TOPICAL FIRE REPORT SERIES Volume 13, Issue 7 / August 2012

# Clothes Dryer Fires in Residential Buildings (2008–2010)

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

- An estimated 2,900 clothes dryer fires in residential buildings are reported to U.S. fire departments each year and cause an estimated 5 deaths, 100 injuries, and $35 million in property loss.
- Clothes dryer fire incidence in residential buildings was higher in the fall and winter months, peaking in January at 11 percent.
- Failure to clean (34 percent) was the leading factor contributing to the ignition of clothes dryer fires in residential buildings.
- Dust, fiber, and lint (28 percent) and clothing not on a person (27 percent) were, by far, the leading items first ignited in clothes dryer fires in residential buildings.
- Fifty-four percent of clothes dryer fires in residential buildings were confined to the object of origin.

For many households and other establishments, the clothes dryer is an indispensable convenience and necessity. However, damaging fires can occur if clothes dryers are not properly installed and maintained. Eighty-four percent of clothes dryer fires that occurred in buildings took place in residential buildings.[1, 2] Because the residential building portion of these fires predominates, the primary focus of this analysis addresses the characteristics of clothes dryer fires in residential buildings reported to the National Fire Incident Reporting System (NFIRS). The focus is on fires reported from 2008 to 2010, the most recent data available at the time of this analysis.

From 2008 to 2010, fire departments responded to an estimated 2,900 clothes dryer fires in residential buildings each year across the Nation.[3] These fires resulted in an annual average loss of 5 deaths, 100 injuries, and $35 million in property loss.

For the purpose of this report, the term "clothes dryer fires" is synonymous with "clothes dryer fires in residential buildings." "Clothes dryer fires" is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, "clothes dryer fires in residential buildings."

## The Hows and Whys of a Clothes Dryer Fire

A clothes dryer works by forcing hot air through a turning drum. Wet clothes placed in the drum are then dried by moving hot air. It is possible for a full load of wet clothes to contain as much as one and a half gallons of water. Lint, consisting mostly of small fibers from the clothes and debris in or on the clothes, is created from the clothes as the clothes tumble in the drum. While much of the lint is trapped by the dryer's filter, lint is also carried through the vent system along with moist air.[4] Lint is a highly combustible material that can accumulate both in the dryer and in the dryer vent. Accumulated lint leads to reduced airflow and can pose a potential fire hazard.[5]

In addition to the accumulation of lint, blockage in dryer exhaust vents also can occur from the nests of small birds or other animals or from damages to the venting system itself. A compromised vent will not exhaust properly to the outside. As a result, overheating may occur and a fire may ensue.[6]

## Loss Measures

Table 1 presents losses, averaged over the 3-year period from 2008 to 2010, of reported clothes dryer fires in residential buildings.[7] The average number of injuries per 1,000 clothes dryer fires was slightly higher than the same loss measure for all other residential building fires. The average number of fatalities per 1,000 clothes dryer fires and average dollar loss per clothes dryer fire, however, were notably less than the same loss measures for all other residential building fires.

## Table 1. Loss Measures for Clothes Dryer Fires in Residential Buildings (3-year average, 2008–2010)

| Measure | Clothes Dryer Fires in Residential Buildings | Residential Building Fires (Excluding Clothes Dryer Fires) |
|---|---|---|
| **Average Loss:** | | |
| Fatalities/1,000 fires | 1.8 | 5.5 |
| Injuries/1,000 fires | 30.5 | 28.8 |
| Dollar loss/fire | $9,610 | $15,940 |

Source: NFIRS 5.0.

Notes: 1) 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.
2) When calculating the average dollar loss per fire for 2008–2010, the 2008 and 2009 dollar-loss values were adjusted to their equivalent 2010 dollar-loss values to account for inflation.

## Where Clothes Dryer Fires in Residential Buildings Occur

One- and two-family residences accounted for 77 percent of clothes dryer fires as shown in Table 2. Only 17 percent of clothes dryer fires occurred in multifamily dwellings, and even fewer occurred in hotels and motels (3 percent). The remaining 3 percent of clothes dryer fires occurred in other residential buildings including boarding and rooming homes, sororities and fraternities, dormitories, barracks, and other residences.[8]

## Table 2. Clothes Dryer Fires in Residential Buildings by Property Use (2008–2010)

| Property Use | Clothes Dryer Fires in Residential Buildings (Percent) |
|---|---|
| One- or two-family dwellings | 77.1 |
| Multifamily dwellings | 17.4 |
| Hotels and motels | 3.0 |
| Other residential buildings | 2.5 |
| Total | 100.0 |

Source: NFIRS 5.0.

In addition, as expected, clothes dryer fires most often started in laundry areas (83 percent) as shown in Table 3. The next leading areas of origin for clothes dryer fires were substructure areas such as crawl spaces and garages (each at 3 percent), kitchens (2 percent), and other service or equipment areas (1 percent).

## Table 3. Leading Specific Areas of Fire Origin in Clothes Dryer Fires in Residential Buildings (2008–2010)

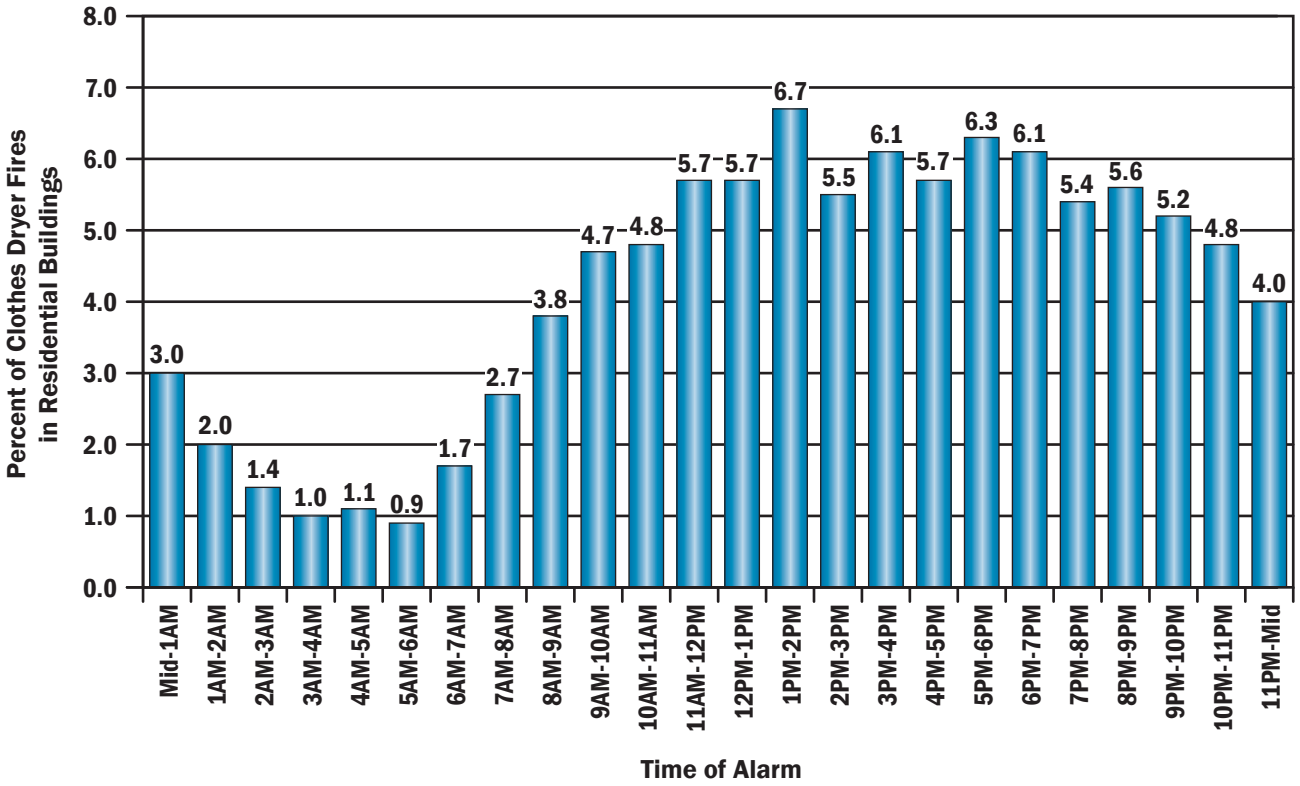
| Areas of Fire Origin | Percent (Unknowns Apportioned) |
|---|---|
| Laundry area | 82.6 |
| Substructure area or space | 2.6 |
| Garage, carport | 2.5 |
| Cooking area, kitchen | 2.0 |
| Other service or equipment areas | 1.4 |

Source: NFIRS 5.0.

## When Clothes Dryer Fires in Residential Buildings Occur

As shown in Figure 1, clothes dryer fires increased in frequency beginning in the early morning and occurred fairly regularly between the hours of 8 a.m. and midnight, with a slight peak between 1 and 2 p.m. (7 percent).[9] Clothes dryer fires then declined reaching the lowest point between 3 and 6 a.m., when most people are expected to be sleeping.

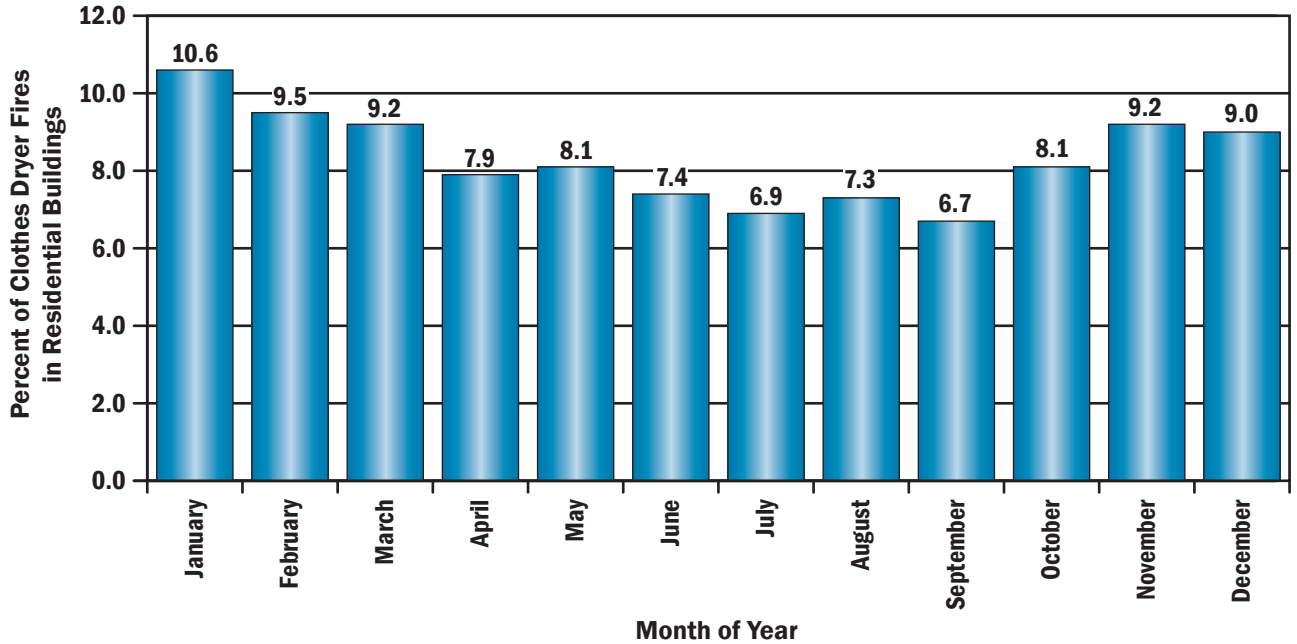
## Figure 1. Clothes Dryer Fires in Residential Buildings by Time of Alarm (2008–2010)




Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

Figure 2 illustrates that clothes dryer fire incidence was higher in the fall and winter months, peaking at 11 percent in January. The increase in fires in the cooler months may be explained by the quantity and type of clothes worn in these months. In addition, people are less likely to dry clothes outdoors during the cooler months than during the warmer months.

## Figure 2. Clothes Dryer Fires in Residential Buildings by Month (2008–2010)




Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

## Factors Contributing to Ignition in Clothes Dryer Fires in Residential Buildings

Table 4 shows the categories of factors contributing to ignition in clothes dryer fires. The leading category was "operational deficiency" (47 percent). The leading specific factor contributing to ignition, which is part of the operational deficiency category, was failure to clean. This is not surprising as proper clothes dryer maintenance to avoid a fire hazard involves removing the lint from the traps, vents, and surrounding areas of the dryer. Failure to clean accounted for 72 percent of the operational deficiency contributing factors category. It also accounted for 34 percent of **all** clothes dryer fires in residential buildings.

The second leading factors contributing to ignition category was "mechanical failure, malfunction" at 29 percent. "Electrical failure, malfunction" was the third leading category at 16 percent. Reduced airflow resulting from lint buildup in the screen or other areas around the dryer can cause a clothes dryer to not operate efficiently and possibly overheat. Problems can also occur if improper items, such as foam-backed rugs or athletic shoes, are placed in dryers, or plastic or vinyl exhaust materials are used to vent the appliances.[10]

### Table 4. Factors Contributing to Ignition in Clothes Dryer Fires in Residential Buildings by Major Category (Where Factors Contributing to Ignition are Specified, 2008–2010)

| Factors Contributing to Ignition Category | Percent of Clothes Dryer Fires in Residential Buildings (Unknowns Apportioned) |
|---|---|
| Operational deficiency | 46.6 |
| Mechanical failure, malfunction | 28.6 |
| Electrical failure, malfunction | 15.6 |
| Misuse of material or product | 9.5 |
| Design, manufacture, installation deficiency | 4.0 |
| Other factors contributing to ignition | 3.3 |
| Natural condition | 0.6 |
| Fire spread or control | 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.

## What Ignites First in Clothes Dryer Fires in Residential Buildings

Not unexpectedly, dust, fiber, and lint (28 percent) and clothing not on a person (27 percent) were, by far, the leading items first ignited as shown in Table 5. Other leading items first ignited included other soft goods, wearing apparel or clothing (9 percent), appliance housing or casing (8 percent), linen other than bedding (6 percent), and electrical wire, cable insulation (also 6 percent).

### Table 5. Leading Specific Items First Ignited in Clothes Dryer Fires in Residential Buildings (2008–2010)

| Item First Ignited | Percent (Unknowns Apportioned) |
|---|---|
| Dust, fiber, lint | 27.6 |
| Clothing not on a person | 27.2 |
| Other soft goods, wearing apparel or clothing | 8.8 |
| Appliance housing or casing | 7.5 |
| Linen other than bedding | 6.0 |
| Electrical wire, cable insulation | 5.7 |

Source: NFIRS 5.0.

## Fire Spread in Clothes Dryer Fires in Residential Buildings

Fifty-four percent of clothes dryer fires were confined to the object of origin (Table 6).[11] An additional 32 percent were confined to the room of origin. The remaining 14 percent extended beyond the room of origin. The average dollar loss per clothes dryer fire confined to the object of origin was less than $2,000. The average loss per all other clothes dryer fires was notably greater, and for those that extended beyond the floor of origin, the average loss was over $40,000.

**Table 6. Dollar Loss Per Clothes Dryer Fire in Residential Buildings by Fire Spread (3-year average, 2008–2010)**

| Measure | Confined to object of origin | Confined to room of origin | Confined to floor of origin | Confined to building of origin | Beyond building of origin |
|---|---|---|---|---|---|
| **Average Loss:** | | | | | |
| Percent of fires | 53.5 | 32.1 | 5.1 | 8.7 | 0.5 |
| Dollar loss per fire | $1,790 | $6,790 | $37,170 | $49,500 | $46,090 |

Source: NFIRS 5.0.
Notes: 1) Total percent of fires does not add up to 100 percent due to rounding.
2) Average dollar loss is computed ***per fire*** and rounded to the nearest $10.
3) When calculating the average dollar loss per fire for 2008–2010, the 2008 and 2009 dollar-loss values were adjusted to their equivalent 2010 dollar-loss values to account for inflation.

## Suppression/Alerting Systems in Clothes Dryer Fires in Residential Buildings

Over the past 30 years, technologies to detect and extinguish fires have been a major contributor in the drop in fire fatalities and injuries. Smoke alarms are now present in the majority of residential buildings. In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

Note that the data presented in Tables 7 to 9 are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms and sprinklers in residential fires. In addition, NFIRS does not allow for the determination of the type of smoke alarm (i.e., photoelectric or ionization) or the location of the smoke alarm with respect to the area of fire origin.

### Smoke Alarms

Smoke alarms were present in 62 percent of clothes dryer fires (Table 7). In 16 percent of clothes dryer fires, there were no smoke alarms present. In another 20 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Additionally, smoke alarm presence status was not reported in 2 percent of incidents.[12] Thus, smoke alarms were potentially missing in between 16 and 38 percent of these fires with the ability to spread and possibly result in fatalities.

**Table 7. Presence of Smoke Alarms in Clothes Dryer Fires in Residential Buildings (2008–2010)**

| Presence of Smoke Alarms | Percent |
|---|---|
| Present | 62.3 |
| None present | 15.7 |
| Undetermined | 20.2 |
| Null/blank | 1.8 |
| Total | 100.0 |

Source: NFIRS 5.0.

Only one percent of all clothes dryer fires occurred in residential buildings that are **not** currently or routinely occupied. These occupancies—buildings under construction, undergoing major renovation, vacant, and the like—are more unlikely to have alerting and suppression systems that are in place and, if in place, that operate.[13] As a result, the detailed smoke alarm analyses in the next section focus only on clothes dryer fires in occupied residential buildings.

### *Smoke Alarms in Clothes Dryer Fires in Occupied Residential Buildings*

Smoke alarms were reported as present in 64 percent of clothes dryer fires in occupied residential buildings (Table 8). In 16 percent of clothes dryer fires in occupied residential buildings, there were no smoke alarms present. In another 21 percent of these fires, firefighters were unable to determine if a smoke alarm was present.[14]

When smoke alarms were present (64 percent) and the alarm operational status is considered, the percentage of smoke alarms reported as present consisted of:

- smoke alarms present and operated—42 percent;
- present but did not operate—16 percent (alarm did not operate, 8 percent; fire too small, 8 percent); and
- present, but operational status unknown—6 percent.

When the subset of incidents where smoke alarms were reported as present are analyzed separately and as a whole, smoke alarms were reported to have operated in 66 percent of the incidents. Smoke alarms failed to operate in 12 percent of the incidents. In another 13 percent of the subset where smoke alarms were reported as present, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 9 percent of the incidents.

**Table 8. NFIRS Smoke Alarm Data for Clothes Dryer Fires in Occupied Residential Buildings (2008–2010)**

| Presence of Smoke Alarms | Smoke Alarm Operational Status | Smoke Alarm Effectiveness | Count | Percent |
|---|---|---|---|---|
| Present | Fire too small to activate smoke alarm | | 484 | 8.2 |
| | Smoke alarm operated | Smoke alarm alerted occupants, occupants responded | 2,036 | 34.5 |
| | | Smoke alarm alerted occupants, occupants failed to respond | 76 | 1.3 |
| | | No occupants | 135 | 2.3 |
| | | Smoke alarm failed to alert occupants | 69 | 1.2 |
| | | Undetermined | 151 | 2.6 |
| | Smoke alarm failed to operate | | 451 | 7.6 |
| | Undetermined | | 352 | 6.0 |
| None present | | | 939 | 15.9 |
| Undetermined | | | 1,214 | 20.6 |
| Total Incidents | | | 5,907 | 100.0 |

Source: NFIRS 5.0.

Notes 1) The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in clothes dryer fires in residential buildings. They are presented for informational purposes.
2) Total does not add to 100 percent due to rounding.

### *Automatic Extinguishment Systems in Clothes Dryer Fires in Residential Buildings*

The analyses presented here do not differentiate between occupied and unoccupied housing, as extremely few reported fires in unoccupied housing have Automatic Extinguishing Systems (AESs) present (occupied housing accounted for 99 percent of reported clothes dryer fires with AESs). Full or partial AESs were present in only 5 percent of clothes dryer fires (Table 9).[15] While the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities, the lack of AESs is not unexpected as they are not yet widely installed.

**Table 9. NFIRS Automatic Extinguishing System (AES) Data for Clothes Dryer Fires in Residential Buildings (2008–2010)**

| AES Presence | Count | Percent |
|---|---|---|
| AES present | 307 | 5.0 |
| Partial system present | 8 | 0.1 |
| AES not present | 5,467 | 89.6 |
| Unknown | 209 | 3.4 |
| Null/Blank | 110 | 1.8 |
| Total Incidents | 6,101 | 100.0 |

Source: NFIRS 5.0.

Notes: 1) The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of AESs in clothes dryer fires in residential buildings. They are presented for informational purposes.
2) Total does not add to 100 percent due to rounding.

## Examples

The following are recent examples of clothes dryer fires reported by the media:

- March 2012: A family was displaced after a clothes dryer fire quickly spread and destroyed their two-story Colonial home in Readington, NJ. The blaze, which started on the second floor and rapidly spread to the rest of the house, kept crews from the local fire companies and a tanker task force on the scene for more than two and a half hours. No one was injured, and neighboring homes were not damaged.[16]
- March 2012: A load of clothes in a dryer ignited a fire that displaced residents from their home in Chapel Hill, NC. The Chapel Hill Fire Department was dispatched to the 63-year-old home and quickly discovered that a dryer in the unfinished basement was the source of smoke reported by the residents. Firefighters extinguished a load of clothes in the dryer that had caught fire and then removed the dryer from the home. No injuries were reported.[17]
- February 2012: Investigators believe a clothes dryer sparked a fire in a Cornelius, OR home causing approximately $75,000 in damage. The homeowner had put clothes in the dryer and was playing with her son in another room when she heard two loud noises from the laundry room. After discovering smoke coming from the dryer, the woman ran upstairs to get her sleeping daughter, grabbed her son, and got out of the house. She then called 9-1-1. No injuries were reported, but the fire caused "serious smoke damage" throughout the house and "significant damage" in the laundry room and nearby bathroom and playroom.[18]

## Clothes Dryer Venting Systems

In order to prevent possible fire hazards, building codes[19] require that clothes dryers be exhausted directly to the outdoors. Venting a dryer into attics, soffits, ridge vents, or crawl spaces is expressly prohibited.

The codes require that dryer vents be made of metal with smooth interior finishes, sections of vent duct be securely supported and firmly sealed together, and the total length of the vent duct not exceed 35 feet (shorter if there are turns or bends). Flexible transition ducts used to connect the dryer to the exhaust duct system are required to be not longer than eight feet, not concealed within construction, and **listed** and **labeled** in accordance with Underwriters Laboratories (UL) 2158A.[20]

New construction trends often situate washers and dryers in nontraditional areas of the house, such as upstairs bedrooms, hallways, bathrooms, kitchens, and closets. These new sites may require longer dryer vent ducts in order to reach an outside wall. If a dryer vent is too long or has many bends and turns, moisture in the warm air passing through it condenses on the vent surfaces, attracting lint. Eventually, the lint accumulates and creates resistance.[21] Thus, it is crucial for homeowners to regularly inspect and clean out the dryer vent.

All manufacturers now state in their manuals **not** to use plastic, flexible dryer ducts between the vent and the clothes dryer. Many homes, however, continue to use plastic, flexible ducts.[22] The plastic itself can provide additional fuel for a fire. Even flexible foil vents are not a good choice for venting clothes dryers. Flexible vents can twist, allowing lint to build up and catch on fire if it comes in contact with a sufficient amount of heat. If a fire starts beneath the dryer when the motor overheats, then the drafts from the dryer can pull the fire up into the duct, allowing a house fire to develop.[23] Only flexible transition ducts that are **listed** by UL or another approved product safety testing agency should be used.

Serious hazards occur when dryer vents do not exhaust directly to the outside. Faulty installations can vent dryer exhaust into the attic, crawl space, chimney, or interior walls, which can cause indoor air deterioration and mold buildup.[24] Small birds and animals that nest in dryer vents or other debris can obstruct air flow and prevent proper venting to the outside.[25]

By observing a few simple indications of poor system performance, it can be determined whether the dryer components need to be examined for any blockage or excessive heat. If heavy clothes such as blue jeans or towels are taking a long time to dry, or clothes feel hotter than usual at the end of the cycle, a clogged dryer vent exhaust is likely the problem.[26]

## Proper Dryer Installation and Maintenance

The installation and maintenance of clothes dryers are an important part of making sure that a clothes dryer performs as designed and does not become a fire hazard. Several recommendations for clothes dryer safety include the following:[27, 28, 29, 30, 31, 32]

### Clothes Dryer Dos

- Have your clothes dryer installed by qualified personnel.
- Clean the lint filter before and after each cycle. Do not forget to clean the back of the dryer where lint can build up. In addition, clean the lint filter with a nylon brush at least every 6 months or more frequently if it becomes clogged.
- Inspect the venting system behind the dryer to ensure it is not damaged, crushed, or restricted.
- Outside wall dampers should have a covering that will keep out rain, snow, and dirt. Do not, however, use wire screen or cloth as these can collect lint and clog areas of the dryer vent.
- Make sure the outdoor vent covering opens when the dryer is operating.
- The interior of the dryer and venting system should be serviced and cleaned periodically by qualified service personnel, especially if it is taking longer than normal for clothes to dry.
- Replace coiled-wire foil or plastic venting with rigid, non-ribbed metal duct.
- Have gas-powered dryers inspected by a professional annually to ensure that the gas line and connection are intact and free of leaks.
- Check periodically to make sure nests of small animals and insects are not blocking the outside vent.
- Make sure the correct electrical plug and outlet are used and that the dryer is connected properly.
- Read manufacturers' instructions and warnings in use and care manuals that accompany new dryers.
- Keep the area around the clothes dryer free of items that can burn.
- If you will be away from home for an extended time, unplug or disconnect the dryer.

### Clothes Dryer Don'ts

- Do not operate a clothes dryer without a lint filter or with a lint filter that is loose, damaged, or clogged.
- Do not dry anything containing foam, rubber, or plastic (i.e., bathroom rugs).
- Do not dry any item for which manufacturers' instructions state "dry away from heat."
- Do not dry glass fiber materials (unless manufacturer's instructions allow).
- Do not dry materials that have come into contact with anything flammable (e.g., alcohol, cooking oils, gasoline, etc.). These should be dried outdoors or in a well-ventilated room, away from heat.
- Do not leave a clothes dryer running if you leave home or when you go to bed.

## NFIRS Data Specifications for Clothes Dryer Fires in Residential Buildings

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2008, 2009, and 2010. Only Version 5.0 data were extracted.

Clothes dryer fires in residential buildings are defined by the following criteria:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) are excluded to avoid double counting of incidents.
- Incident Types 111–123 (excluding Incident Type 112):

| Incident Type | Description |
|---|---|
| 111 | Building fire |
| 113 | Cooking fire, confined to container |
| 114 | Chimney or flue fire, confined to chimney or flue |
| 115 | Incinerator overload or malfunction, fire confined |
| 116 | Fuel burner/boiler malfunction, fire confined |
| 117 | Commercial compactor fire, confined to rubbish |
| 118 | Trash or rubbish fire, contained |
| 120 | Fire in mobile property used as a fixed structure, other |
| 121 | Fire in mobile home used as fixed residence |
| 122 | Fire in motor home, camper, recreational vehicle |
| 123 | Fire in portable building, fixed location |

Notes: 1) Incident Types 113–118 (confined fires) do not specify if the structure is a building.
2) The analyses in this report include all clothes dryer fires and do not distinguish between confined and nonconfined fires. (See the note on "Special Considerations" at the end of this section.)

- Property use 400–464 is included to specify residential buildings:

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

- Structure Type:
  - For Incident Types 113–118:
    - 1—Enclosed building;
    - 2—Fixed portable or mobile structure; and
    - Structure Type not specified (null entry).
  - For Incident Types 111 and 120–123:
    - 1—Enclosed building and
    - 2—Fixed portable or mobile structure.
- Equipment Involved in Ignition 811:[33]

| Equipment Involved in Ignition | Description |
|---|---|
| 811 | Clothes Dryer |

## *Special Considerations*

Building fires are divided into two classes of severity in NFIRS: "Confined fires," which are those fires confined to certain types of equipment or objects, and "nonconfined fires," which are not. Confined building fires are small fire incidents that are limited in extent, staying within **specific** noncombustible containers such as cooking pots, fireplaces, or incinerators. In NFIRS, confined fires are defined by Incident Type codes 113 to 118. Confined fires rarely result in serious injury or large content losses and are expected to have no significant accompanying property losses due to flame damage.[34] From 2008 to 2010, nonconfined fires accounted for 98 percent of clothes dryer fires, while confined fires accounted for the remaining 2 percent. It is believed, however, that the confined fires were miscoded in NFIRS since a clothes dryer is not one of the **specific** noncombustible containers listed under the NFIRS confined fire incident type codes. In addition, the areas of origin for the confined fires were locations where a clothes dryer fire would most typically start, such as laundry areas, laundry chutes, and ducts. Finally, the items first ignited were items most typically involved in clothes dryer fires, such as clothing not on a person, dust, fiber, lint, and linen. Instead of these fires being coded as confined in NFIRS, it is believed that they should have been coded as nonconfined fires with a fire spread that was limited to the object of origin (clothes dryer). As a result, the analyses in this report include all clothes dryer fires in residential buildings and do not distinguish between confined and nonconfined fires.

The analyses contained in this report reflect the current methodologies used by the U. S. Fire Administration (USFA). The USFA is committed to providing the best and most current information on the United States fire problem and continually examines its data and methodology to fulfill this goal. Because of this commitment, data collection strategies and methodological changes are possible and do occur. As a result, analyses and estimates of the fire problem may change slightly over time. Previous analyses and estimates on specific issues (or similar issues) may have used different methodologies or data definitions and may not be directly comparable to the current ones.

**To request additional information or to comment on this report, visit http://apps.usfa.fema.gov/feedback/**

## *Notes:*

[1] In NFIRS, Version 5.0, a structure is a constructed item of which a building is one type. In previous versions of NFIRS, the term "residential structure" commonly referred to buildings where people live. To coincide with this concept, the definition of a residential structure fire for NFIRS 5.0 has, therefore, changed to include only those fires where the NFIRS 5.0 Structure Type is 1 or 2 (enclosed building and fixed portable or mobile structure) with a residential property use. Such fires are referred to as "residential buildings" to distinguish these buildings from other structures on residential properties that may include fences, sheds, and other uninhabitable structures. In addition, confined fire incidents that have a residential property use, but do not have a structure type specified are presumed to be buildings. Nonconfined fire incidents that have a residential property use without a structure type specified are considered to be invalid incidents (structure type is a required field) and are not included.

[2] The term "residential buildings" includes what are commonly referred to as "homes," whether they are one- or two-family dwellings or multifamily buildings. It also includes manufactured housing, hotels and motels, residential hotels, dormitories, assisted living facilities, and halfway houses—residences for formerly institutionalized individuals (patients with mental disabilities, drug addicts, or those formerly incarcerated) that are designed to facilitate their readjustment to private life. The term "residential buildings" does not include institutions such as prisons, nursing homes, juvenile care facilities, or hospitals, even though people may reside in these facilities for short or long periods of time.

[3] National estimates are based on 2008–2010 native Version 5.0 data from NFIRS, residential structure fire-loss estimates from the National Fire Protection Association's (NFPA's) annual surveys of fire loss, and the U.S. Fire Administration's (USFA's) residential building fire-loss estimates. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest million dollars.

[4] Al's Home Improvement Center, "Venting Clothes Dryers," http://www.alsnetbiz.com/homeimprovement/dryervent.html.

[5] The Laundry Alternative, "Clothes Dryer Fire Prevention," http://www.laundry-alternative.com/clothes_dryer_fire.htm.

[6] Colonial Plumbing & Heating, "Dryer Fire Fact Sheet," http://www.colonialplumbing.com/webapp/GetPage?pid=113.

[7] The average fire death and fire injury loss rates computed from the national estimates do not agree with average fire death and fire injury loss rates computed from NFIRS data alone. For example, the fire death rate computed from national estimates is (1,000*(5/2,900)) = 1.7 deaths per 1,000 clothes dryer fires in residential buildings, and the fire injury rate is (1,000*(100/2,900)) = 34.5 injuries per 1,000 clothes dryer fires in residential buildings.

[8] "One- and two-family residential buildings" include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes. "Multifamily residential buildings" include apartments, townhouses, rowhouses, condominiums, and other tenement properties. "Hotels/Motels" include those for commercial use. "Other residential buildings" include boarding/rooming houses, residential board and care facilities, dormitory-type residences, sorority/fraternity houses, and barracks.

[9] 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.

[10] Underwriters Laboratories, "Product Safety Tips: Clothes Dryers," http://www.ul.com/global/eng/pages/offerings/perspectives/consumer/productsafety/dryers/.

[11] Included in these fires were those coded as "confined fires" in NFIRS. Confined building 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. In NFIRS, confined fires are defined by Incident Type codes 113–118.

[12] All incidents where smoke alarm presence was not reported were confined fires (Incident Type codes 113–118). NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires including smoke alarm presence are not required, nor are they reported.

[13] "Residential Building Fires (2008–2010)," USFA, April 2012, Volume 13, Issue 2, http://www.usfa.fema.gov/downloads/pdf/statistics/v13i2.pdf.

[14] Total does not add to 100 percent due to rounding.

[15] All incidents where AES presence was not reported were confined fires (Incident Type codes 113–118). NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires including AES presence are not required, nor are they reported.

[16] Cristina Rojas, "Readington Family Displaced Monday After Dryer Fire Damages Home," www.nj.com, March 27, 2012, http://www.nj.com/hunterdon-county-democrat/index.ssf/2012/03/readington_family_displaced_mo.html (accessed April 2, 2012).

[17] "Chapel Hill Firefighters Put Out Dryer Fire," www.newsobserver.com, March 6, 2012, http://www.newsobserver.com/2012/03/06/1909480/chapel-hill-firefighters-put-out.html (accessed April 2, 2012).

[18] Kate Mather, "Fire Investigators Blame Dryer for Blaze in Cornelius Home," www.oregonlive.com, February 27, 2012, http://www.oregonlive.com/forest-grove/index.ssf/2012/02/fire_investigators_blame_dryer.html (accessed April 2, 2012).

[19] 2012 International Residential Code®, Section M1502, International Code Council, Washington, DC 20001, 2012.

[20] International Code Council.

[21] Don Vandervort's Home Tips, "Clothes Dryer Venting (Ductwork) Problems," http://www.hometips.com/repair-fix/dryer-vent.html.

[22] Al's Home Improvement Center.

[23] Colonial Plumbing & Heating.

[24] Builder's Best, "Do I Have to Vent My Dryer to the Outside?" http://buildersbest.com/indoor.htm.

[25] Colonial Plumbing & Heating.

[26] Ibid.

[27] Underwriters Laboratories, "Product Safety Tips: Clothes Dryers."

[28] Association of Home Appliance Manufacturers, "Clothes Dryer Fact Sheet," http://www.aham.org/ht/a/GetDocumentAction/i/859.

[29] *CPSC Safety Alert: Overheated Clothes Dryers Can Cause Fires*, U.S. Consumer Product Safety Commission, http://www.cpsc.gov/cpscpub/pubs/5022.pdf.

[30] USFA, "Focus on Fire Safety: Appliance Fires," http://www.usfa.fema.gov/citizens/focus/appliances.shtm.

[31] Al's Home Improvement Center.

[32] Colonial Plumbing & Heating.

[33] NFIRS has two equipment involved in ignition codes that are applicable to dryers: code 811 (clothes dryer) and 814 (washer/dryer combination in one frame). This analysis is based on equipment that is exclusively clothes dryers, equipment code 811.

[34] 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. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for Incident Type 118), and hence, there was no property damage (damage to the structure itself) from the flames. There could be, however, property damage as a result of smoke, water, and overhaul.