

Home Electrical Fires



**Minnesota Department of Public Safety
State Fire Marshal Division**

July 2020



Executive Summary

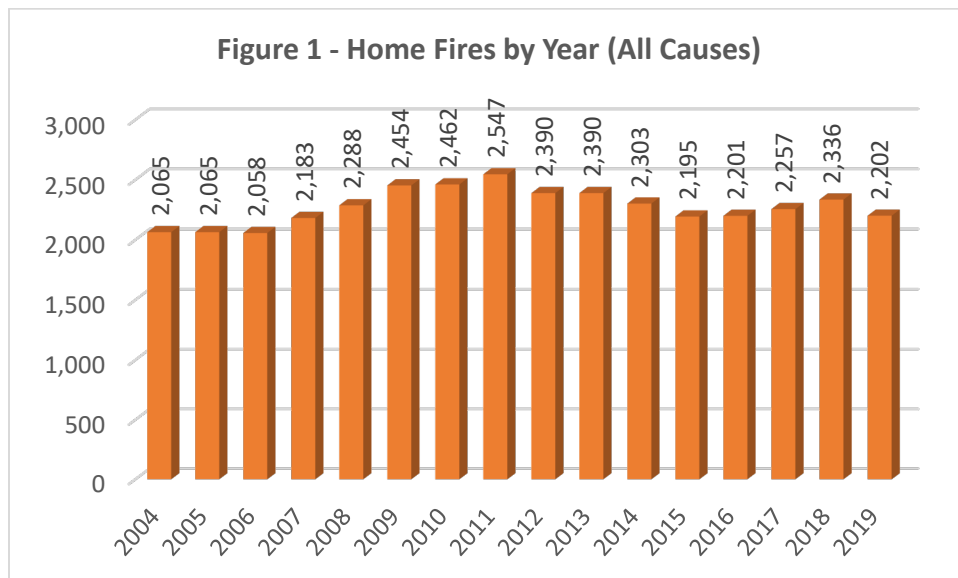
This report examines electrical fires reported by fire departments to the Minnesota State Fire Marshal Division (SFMD) using the Minnesota Fire Incident Reporting System (MFIRS). More than 95 percent of the state's fire departments enter data into MFIRS, the statewide fire reporting system.

This report looks at home electrical fires only. Homes are defined as one- and two-family dwellings and apartment buildings. Electrical fires in commercial buildings and other residential buildings (hotels, dormitories, shelters, and similar types of facilities) are excluded.

The data is from Jan. 1, 2004, through Dec. 31, 2019.

Home Fires

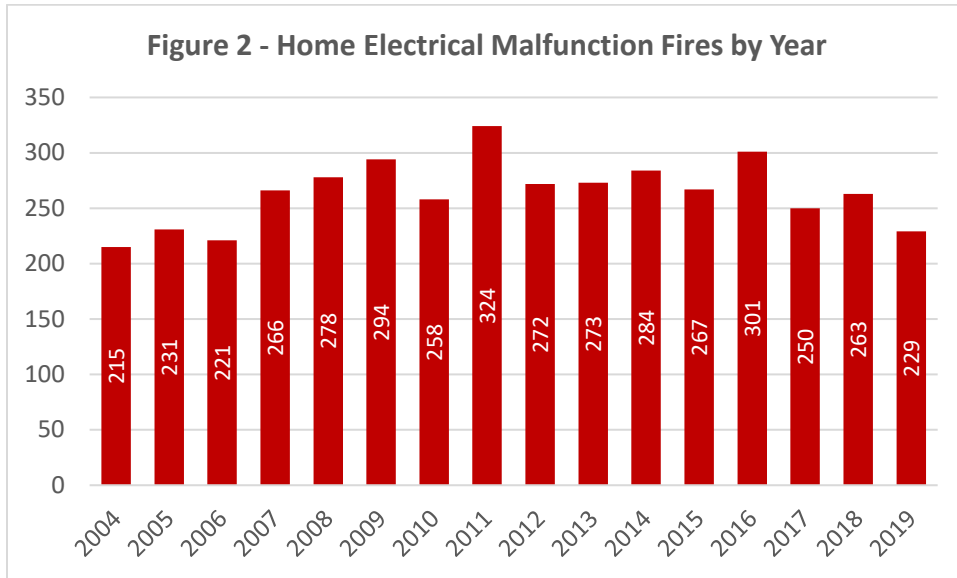
There is an average of 2,275 home fires each year in Minnesota. Fires are defined as incidents where the building or its contents were damaged. This report excludes fires where nothing was damaged and it was determined that there was no loss. Figure 1 shows a breakdown of home fires by year.



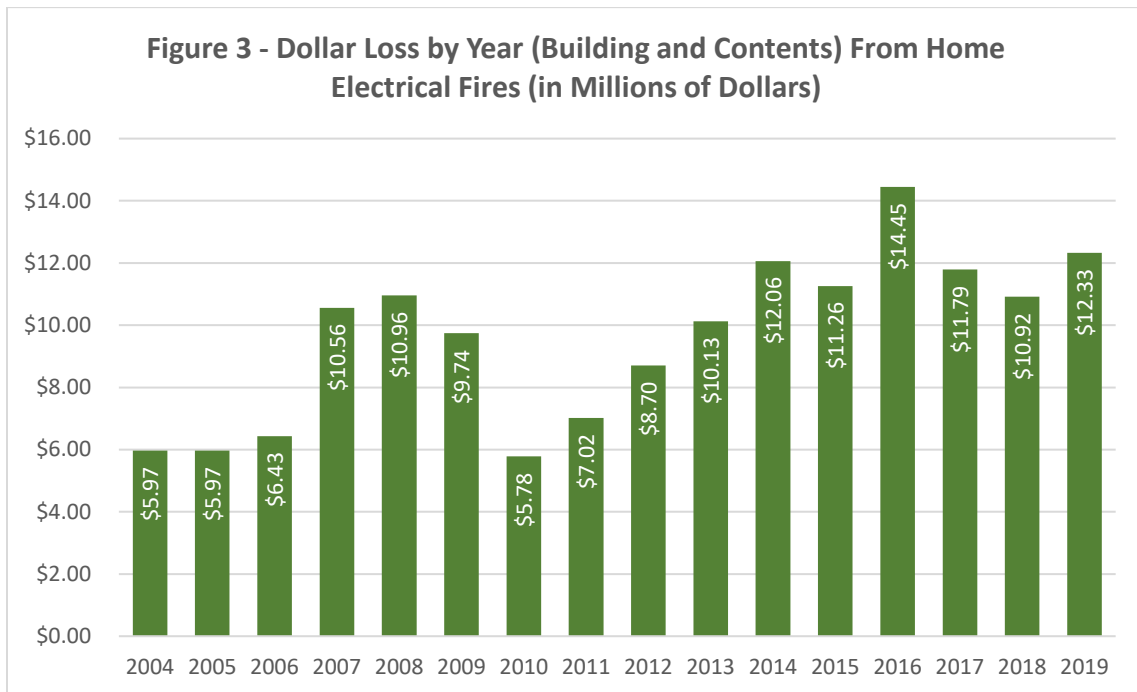
Home Electrical Fires

Minnesota averages about 290 home electrical fires each year. The most common types of home electrical fires are classified in MFIRS as “electrical failures or malfunctions.” These fires typically involve some sort of short circuit, where two electrical conductors contact each other and cause electrical arcing. This arcing can

ignite nearby combustible materials. A breakdown of this type of home electrical fire by year can be found in Figure 2.



Electrical failures or malfunctions account for about 11.5 percent of all home fires and cause an average of over \$9.6 million in damages per year to homes and contents (see Figure 3). It should be noted that fire department estimates of fire loss are often significantly lower than the loss experience of insurance companies.



Electrical Overload Fires

Electrical fires can also happen when equipment (especially cords and wiring) is overloaded. This happens when too many items are plugged in or when devices draw more amperage than the cord or wire is intended to handle. There were 188 fires of this type reported from 2004 through 2019. In 60 of these fires, no equipment or device was identified. The following table shows the equipment or devices involved in electrical overload fires.

Clothes dryer	29
Electrical wiring, other	16
Extension cord	11
Electrical branch circuit	7
Heater, portable	7
Circuit breaker or fuse panel	6
Fan	5
Outlet, receptacle	5
Air conditioner	3
Dehumidifier, portable	3
Electrical distribution, other	3
Power cord, plug; detachable	3
Computer	2
Cord, plug, other	2
Furnace, central heating unit	2
HVAC, other	2
Lamp, lighting, other	2
Washing machine, clothes	2
Battery charger, rectifier	1

Chimney: metal, stovepipe, flue	1
Deep fryer	1
Electronic equipment, other	1
Fireplace, chimney, other	1
Fireplace, insert/stove	1
Generator	1
Heat lamp	1
Heat tape	1
Hot tub, whirlpool, spa	1
Lawn mower	1
Other equipment	1
Portable heat-producing appliance, other	1
Range, stove with/without oven or cooking surface	1
Stove, heating	1
Surge protector	1
Transformer, distribution-type	1
Video game, electronic	1

Electrical Fires Due to Improper Installation

Improper installation can also cause electrical fires. These fires are fairly rare when compared to electrical malfunctions. There were 136 such fires from 2004 through 2019. In 44 of these fires, improperly installed equipment or devices were identified. The following table shows the equipment or devices involved in the improper installation leading to fires.

Note: Because heating-related equipment (chimneys, fireplaces, etc.) was listed for several of these fires, it is assumed they were not electrical fires but rather some type of heating-related issue.

Chimney: metal, stovepipe, flue	7
Furnace, built-in	5
Clothes dryer	4
Stove, heating	4
Heater, portable	2
HVAC, other	2
Water heater	2
Chimney or vent connector	1
Chimney: brick, stone, masonry	1
Electric meter, meter box	1
Electrical branch circuit	1
Electrical wiring from meter box to circuit breaker	1
Fan	1

Fireplace, chimney, other	1
Fireplace, masonry	1
Furnace, central heating unit	1
Grill, hibachi, barbecue	1
Halogen lighting fixture or lamp	1
Heat lamp	1
Incandescent lighting fixture	1
Outlet, receptacle	1
Overcurrent, disconnect equipment	1
Personal or household equipment, other	1
Refrigerator, refrigerator/freezer	1
Washer/dryer combination (within one frame)	1

Electrical Fire Cause Breakdown

The number of fires caused by electrical failures or malfunctions far exceeds electrical fires caused by overloading or improper installation.

Cause of Ignition	Fires	Percent
Electrical failure or malfunction	4,294	93
Overloaded electrical	188	4
Improper installation	136	3
TOTAL	4,618	100

The following table breaks down the types of electrical failure fires caused by arcing for each year (2004-2019).

Factor	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Arc from faulty contact, broken conductor	8	13	12	15	16	4	8	13	7	9	5	6	12	4	7	8
Arc, spark from operating equipment	3	10	6	5	12	12	8	17	12	12	8	14	17	11	6	9
Short-circuit arc from defective, worn insulation	24	35	25	37	31	22	20	17	10	19	17	8	9	12	13	14
Short-circuit arc from mechanical damage	5	6	6	12	10	11	8	6	4	3	5	5	4	3	7	5
Unspecified short-circuit arc	56	57	40	48	66	65	46	48	35	31	30	22	23	19	24	53
Water-caused short-circuit arc	5	0	3	3	6	10	7	3	3	3	0	4	3	1	2	4

This table compares the average number of electrical failure fires caused by arcing in two five-year periods.

Factor	Total	Average '04-'08	Average '15-'19	% Increase / Decrease
Arc from faulty contact, broken conductor	149	12.8	7.4	-42.2
Arc, spark from operating equipment	164	7.2	11.4	58.3
Short-circuit arc from defective, worn insulation	317	30.4	11.2	-63.2
Short-circuit arc from mechanical damage	101	7.8	4.8	-38.5
Unspecified short-circuit arc	679	53.4	28.2	-47.2
Water-caused short-circuit arc	61	4.3	2.8	-34.1

As the table shows, the only category of electrical failure fires due to arcing that increased was the category involving operating equipment. These fires typically happen when someone plugs in or unplugs a device. They represent about 11 percent of the identified electrical arcing or short circuit causes from 2015 through 2019.

Home Fires and Fatalities

From 2004 through 2019, 732 people died in fires in Minnesota. The majority of these deaths (522) were in homes:

Type of home	Number of deaths
One- or two-family dwelling	421
Multifamily dwelling	97
Boarding/rooming house	2
Residential day care, family / group day care	2

Twenty-two of these fires were determined to be electrical, all of which were in one- or two-family dwellings.

Summary

Electrical fires represent about 13 percent of the home fires in Minnesota from 2004 through 2019. Electrical malfunction fires are the most common type of home electrical fires.

Arcing and short circuits were the leading causes of home electrical fires. However, there was a reduction in most categories of arcing and short-circuit–caused home fires between 2004 and 2019.