks_twoalarm_fire_at.html (accessed March 22, 2010).

¹¹ Bernadette Galvez, "Charcoal grill causes \$500,000 fire to several apartments and a neighborhood market," www.cityofmadison.com, May 6, 2007, http://www.cityofmadison.com/fire/departments_news/press_releases/2007/May%206_HamiltonCause.pdf (accessed March 19, 2010).