2023 Ontario Electrical Safety Report

V



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A Message from the Electrical Safety Authority's Public Safety Officer

I am pleased to present the 2023 Ontario Electrical Safety Report (OESR), which includes comprehensive electrical safety data and analysis. This annual report serves as a critical component of our mission to ensure the safety and well-being of all Ontarians by identifying risks and guiding our efforts to mitigate electrical hazards across the province.

This year's report shows a continued decline in electrical-related fatalities and incidents, highlighting ESA's commitment to addressing high-risk areas and managing electrical safety effectively. Despite this progress, the report details several tragic incidents resulting in injuries and fatalities, reminding us that our work is far from complete. By analyzing these events, we aim to prevent future occurrences and create an Ontario where people can live, work, and play free from electrical harm.

The insights gained from the OESR further ESA's strategic goal of reducing electrical fatalities and critical injuries between 2020 and 2025. This includes mitigating risks in electrical occupations, non-occupational electrical interactions, powerline contacts, uncertified product use, and aging infrastructure.

Our findings also emphasize the need for continued public education and awareness, particularly given Ontario's evolving energy landscape, including electric vehicles, and the increasing impact of severe weather events on our electrical infrastructure.

The development of this report would not have been possible without the valuable contributions of our safety partners, including the Office of the Chief Coroner, the Ontario Ministry of Labour, Immigration, Training and Skills Development, the Office of the Fire Marshal, the Canadian Institute of Health Information, and the Workplace Safety and Insurance Board of Ontario. This collaboration is crucial to our shared goal of enhancing electrical safety.

I would also like to recognize the safety organizations, electrical contractors, utility line crews, first responders, product manufacturers, electrical inspectors, and extended ESA staff, who work every day to help keep Ontarians safe from electrical harm.

Finally, thank you to my colleagues at ESA who have worked diligently to consolidate, analyze, and write this report, helping inform the safety community at large.

I am proud of this report and of our contribution to reducing electrical harm. It is an honor and a privilege to serve the people of Ontario.

Jeter (other

Patience Cathcart Public Safety Officer, Electrical Safety Authority

Electrical-related Fatalities and Incidents Over the Past Ten Years (2014–2023) **147 ELECTRICAL-RELATED FATALITIES 50** Electrocution Fatalities **497** Electrical Fire Fatalities* **Electrocution Fatalities Fire Fatalities and Events** 14% 2014-2018 VS. 2019-2023 2014-2018 VS. 2019-2023 rate rate decrease increase **Utility-related Deaths Electrical Cooking Fires** Most common type of fire **Distribution** Accounted for **50%** of all electrical-related with electricity as the fatalities in the past ten years Fires ignition source Deaths from Occupational Number of Number of Electrical **Powerline Contact Distribution Fires** Deaths **Cooking Fires** 2014-2018 2014-2018 2018 2018 699 434 12 8 2022 2022 523 42: 2019-2023 2019-2023 13 **m**m <u>TTTŤŤŤŤŤŤ</u> 10 decrease decrease **PRIORITY ISSUES** The ESA's focus areas to reduce electrical injuries and fatalities fall in the following harm categories: Non-occupational Occupational settings The five-year rolling average rate 5% 2 Non-occupational settings of fatalities has decreased from 0.20 per million (2014-2018) to decrease **3** Powerline contact 0.19 per million (2019-2023) Product safety **5** Aging infrastructure

*Fire fatalities are those where the ignition source was reported as "electrical distribution equipment" or the fuel of the ignition source was reported as "electricity."

Executive Summary

The Electrical Safety Authority's (ESA's) Ontario Electrical Safety Report (OESR) was created to provide a comprehensive perspective of electrical fatalities, injuries, and incidents in Ontario. Data presented in this report come from multiple sources, investigations, and root-cause analyses. Information is provided on potential electrical risks and high-risk sectors. This report is used by the ESA and others to better understand the dynamics of electrical safety and to encourage the development of initiatives to improve the status of electrical safety in the province.

Since 2017, the five-year average rate of electrocution and burn fatalities, and electrical fire fatalities (where the ignition source was identified to be electrical) has been one per million population. Progress has been made to reduce the number of fatalities and injuries, while the causes and context have shifted slightly over the time period. Concerted efforts remain essential for rates to continue to decrease.

1.2 — 1.0 Average rate of fatalities per million population 0.8 0.6 0.4 0.2 0.0 Five-year 2010-2011-2012-2013-2014-2015-2016-2017-2018-2019period 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 Electrical fire 0.59 0.59 0.63 0.59 0.61 0.64 0.66 0.72 0.84 0.71* fatalities Electrocution 0.40 0.37 0.35 0.32 0.37 0.32* 0.40 0.38 0.42 0.34 and burn fatalities Total electrical-related 1.01 0.99 1.02 1.02 1.00 0.94 0.98 1.03* 1.09 1.18 fatalities

FIVE-YEAR ROLLING AVERAGE OF ALL ELECTRICAL-RELATED FATALITIES IN ONTARIO, 2010–2023

*Preliminary data subject to change Source: ESA, Coroner, and OFM records

Electrical-related Fatalities

In the past ten years, there were 147 electrical fatalities in Ontario. From 2014 to 2023, 50 people have died from electrocution (non-intentional death caused by contact with electricity) or by the effects of electrical burns, and 97 have died as a result of electrical fires (where the ignition fuel was identified as electricity and/or the ignition source was electrical distribution equipment). In comparison, the previous ten-year period from 2013 to 2022 reported 54 deaths from electrocutions and burns, and 103 fire deaths where the ignition source was identified as electrical. The trend rate of electrical-related fatalities continues to decrease.

Electrocutions and Electrical Burn Fatalities

Below are the five-year rolling average rates of electrocutions and electrical burn fatalities, comparing the two most recent five-year periods:

	Five-year period	
2014-2018	 26 electrical-related fatalities Five-year rolling average of 0.37 per million population 	Rate
2019-2023	 24 electrical-related fatalities Five-year rolling average of 0.32 per million population 	decrease of 14%

Utility-related electrocutions have accounted for 50% of all electrical-related fatalities in the past ten years:

	Five-year period	<u> </u>
2014-2018	 31% of all electrical-related fatalities (8/26) were from powerline contact Five-year rolling average of 0.11 per million population 	Rate
2019-2023	 54% of all electrical-related fatalities (13/24) were from powerline contact Five-year rolling average of 0.15 per million population 	of 36%

In the past ten years, the number of non-occupational electrical-related fatalities have been greater than occupational fatalities. Historically, previous ten-year periods have shown that occupational electrical-related fatalities were greater or equal to non-occupational electrical-related fatalities.

Five-year period									
2014-2018	 46% of electrical-related fatalities (12/26) were occupational Five-year rolling average of 0.32 per million labour force 	Rate							
2019-2023	 42% of electrical-related fatalities (10/24) were occupational Five-year rolling average of 0.25 per million labour force 	decrease of 22%							

Electrical tradespeople (electricians and apprentice electricians) accounted for 23% of occupational electricalrelated fatalities between 2014 and 2023 as they were fatally injured on the job when working energized. Between 2018 and 2022, there were 28 non-occupational electrical fatalities.

	Five-year period	
2013-2017	 54% of electrical fatalities (14/26) were non-occupational Five-year rolling average of 0.20 per million population 	Rate
2018-2022	 58% of electrical fatalities (14/24) were non-occupational Five-year rolling average of 0.19 per million population 	decrease of 5%

Fire Fatalities and Events

The rate of electrical fire fatalities (where the ignition fuel was identified as electricity and/or the ignition source was electrical distribution equipment) has increased by 13% when comparing the five-year rolling average in 2014–2018 and 2019–2023. Since the last report, the Ontario Fire Marshal (OFM) have confirmed that a number of electrical fire fatality investigations have closed, thus confirming an increase of electrical fatalities up until 2022.

The number of structure-loss fires where electricity was identified as the fuel of the ignition source has decreased by 7% between 2018 and 2022.

Cooking-related fires continue to be the most common type of fire where electricity was the fuel of the ignition source:

- In 2018, there were 639 cooking equipment fires;
- In 2022, there were 523 cooking equipment fires, a decrease of 18%.

Electrical distribution equipment fires are fires from electrical wiring, devices, or equipment in which its primary function is to carry current from one location to another (e.g., wiring, extension cords, terminations, electrical panels, and appliance cords) with electricity as the fuel of the ignition source. This type of fire has decreased over the most recent five years:

- In 2018, there were 434 electrical distribution equipment fires;
- In 2022, there were 423 electrical distribution equipment fires, a decrease of 3%.

Priority Issues

The ESA uses incident data from the OESR to identify areas that present the greatest risk to Ontarians, to monitor changes in incidence, and to identify emerging risks and trends.

Based on the data collected in the past ten years, the ESA has identified that the majority of electrical injuries and fatalities occur in the following specific areas. These areas have been identified as priorities for reducing electrical fatalities, serious injuries, damage, and loss in Ontario:

- **Occupational powerline contacts** Powerline contact while working accounted for 43% of all occupational electrical fatalities between 2014 and 2023.
- Non-occupational powerline contacts Powerline contact while at home or in recreational settings has increased; between 2014 and 2018, 36% of non-occupational fatalities were due to powerline contact. More recently, between 2019 and 2023, 50% of non-occupational fatalities were due to powerline contact.
- **Electrical trade workers** There was at least one critical injury to an electrical trade worker each year, in the past ten years. Safety incidents tend to be associated with unsafe work practices.
- **Non-occupational electrical injuries** from the most currently available data, these injuries, identified from emergency department visitss in Ontario, have increased 7% from 2014 to 2023; however, the proportion of those with severe injuries has decreased by 13%.

- **Product safety compliance** Misuse of electrical products and unapproved or counterfeit products account for a significant number of safety reports.
- Electrical product fires The ESA defines electrical products as appliances, cooking equipment, lighting equipment, other electrical and mechanical equipment, and processing equipment. Data from the Office of the Fire Marshal (OFM) show that the five-year average for electrical product structure-loss fires (where electricity was identified as the fuel source) between 2013–2017 and 2018–2022 has decreased by 20%.
- Electrical fires where there was property loss, injury and/or fatality An average of 1,414 electrical loss fires (where ignition sources were fuelled by electricity) occurred in the past five years, with an average of eight fatalities per year.

ESA Initiatives

Based on the information collected from the OESR, the ESA's strategic plan (Safely Powering Tomorrow) focuses on addressing those harms that represent the majority of incidents and fatalities. The ESA is working to reduce the electrical fatality and critical injury rate between 2020 and 2025. Harms within the following five categories are being considered for mitigation and prioritization:

- worker safety;
- powerline safety;
- non-occupational electrical interactions;
- electrical product fires; and
- aging infrastructure.

Additional details on the ESA's efforts can be found at <u>www.esasafe.com</u>.

To ensure that the ESA is optimizing its efforts to act as an effective and efficient regulator, the ESA has undertaken a risk-based prioritization of electrical harms for safety, and manages harms from a life cycle perspective. The harm life cycle (HLC) uses data from internal and external sources (including those from this safety report) to manage harm reduction action.

The ESA cannot reach its goal without the significant work and support of its partners and stakeholders within the electrical safety system. We would like to acknowledge:

- those who generate and distribute electricity;
- electrical equipment manufacturers;
- standards organizations;
- safety organizations;
- installers of electrical equipment;
- educators;
- facility owners;
- injury response and treatment providers;
- government;
- researchers;
- injury prevention specialists;
- safety regulators and worker safety advocates; and
- those who are end users of electricity.

Working together, we seek to reduce the number of electrical fatalities, injuries, and fires with the ultimate vision of "An Ontario where people can live, work, and play safe from electrical harm."

1.0

Purpose of This Report

This 23rd report on the state of electrical safety in Ontario summarizes electrical incidents, electricalrelated fatalities identified by the Office of the Chief Coroner, and injuries of an electrical nature. It also provides information on deaths, injuries, and damage caused by fire incidents identified by the Office of the Fire Marshal (OFM), as well as fires and fire fatalities identified by local fire departments where electricity was identified as the ignition fuel and/or electrical distribution equipment was identified as the ignition source.

The purpose of this report is to provide stakeholders within the broad electrical safety system with an update and an overview of electrical safety in Ontario.

Those stakeholders include:

- electrical utilities and those organizations that generate, transmit, and distribute electricity;
- organizations that design, manufacture, distribute, and supply electrical products;
- electrical contractors who install, repair, and maintain electrical wiring installations and products in our homes, workplaces, and public spaces;
- regulators and various levels of government that write policies and regulations to protect public safety;
- Canadian and international organizations which develop standards for electrical installation and products;
- academic and commercial organizations that focus on safety research and development;
- organizations, such as insurance companies, that create policies that drive organization and consumer behaviour to reduce risk;
- health care providers, workplace and community-based safety organizations, and education and training organizations that provide public communication and increase hazard-mitigation skills and awareness;
- consumers who purchase electrical products and use and rely on electricity every day in their homes, workplaces, and public spaces;
- and more.

All of these stakeholders have an important role in contributing to and improving electrical safety in Ontario.

This report intends to educate and inform members of the electrical safety system by identifying key electrical safety risks. This information can be used to develop and improve standards, identify areas for continued safety research, influence the development of workplace and community-based safety programs, and lead to improved training, education, and communication programs.

1.1 | Role of the Electrical Safety Authority



Role of the Electrical Safety Authority

The Electrical Safety Authority (ESA) is an administrative authority acting on behalf of the Government of Ontario with specific responsibilities under Part VIII of the *Electricity Act, 1998*, and the *Safety and Consumer Statutes Administration Act, 1996*. As part of its mandate, the ESA is responsible for administering regulation in five key areas:

- Ontario Electrical Safety Code (Regulation 164/99);
- · Licensing of Electrical Contractors and Master Electricians (Regulation 570/05);
- Distribution Safety (Regulation 22/04);
- Product Safety (Regulation 438/07); and
- Administrative Penalties (Regulation 12/23).

The ESA operates as a private, not-for-profit corporation. Funding derives from fees for electrical oversight, safety services, administering monetary penalties, and licensing of electrical contractors and master electricians. Activities include:

- overseeing compliance with regulations;
- investigating fatalities, injuries, and fire losses associated with electricity;
- identifying and targeting leading causes of electrical risk, using a harm life cycle approach;
- promoting awareness, education, and training on electrical safety;
- administering monetary penalties; and
- engaging with stakeholders to improve safety.



Electrocutions and Electrical Burn Fatalities

Electrocution occurs when a person is exposed to a lethal amount of electrical energy.

It takes very little electrical current to seriously injure or to kill a person. Direct contact with a circuit that can cause less than one amp of electricity (less than the current through a 100-Watt lightbulb) to pass through a human body can cause a person to stop breathing (fibrillation). Direct contact with a live 15-amp circuit, the equivalent to a standard household outlet, can result in death (Canadian Centre for Occupational Health and Safety, 2023).

There were 50 electrical-related fatalities reported in Ontario in the ten-year span between 2014 and 2023, which is four fewer deaths than in the time period between 2013 and 2022.

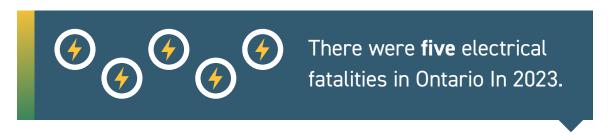
By age group, individuals aged 20 to 39 years accounted for the largest proportion of fatal injuries (48%), followed by individuals 40 to 59 years of age (28%). Many electrical fatalities occurred between the months of June and September (61%), with a peak of fatalities in August (19%).

The five-year rolling average rate of electrical fatalities has decreased by 14% when comparing 2014–2018 (0.37 per million population) and 2019–2023 (0.32 per million population). However, the rate of powerline fatalities has increased: when 2014–2018 (0.11 per million) and 2019–2023 (0.17 per million) were compared, there was a 55% increase in the five-year rolling average rate of powerline electrocutions.

Residential (21%) and commercial (17%) settings were the most common places for electrical-related fatalities between 2019 and 2023.

The five-year rolling average rate of occupational electrical-related fatalities per labour force has decreased 22% when comparing 2014–2018 (0.32 fatalities per million) to 2019–2023 (0.25 fatalities per million). The five-year rolling average rate of non-occupational electrical-related fatalities per million population has decreased by 5% between the same time periods (0.20 fatalities per million to 0.19 fatalities per million).

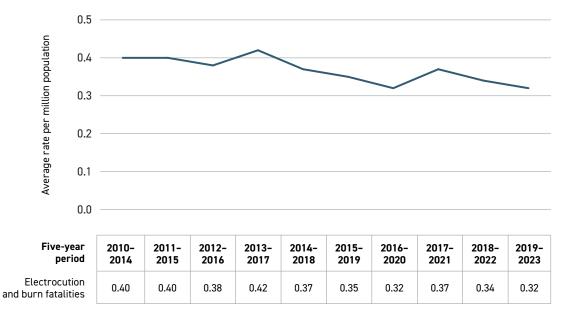
NUMBER OF ELECTRICAL-RELATED FATALITIES IN ONTARIO, 2014–2023



Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Number of electrical fatalities	6	6	3	5	6	5	4	7	3	5

Source: ESA and Coroner records

FIVE-YEAR ROLLING AVERAGE RATE OF ELECTRICAL FATALITIES IN ONTARIO, 2010–2023

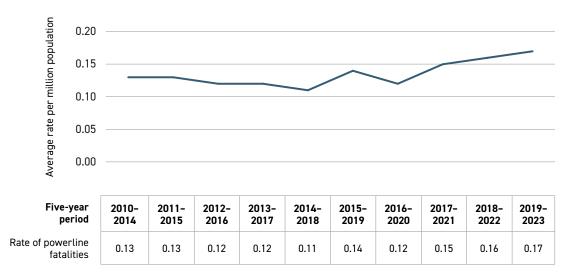


Source: ESA and Coroner records

Conclusion

The rate of electrical-related fatalities has decreased when compared to the previous year of 2022. There has been a 14% decrease when comparing the average rate at 2014–2018 and 2019–2023.

3 FIVE-YEAR ROLLING AVERAGE RATE OF POWERLINE FATALITIES IN ONTARIO, 2010–2023

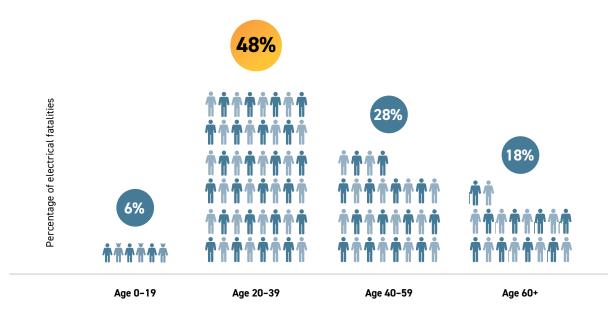


Source: ESA and Coroner records

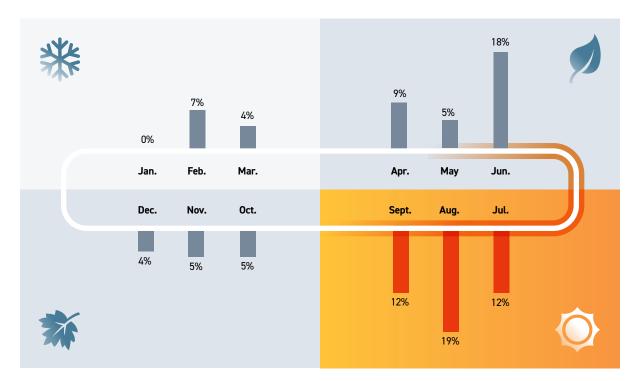
Conclusion

In 2023, there were three powerline fatalities. There has been a 55% increase when comparing the rate at 2014–2018 and 2019–2023.

PERCENTAGE OF ELECTRICAL-RELATED FATALITIES BY AGE GROUP IN ONTARIO, 2014–2023



5 PERCENTAGE OF ELECTRICAL-RELATED FATALITIES BY MONTH IN ONTARIO, 2013–2022



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PERCENTAGE OF ELECTRICAL FATALITIES BY FACILITY TYPE IN ONTARIO, 2014–2018 AND 2019–2023

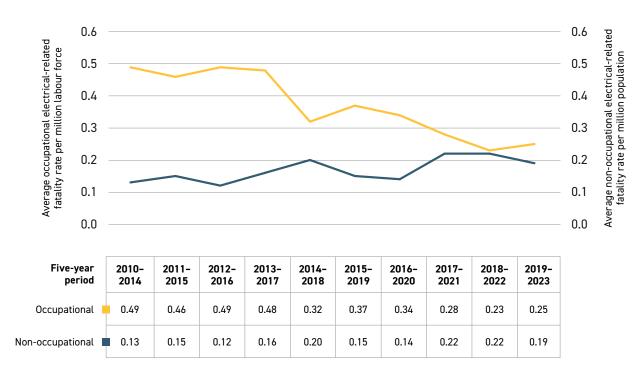
Residential, commercial and **industrial settings** were the most common settings where electrical fatalities occur.

• • •

Time period	Residential	Commercial	Industrial
2014–2018	46%	8%	19%
2019-2023	21%	17%	13%

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FIVE-YEAR ROLLING AVERAGE RATE OF OCCUPATIONAL AND NON-OCCUPATIONAL ELECTRICAL-RELATED FATALITIES IN ONTARIO, 2010–2023



Source: ESA and Coroner records

Conclusion

The five-year rolling average rate of occupational electrical-related fatalities per million labour force has decreased 22% when comparing 2014–2018 to 2019–2023. The five-year rolling average rate of non-occupational electrical-related fatalities per million population has decreased by 5% between the same time periods.

2 3 4 5 6



Occupational Electrical-related Fatalities and Electrical Injuries

Occupational electrical-related fatalities are a particular hazard to those who routinely work near electrical sources. In the United States, contact with or exposure to electricity continues to be one of the leading causes of workplace fatalities and injuries. According to the U.S. Bureau of Labor Statistics, electrical fatality rates per 100,000 workers have remained consistent while overall fatality rates have increased. Construction and extraction occupations, installation, maintenance, and repair occupations, and building and grounds cleaning and maintenance occupations have the highest rate of electrical fatalities (ESFI, 2024).

In Ontario, Kim et al. (2016) studied occupational fatalities among construction workers between 1997 and 2007 and found that electrical contact was responsible for 15% of fatalities; risk factors associated with occupational fatalities included direct contact with electrical sources, lower voltage sources, and working outdoors. The greatest proportion of electrocution deaths occur among electricians and electrical helpers, utility workers, and those working in construction and manufacturing industries. Electrical-related fatalities are more common among workers who are younger than the average age of occupational deaths overall. Contact with overhead powerlines is reportedly by far the most frequent cause of fatal occupational electrocution injury (Campbell, 2022).

For those who survive electrical injury, the immediate consequences are usually obvious and often require extensive medical intervention. But symptoms may not appear until days or years later and they may present as pervasive, and less well-defined consequences. Long-term effects are particularly difficult to diagnose, as the link between the injury and the symptoms can often go unrecognized by patients and their physicians and worsen (Yiannopoulou et al., 2021). Substantial acute and long-term neuropsychological and social outcomes existed among patients after an electrical injury and were similar between patients exposed to low- and high-voltage injuries (Radulovic et al., 2019).

Education and proper protection are essential in preventing electrical injuries at work. A survey of 600 people in 2020 who worked directly with electricity asked questions about their experience with electrical shock hazards. Seventy-eight percent of respondents said they have been shocked while on the job, where 37% were shocked by less than 221 V. This is in contrast with 85% of respondents, who felt they were highly confident in recognizing electrical hazards (Littelfuse, 2020). This highlights the need for ongoing and refresher training for those who work with electricity in an occupational setting.

Between 2014 and 2023, there were 22 occupational electrical-related fatalities in Ontario. In the previous period (2013–2022), there were 27 occupational fatalities. In 2023, three occupational electrical-related fatalities were reported.

2 3 4 1

The five-year rolling average number of fatalities and critical injuries among workers (overall occupational safety) has increased by 31% when comparing between 2014–2018 and 2019–2023; this number is driven by the higher number of injuries being reported in the recent years. The five-year rolling average number of fatalities and critical injuries among electrical trade workers has increased from three to four when comparing these two time periods.

When comparing the five-year rolling average rate, the occupational electrical-related fatalities have decreased from 0.32 per million labour force population in 2014–2018 to 0.25 per million labour force population in 2019–2023. This is a decrease of 22%.

In the 2019–2023 time period, industrial settings (30%) were the most common places for occupational electrical-related fatalities. Repair and maintenance, and landscaping were the most common types of work being done when these fatalities occurred. Between 2014 and 2023, the most commonly cited cause of death was improper procedure (14%) when excluding unknown causes.

Between 2014 and 2023, electrical tradespeople accounted for 23% of all occupational electrical-related fatalities. In the previous ten-year period (2013–2022), electrical tradespeople accounted for 26% of all occupational electrical-related fatalities.

A review of data provided by the WSIB from 2014 to 2023 shows that male workers continue to outnumber female workers with respect to occupational electrical injury. Workers in the construction and services sectors contribute to the highest number of WSIB lost time injury claims. Machine tools, electric parts, and other sources were the most common sources of injury. There is a 16% increase in the total number of electrical injury claims between 2014–2018 and 2019–2023; the number of claims for electrocution has increased by 20% between the time periods.

Statistics Directly Related to the ESA's Harm Reduction Priorities

WORKER SAFETY

Five-year Rolling Average Comparison

Number of worker-related electrical fatalities and critical injuries based on data reported by the Ministry of Labour, incidents investigated by the ESA and confirmed with the Office of the Chief Coroner.

The worker safety five-year rolling average has increased by 31% between 2014–2018 and 2019–2023.

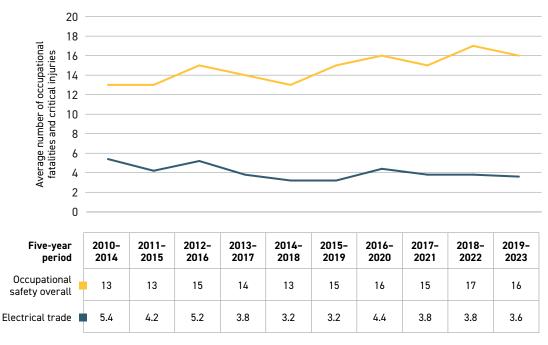
2 3 4 5 6

NUMBER OF OCCUPATIONAL ELECTRICAL FATALITIES IN ONTARIO, 2014–2023

There were three occupational fatalities in Ontario in 2023.								ıl		
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Number of occupational electrical-related fatalities	2	3	3	2	2	4	2	1	0	3

Source: ESA and Coroner records

2 FIVE-YEAR ROLLING AVERAGE OF OCCUPATIONAL ELECTRICAL FATALITIES AND CRITICAL INJURIES IN ONTARIO, 2010–2023



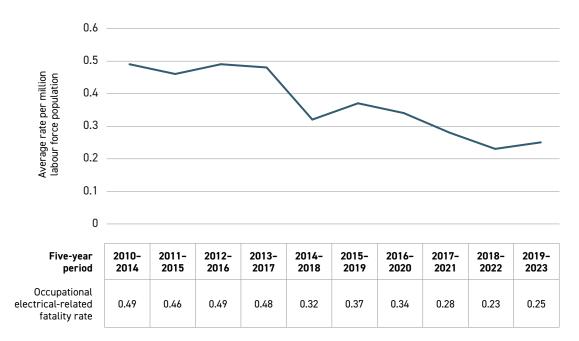
Source: ESA, Coroner, and MOLTSD records

Conclusion

The five-year rolling average number of occupational fatalities and critical injuries has increased among occupational safety overall. Likewise, it has also increased among electrical trade workers when comparing 2014–2018 and 2019–2023.

2 3 4 5 6

FIVE-YEAR ROLLING AVERAGE RATE OF OCCUPATIONAL ELECTRICAL FATALITIES IN ONTARIO, 2010–2023



Source: ESA and Coroner records

Conclusion

3

The rate of occupational electrical-related fatalities has decreased by 22% when comparing 2014–2018 and 2019–2023.

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PERCENTAGE OF OCCUPATIONAL ELECTRICAL FATALITIES BY FACILITY TYPE IN ONTARIO, 2014–2018 AND 2019–2023

	· ·		
Facility Type	2014-2018		2019-2023
Commercial		17%	10%
Farm		8%	10%
Industrial		33%	30%
Mining	•••••	8%	0%
Public place	•••••	8%	0%
Residential		17%	10%
Unknown		0%	30%
Utility		8%	10%

Percentage of occupational electrical-related fatalities



Industrial setting is the most common facility type for occupational electrical fatalities.

PERCENTAGE OF OCCUPATIONAL ELECTRICAL FATALITIES BY TYPE OF WORK IN ONTARIO, 2014–2018 AND 2019–2023



From 2014–2023, **repair/maintenance activities** were the most common types of work for occupational electrical fatalities.

	Work type	Construction	Excavation	Inspection	Installation	Landscaping	Other	Repair/ maintenance	Unknown
Percentage of occupational electrical-related fatalities	2014-2018	8%	8%	8%	0%	0%	0%	67%	8%
	2019-2023 🔳	10%	10%	0%	10%	20%	10%	20%	20%

Source: ESA and Coroner records



Within the more recent five-year period (2019-2023), fatalities while **landscaping** have been on the rise.

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2 3 4 5 6

PERCENTAGE OF OCCUPATIONAL ELECTRICAL FATALITIES BY PROBABLE CAUSE IN ONTARIO, 2014–2023

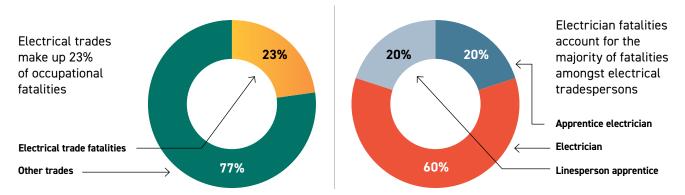


Probable cause	Defective equipment	Human error	Improper installation	Improper procedure	Lack of training	Unknown
Percentage of occupational electrical- related fatalities	9%	9%	5%	14%	5%	59%

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2 3 4 5 6

NUMBER OF OCCUPATIONAL ELECTRICAL FATALITIES BY OCCUPATION IN ONTARIO, 2014–2023



Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Apprentice electrician	0	0	0	0	0	1	0	0	0	0
Electrician	0	0	1	0	0	0	0	1	0	1
Power linesperson	0	0	0	0	0	0	0	0	0	0
Linesperson apprentice	0	0	0	0	0	0	1	0	0	0
Total electrical	0	0	1	0	0	1	1	1	0	1
Other trades	2	3	2	2	2	3	1	0	0	2
All occupational fatalities	2	3	3	2	2	4	2	1	0	3

2 3 4 5 6

NUMBER OF ALLOWED WSIB LOST TIME ELECTRICAL INJURY CLAIMS BY SEX IN ONTARIO, 2014–2023

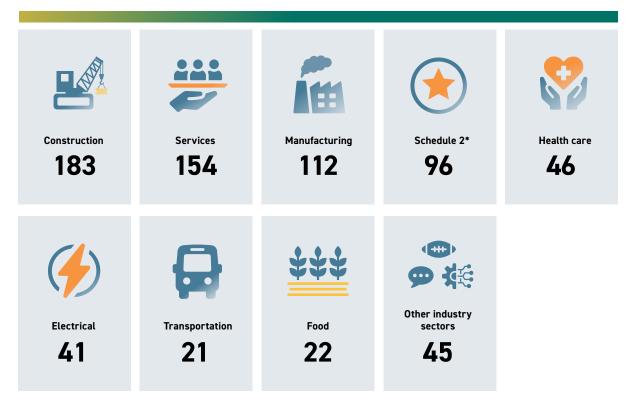


Between 2014-2023, the number of WSIB claims related to electrical injury among **males** was almost **three times greater** than that among females.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Male	47	49	43	46	52	64	44	56	61	70
Female	14	17	21	24	13	22	16	11	21	22

Source: Workplace Safety and Insurance Board

NUMBER OF ALLOWED WSIB LOST TIME ELECTRICAL INJURY CLAIMS BY SECTOR IN ONTARIO, 2014–2023



* Schedule 2 workers are those that work in firms funded by public funds (federal, provincial, and/or municipal governments), firms legislated by the province but self-funded, or firms that are privately owned but involved in federally regulated industries such as telephone, airline, shipping, and railway.

Source: Workplace Safety and Insurance Board

2 3 4 5 6

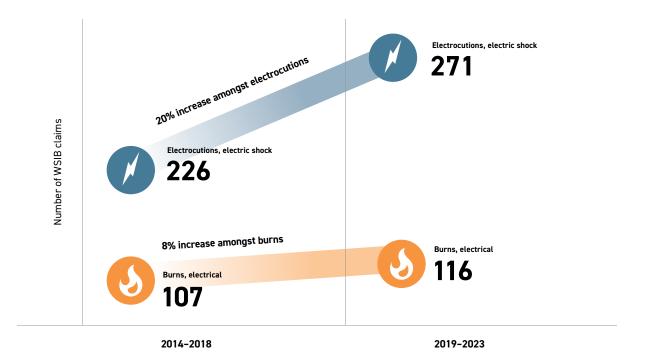
10 NUMBER OF ALLOWED WSIB LOST TIME ELECTRICAL INJURY CLAIMS BY THE TOP TEN SOURCES IN ONTARIO, 2014–2023

Source	Number of WSIB lost time claims								
		000000000000000000							
Machine tools and electric parts	397	00000000000000000							
		0000000000							
Heating, cooling and cleaning machinery	79	00000000							
Metal woodworking and plastic, rubber concrete and other processing	24	00(
Miscellaneous machinery (e.g., audio, video, televisions, telephones, snowblowers)	27	000							
Hand tools, powered	25	00(
Other tools, instruments, equipment, unspecified not elsewhere classified	24	00(
Fire flame, smoke	15	0 (
Special process machinery (e.g., food slicers, paper printing, wrapping, sewing, pumps)	17	00							
Furniture and fixtures	15	0(
Office and business machines	18	•							
Other sources	79	0000000							

Source: Workplace Safety and Insurance Board

11

NUMBER OF ALLOWED WSIB LOST TIME ELECTRICAL INJURY CLAIMS BY NATURE OF INJURY IN ONTARIO, 2014–2018 AND 2019–2023



Note: Electrocutions and electric shock, as provided by the WSIB, only include injuries. Source: Workplace Safety and Insurance Board



Non-occupational Electrical-related Fatalities and Injuries

Injuries are a leading cause of death for the young and contribute substantially to the burden on the health care system. Many injuries are predictable and preventable.

In 2023, there were two non-occupational electrical-related fatalities. In the previous year, there were three non-occupational electrical-related fatalities. The five-year rolling average rate between 2014–2018 and 2019–2023 has decreased by 5% from 0.20 per million population to 0.19 per million population.

In the past ten years, the residential setting was the most common place for non-occupational electrical-related fatalities. Human error and improper use/misuse were the most common activities associated with fatalities.



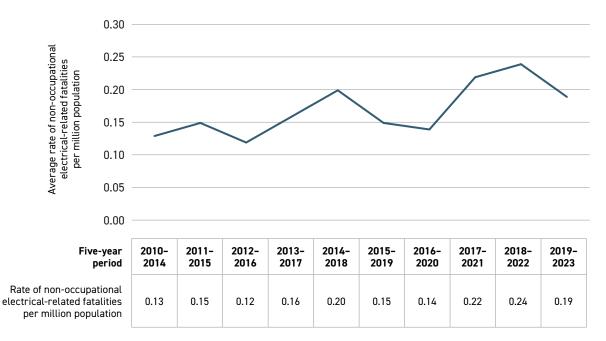
NUMBER OF NON-OCCUPATIONAL ELECTRICAL FATALITIES IN ONTARIO, 2014-2023



There were **two** non-occupational fatalities in Ontario in 2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Number of non-occupational electrical-related fatalities	4	3	0	3	4	1	2	6	3	2

FIVE-YEAR ROLLING AVERAGE RATE OF NON-OCCUPATIONAL ELECTRICAL FATALITIES IN ONTARIO, 2010–2023



Source: ESA and Coroner records

Conclusion

The five-year rolling average rate of non-occupational electrical-related fatalities has decreased by 5% when comparing 2014–2018 and 2019–2023.

2 3 4 5 6

12

PERCENTAGE OF NON-OCCUPATIONAL ELECTRICAL FATALITIES BY SETTING IN ONTARIO, 2014–2023

In both 2014–2018 and 2019–2023, the **residential setting** is the most common place for non-occupational electrical-related fatalities.

Percentage of non-occupational electrical-related fatalities

3

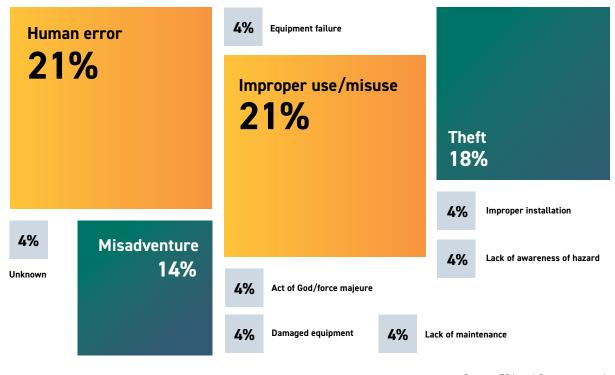
2014-2018

Facility type

Campground	Commercial	Industrial	Public place	Public right of way	Residential	Unknown	Utility
0%	0%	7%	0%	71%	71%	0%	21%
7%	21%	0%	7%	14%	29%	14%	7%

Source: ESA and Coroner records

PERCENTAGE OF NON-OCCUPATIONAL ELECTRICAL FATALITIES BY POTENTIAL CAUSE IN ONTARIO, 2014–2023



3 4 5 0



Electrical Injury and Emergency Department Visits in Ontario, 2014–2023

Electrical injuries can occur as a result of lightning, or low-voltage or high-voltage contact, and are often associated with high morbidity and mortality. Almost all electrical injuries are accidental and preventable (Zemaitis et al., 2023).

Exposure to electricity can result in four main types of injuries: flash, flame, lightning, and true injuries. Flash injuries are caused by an arc flash and are typically associated with superficial burns. Flame injuries occur when an arc flash ignites an individual's clothing, and electrical current may or may not pass the skin. Lightning injuries are associated with an electrical current flowing through the individual's entire body. True electrical injuries involve an individual becoming part of an electrical circuit, where an entrance and exit site can be found (Zemaitis et al, 2023).

Small or minor burns may be managed in an emergency department, but patients with severe burns may be transferred to regional burn centres for additional management (Koyfman and Long, 2020).

In the United States, approximately 10,000 patients present in emergency departments with electrical burns or electric shock per year. An estimated 4% of burn centre admissions are due to electrical burns. Most electrical injuries are due to household or occupational exposures. Young children are affected most by household current, adolescent males by high-risk behaviour, and adult males by occupational exposure (Gentges and Schleche, 2018).

From 2014 to 2023, 9,672 visits to Ontario hospitals' emergency departments (ED) were due to electrical injury. The total number of ED visits for electrical injury has increased by 7% when comparing 2014 and 2023. The trend of males outnumbering females in electrical injuries is also observed in ED visits with 71% of ED visits from males. The age group with the largest number of ED visits was 25-30 years for males and for females.

Using the Canadian Triage and Acuity Scale (CTAS), the severity of electrical injury was assessed upon each ED visit. Between 2014 and 2023, 88% of ED visits were classified as the most severe — that is, requiring resuscitation, conditions that are a potential threat to life, limb, or function requiring medical intervention or delegated acts, or conditions that could potentially progress to a serious problem requiring emergency intervention (Canadian Triage and Acuity Scale between 1 and 3).

In 66% of all ED visits, the principal diagnosis was identified as electrical current, while burns were the principal diagnosis in 17% of cases.

When excluding unspecified place of occurrence, the most common locations for electrical injury were the home, followed by trade and service areas, and industrial and construction locations.

Statistics Directly Related to the ESA's Harm Reduction Priorities

NON-OCCUPATIONAL ELECTRICAL SAFETY

Five-year Rolling Average Comparison

Number of emergency department visits due to critical electrical injuries (Canadian Triage and Acuity Scale levels 1-3) reported to the Canadian Institute of Health Information.

The number of emergency department visits that were classified as critical visits has increased by 1% in the five-year rolling average between 2014–2018 and 2019–2023.



NUMBER OF EMERGENCY DEPARTMENT (ED) VISITS FOR ELECTRICAL INJURY BY SEX IN ONTARIO, 2014–2023



In the past ten years, on average, there are **967 ED** visits per year related to electrical injury. The number of visits from **males** is more than **twice** the number of visits from females.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	325	265	305	304	279	295	196	276	280	321
Male	680	673	716	690	722	644	509	720	719	753
Total	1,005	938	1,021	994	1,001	939	705	996	999	1,074

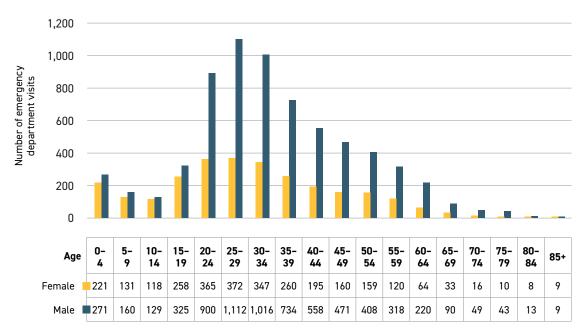
Source: ED All Visit Main Table (CIHI), IntelliHEALTH, Ministry of Health and Long-Term Care (MOHLTC)

3 4 5 0

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2

NUMBER OF EMERGENCY DEPARTMENT (ED) VISITS FOR ELECTRICAL INJURY BY AGE AND SEX IN ONTARIO, 2014–2023



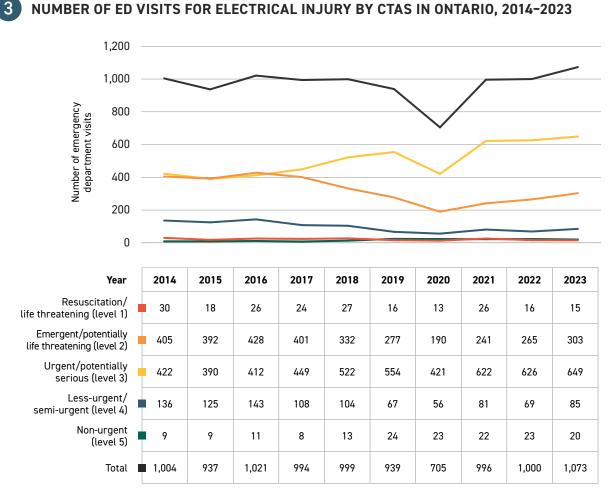
Source: ED All Visit Main Table (CIHI), IntelliHEALTH, MOHLTC

Conclusion

The number of males seen at the ED for electrical injury is greater than the number of females in all age groups in the past ten years. The age group with the largest number of ED visits was 25–30 years for males and 20–24 for females.

3 4 5 0

2



Source: ED All Visit Main Table (CIHI), IntelliHEALTH, MOHLTC

Conclusion

Eighty-eight percent of ED visits for electrical injury were classified on the Canadian Triage and Acuity Scale (CTAS) at levels 1–3 (Resuscitation, Emergent, Urgent) between 2014 and 2023.

2 3 4 5 6

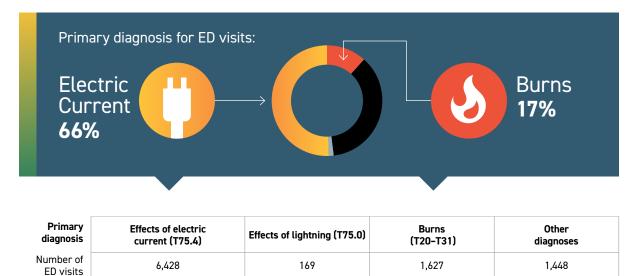
LOCATION OF BURNS ASSOCIATED WITH ELECTRICAL INJURY IN ONTARIO, 2014–2023

The majority of burns associated with electrical injury were found on the **wrist** and hand.

Location of burns	Head and neck	Trunk	Shoulder and upper limb, except wrist and hand	Wrist and hand	Hip and lower limb, except ankle and foot	Ankle and foot	Eye and adnexa	Respiratory tract	Other internal organs	Multiple body regions	Unspecified body areas	Unknown
Total	158	83	162	1,328	61	48	31	1	16	68	13	996

Source: ED All Visit Main Table (CIHI), IntelliHEALTH, MOHLTC

PRIMARY DIAGNOSIS OF EMERGENCY DEPARTMENT (ED) VISITS FOR ELECTRICAL INJURY IN ONTARIO, 2014–2023



Source: ED All Visit Main Table (CIHI), IntelliHEALTH, MOHLTC

3 4 5 6

2

6 PLACES WHERE ELECTRICAL INJURY OCCURRED IN ONTARIO, 2014–2023



The most commonly reported places of injury were the **home, trade and service areas, and industrial and construction areas**.

Place	Farm	Home	Industrial and construction area	Residential institution	School, other institution, and public area	Sports and athletics area	Street and highway	Trade and service area	Other specified place of occurrence	Unspecified place of occurrence
	56	1,890	909	85	337	24	48	970	726	4,582

Source: ED All Visit Main Table (CIHI), IntelliHEALTH, MOHLTC

3.0

Utility-related Equipment

Utility-related equipment includes electrical equipment and devices used by Local Distribution Companies (LDCs), privately owned companies, or property owners that distribute electricity to customers' facilities or buildings. Examples of such equipment include overhead and underground powerlines (including most equipment on utility poles), substations, electrical chambers (vaults), high-voltage switchgear, and transformers. Utility-related equipment carries dangerous amounts of energy or power, and if barriers are breached, can be fatal. Overhead and underground equipment barriers are typically clearances above and below the ground, while substation barriers typically include fences and walls. Each barrier is designed to prevent public access and exposure to electric shock hazards.

From 2014 to 2023, there were 25 electrical-related fatalities associated with utility-related equipment, which accounted for 50% of the total electrical fatalities in Ontario. This number is similar when compared to the previous ten-year period of 2013–2022 at 48%.

Contact specifically with powerlines accounted for 21 of the electrical-related fatalities in the most recent ten-year period, which contributed to 84% of utility-related equipment fatalities. The five-year rolling average rate for powerline electrocutions has increased by 55% when comparing 2014–2018 and 2019–2023.

The five-year average number of utility-related electrical fatalities has increased by 50% when comparing 2014–2018 and 2019–2023. Overhead powerline contact remains the leading cause of utility-related electrical incidents every year. In 2023, there were fewer than five reported incidents related to overhead powerlines among LDC workers (as a subset of the utility sector).

Under-reporting, inconsistent reporting and missing information is especially prevalent with utility contact incidents, and this information should be interpreted with caution. Reported injuries because of utility-related equipment have decreased over the past ten years, although property damage has been increasingly reported in the most recent five years.

Statistics Directly Related to the ESA's Harm Reduction Priorities

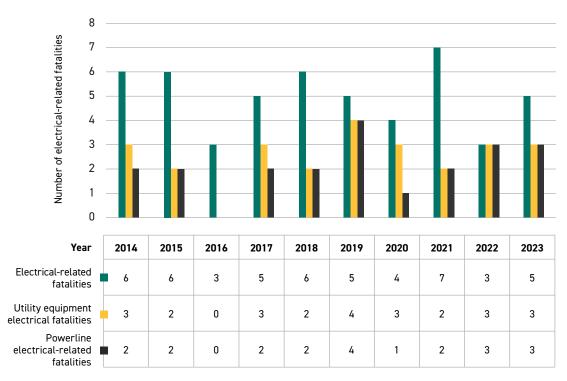
POWERLINE CONTACT

Five-year Rolling Average Comparison

The statistics below represent the number of worker and non-worker powerline-related contact incidents based on data reported to the ESA.

The powerline safety five-year rolling average has increased by 17% between 2014–2018 and 2019–2023.

NUMBER OF ELECTRICAL-RELATED FATALITIES FROM UTILITY EQUIPMENT IN ONTARIO BETWEEN 2014-2023

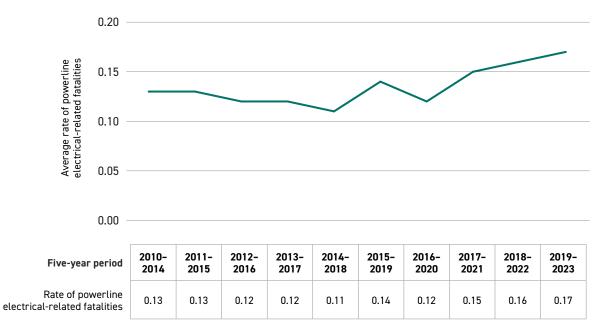


Source: ESA and Coroner records

Conclusion

The number of utility-related equipment fatalities has been within a range of zero to four fatalities reported per year. In 2023, there were three utility equipment fatalities reported, all of which were from powerline contact.

FIVE-YEAR ROLLING AVERAGE OF POWERLINE ELECTRICAL-RELATED FATALITIES IN ONTARIO, 2010–2023

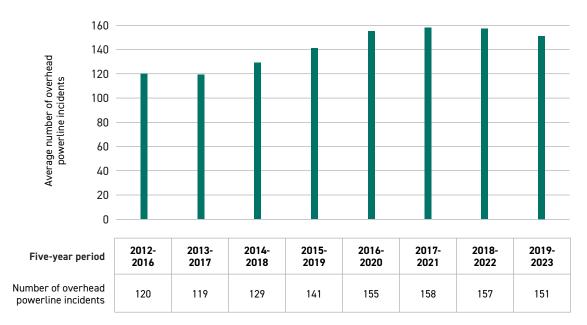


Source: ESA and Coroner records

Conclusion

The rate of powerline electrical-related fatalities has increased when comparing 2014–2018 and 2019–2023.

3 FIVE-YEAR ROLLING AVERAGE NUMBER OF OVERHEAD POWERLINE INCIDENTS IN ONTARIO, 2014–2023

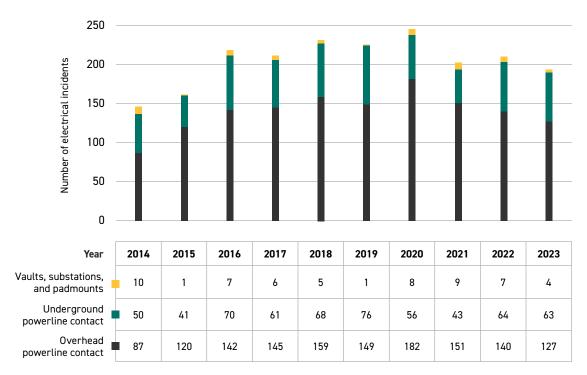


Source: ESA records

Conclusion

The five-year rolling average number of overhead powerline incidents has increased by 17% when comparing 2014–2018 and 2019–2023.

NUMBER OF UTILITY-RELATED ELECTRICAL INCIDENTS BY CONTACT TYPE IN ONTARIO, 2014–2023

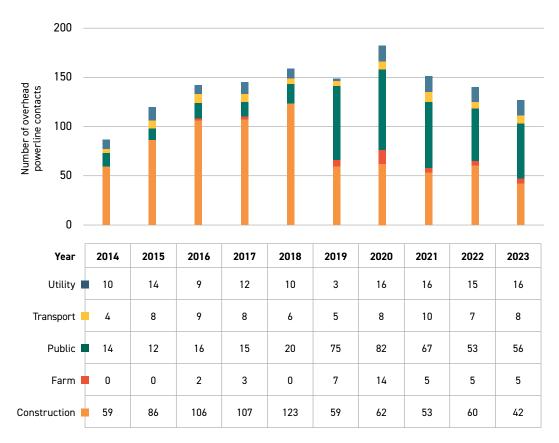


Source: ESA records

Conclusion

Overhead powerline contact remains the leading cause in utility-related electrical incidents between 2014 and 2023.

5 NUMBER OF OVERHEAD POWERLINE CONTACTS BY SECTOR IN ONTARIO, 2014–2023



Source: ESA records

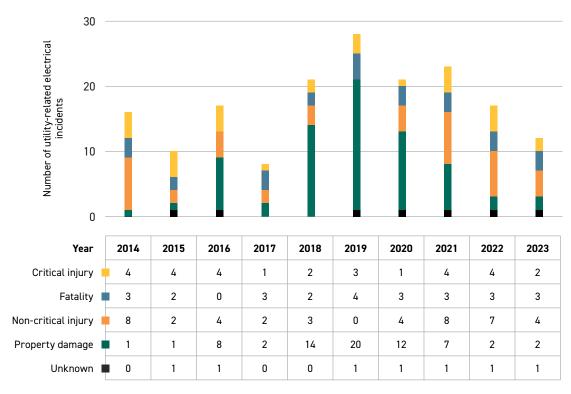
Conclusion

Historically, construction has been the leading sector in overhead powerline contacts; however, in the past five years, incidents reported in public settings have increased.

In 2023, there have been fewer than five reported incidents involving LDC workers and overhead powerline contact.



NUMBER OF UTILITY-RELATED ELECTRICAL INCIDENTS BY OUTCOME IN ONTARIO, 2014–2023



Source: ESA records

Conclusion

The number of critical injuries and the number of fatalities reported from utility-related incidents have remained under four, between 2014 and 2023.

Please note that outcome information for utility incidents contains missing information and/or underreporting.



Overview of Fires in Ontario

Fire remains a significant threat to life and property in urban and rural areas. Structural fires, especially residential fires, remain a critical concern. The high number of electrical incidents and the associated dollar loss, as well as the number of "deliberate" fires and their associated dollar loss, are the two other areas of major concern (Asgary et al., 2010).

Ontario reported 35,132 structure-loss fires (fires resulting in an injury, fatality, or dollars lost) between 2018 and 2022. Residential-loss fires (25,948) account for 74% of structure-loss fires in the same period. Stove-top fires (with electricity fuel only) account for 6% of structure-loss fires and 8% of residential-loss fires. Since 2018, there has been a 5% increase in total-loss fires, a 7% increase in structure-loss fires, and a 5% increase in residential-loss fires.

For the period between 2013 and 2022, the OFM identified the following as the most common ignition sources for structure-loss fires:

- cooking (17%);
- electrical distribution equipment wiring (9%);
- heating and cooling equipment (8%);
- miscellaneous (includes fires natural causes and chemical reactions) (8%);
- cigarettes (7%);
- other electrical, mechanical (5%); and
- appliances (4%).

When comparing 2013–2017 and 2018–2022, the average number of structure-loss fires per year by ignition source decreased 15% for cooking, 5% for electrical wiring, 9% for heating/cooling equipment, and 7% for appliances.

Between 2018 and 2022, among structures that follow the Ontario Building Code (OBC), when structureloss fires were limited to those where electricity was identified as the fuel of the ignition source (but not necessarily the primary fuel energy source), the most common electrical-related products involved were:

- cooking equipment (38%);
- electrical distribution equipment (28%); and
- appliances (11%).

Electrical Products

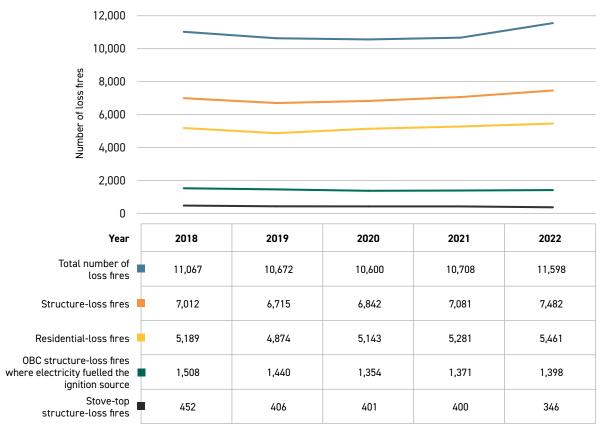
The ESA defines electrical products as appliances, cooking equipment, lighting equipment, other electrical and mechanical equipment, and processing equipment. Data from the OFM shows that the five-year average for electrical product fires (where electricity was identified as the fuel of the ignition source) between 2013–2017 and 2018–2022 has decreased by 20%.

PRODUCT SAFETY

Number of electrical product-related fires: a product fire is defined as one involving appliances, cooking equipment, lighting equipment, and other electrical, mechanical, or processing equipment as classified by the Office of the Fire Marshal.

The five-year rolling average of product safety fires has decreased by 20% between 2013–2017 and 2018–2022.





Source: OFM records

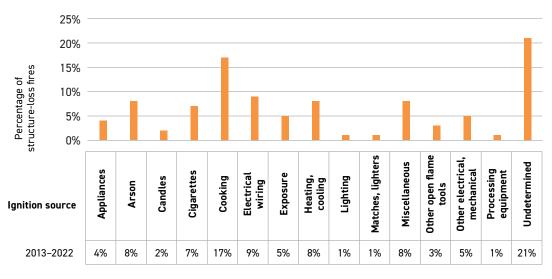
А

Conclusion

The number of total-loss, structure-loss and residential-loss fires have increased between 2018 and 2022. The number of OBC structure-loss fires where electricity fuelled the ignition source has decreased by 7% when comparing 2018 and 2022.



PERCENTAGE OF STRUCTURE-LOSS FIRES BY IGNITION SOURCE IN ONTARIO, 2013-2022



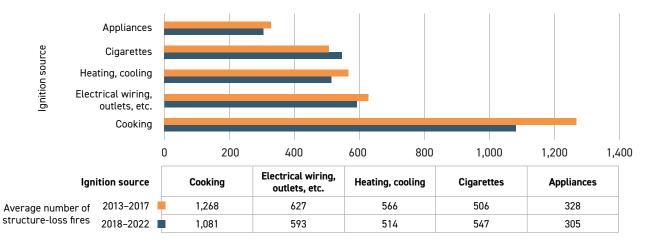
Source: OFM records

Conclusion

When excluding undetermined and miscellaneous sources, cooking (17%) and electrical wiring (9%) were the most common ignition sources for structure-loss fires between 2013 and 2022.



FIVE-YEAR AVERAGE NUMBER OF STRUCTURE-LOSS FIRES BY IGNITION SOURCE IN ONTARIO, 2013–2017 AND 2018–2022



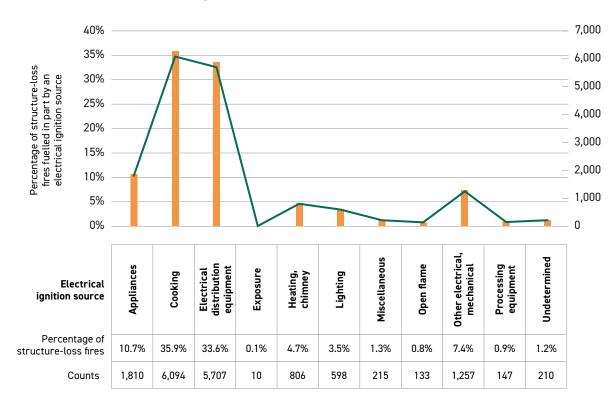
Source: OFM records

Conclusion

Cooking equipment remained the most common ignition source in 2013–2017 and 2018–2022, although the average number of structure-loss fires among cooking equipment, heating/cooling, electrical wiring, and appliances has decreased in the most recent period.

Please note that this chart excludes fires that were intentionally set.

PERCENTAGE OF STRUCTURE-LOSS FIRES FUELLED IN PART BY AN ELECTRICAL IGNITION SOURCE IN ONTARIO, 2013–2022 (OBC STRUCTURES ONLY)

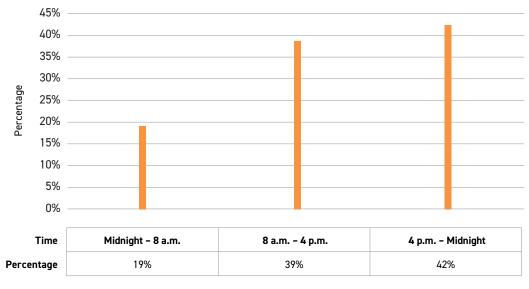


Source: OFM records

Conclusion

When the fire is from ignition sources that use electricity, cooking equipment (36%), electrical distribution equipment (34%), and appliances (11%) were the most common ignition sources between 2018 and 2022.

PERCENTAGE OF ELECTRICAL STRUCTURE-LOSS FIRES IN ONTARIO BY TIME OF DAY, 2013-2022 (OBC STRUCTURES ONLY)

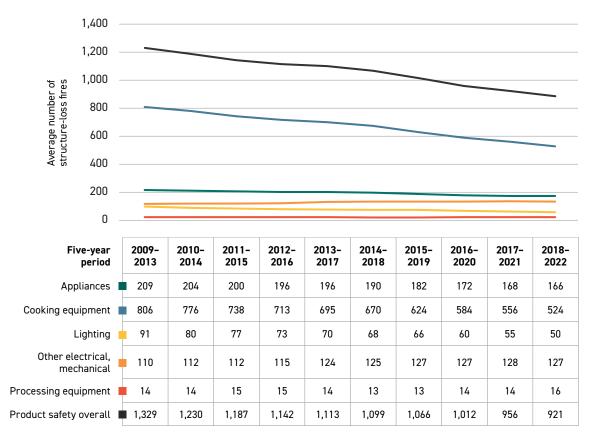


Source: OFM records

Conclusion

Between 2013 and 2022, most of the electrical-related structure-loss fires occurred in the period from 4 p.m. to midnight.

FIVE-YEAR ROLLING AVERAGE NUMBER OF ELECTRICAL STRUCTURE-LOSS FIRES BY PRODUCTS IN ONTARIO, 2008–2021 (OBC STRUCTURES ONLY)



Source: OFM records

Conclusion

Between 2013–2017 and 2018–2022, the five-year rolling average number of fires related to product safety has decreased by 20%.

⁶



Fires Resulting in Fatalities

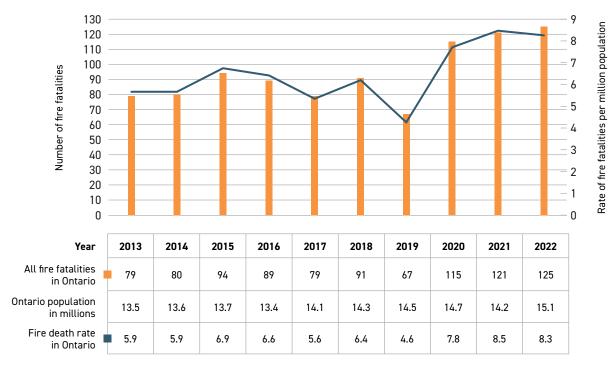
Beaulieu et al. (2020) studied the geographic and demographic distribution of residential fires and related casualties in Canadian provinces. Between 2005 and 2015, 145,252 residential fires were reported from the provinces of British Columbia, Alberta, Manitoba and Ontario, in which 5.5% resulted in casualties. Death rates per population decreased significantly between 2005 and 2015, while casualties per 1,000 house fires did not change. Death rates per house fire incidents were generally higher in urban areas than in remote areas, but tended to increase as distance from city centres increased and moved closer to suburban areas. Fire-related deaths were more likely to involve males, and older residents were much more likely to have died in fires (Clare et al., 2017). The vast majority of fire-related deaths are classified as unintentional (accidents) (Statistics Canada, 2022).

Ontario reported 940 deaths due to fires between 2013 and 2022. This number excludes fire deaths in vehicle collisions, fire fatalities among emergency response, or any fire deaths on federal or First Nations property. This number is more than what was reported between 2012 and 2021, where 884 deaths were reported, excluding First Nations. The OFM reported that in 2022, the fire death rate was 8.3 deaths per million population, which is a 41% increase when compared to the fire death rate in 2013, which was 5.9 deaths per million population.

Structure-loss fires are fires that result in an injury, fatality, and/or financial loss that occur in structures (as opposed to vehicles or the outdoors). In Ontario, there were 852 fire fatalities from structure-loss fires from 2013 to 2022. The OFM reported that in 2022, the structure-loss fire death rate was 7.5 per million population, which is a 44% increase when compared to the structure-loss fire death rate in 2013, which was 5.2 deaths per million population.

The OFM data identified 103 structure fire deaths between 2013 and 2022 (excluding First Nations) where electricity was the fuel of the ignition source or were from electrical distribution equipment. Since 2013, the death rate from this type of fire has increased by 16% from 0.74 deaths per million population to 0.86 deaths per million population.

In these types of fires in which the investigations were considered closed, 97% were considered accidental between 2013 and 2022. Stove or range-top burners accounted for 40% of fire fatalities fuelled by electricity in the last ten years.

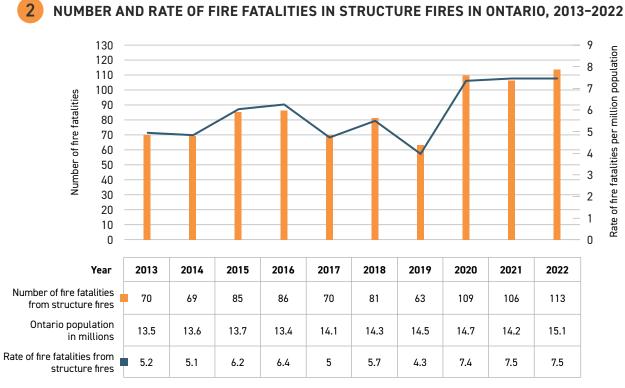


NUMBER AND RATE OF ALL FIRE FATALITIES IN ONTARIO, 2013–2022

Source: OFM records

Conclusion

The number and rate of fire fatalities have increased when comparing 2013 and 2022.



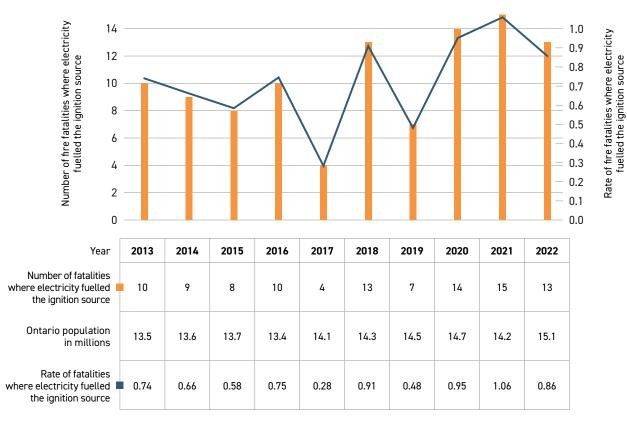
Source: OFM records

Conclusion

The number and rate of fire fatalities in structure fires have increased when comparing 2013 to 2022.

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NUMBER AND RATE OF STRUCTURE FIRE FATALITIES WHERE ELECTRICITY WAS THE FUEL OF THE IGNITION SOURCE OR FROM ELECTRICAL DISTRIBUTION EQUIPMENT IN ONTARIO, 2013-2022

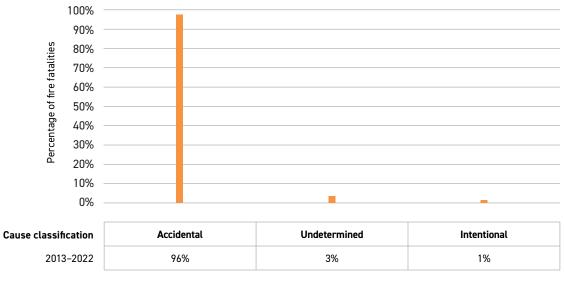


Source: OFM records

Conclusion

Electrical fire fatalities (where electricity fueled the ignition source or was from electrical distribution equipment in Ontario) has increased 16% when comparing 2013 to 2022.

PERCENTAGE OF STRUCTURE FIRE FATALITIES WHERE ELECTRICITY IS THE FUEL OF THE IGNITION SOURCE OR BY ELECTRICAL DISTRIBUTION EQUIPMENT CAUSE CLASSIFICATION IN ONTARIO, 2013–2022 (CLOSED FIRE INVESTIGATIONS ONLY)

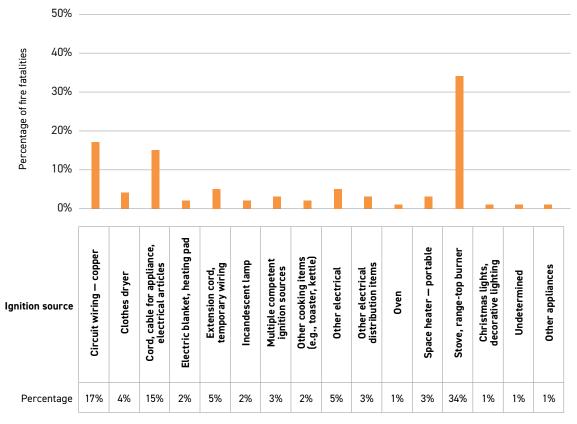


Source: OFM records

Conclusion

Almost all structure fire fatalities (96%) where electricity fuelled the ignition source or where the fires were from electrical distribution equipment were accidental.

PERCENTAGE OF STRUCTURE FIRE FATALITIES WHERE ELECTRICITY WAS THE FUEL OF THE IGNITION SOURCE BY IGNITION SOURCE IN ONTARIO, 2013–2022 (CLOSED FIRE INVESTIGATIONS ONLY)



Source: OFM records

Conclusion

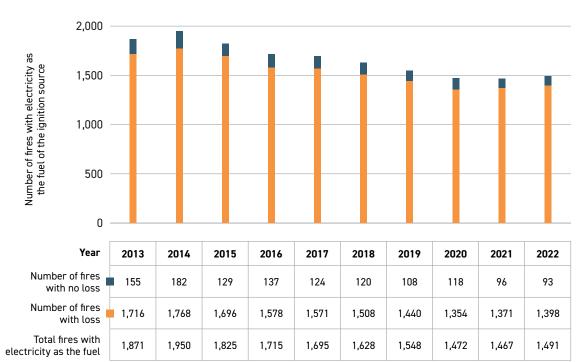
The stove (34%) remains the most common ignition source when examining structure fire fatalities where electricity fuelled the ignition source or where the fires were from electrical distribution equipment in the most recent ten-year period.



Fire Incidents with Electricity as the Fuel of the Ignition Source of the Fire

Among OBC structures, where electricity was the fuel of the ignition source of the fires, there were 15,400 loss fires and 1,262 no-loss fires for a total of 16,662 structure fires from 2013 to 2022. Over the same time period, there was a 19% decrease in structure-loss fires and a 20% decrease in total structure fires.

Between 2013 and 2022, 82% of structure fires occurred in the residential setting. Cooking equipment (44%), electrical distribution equipment (26%), and appliances (12%) remained the most common ignition sources in these fires.



NUMBER OF STRUCTURE FIRES WITH ELECTRICITY AS THE FUEL OF THE IGNITION SOURCE IN ONTARIO, 2013-2022 (OBC STRUCTURES ONLY)

Source: OFM records

Conclusion

In 2022, the total number of structure fires where electricity was the fuel of the ignition source decreased by 20% when compared to 2013.

NUMBER OF FIRES WITH ELECTRICITY AS THE FUEL OF THE IGNITION SOURCE BY STRUCTURE CLASSIFICATION IN ONTARIO, 2013–2022 (OBC STRUCTURES ONLY)

Structure Classification	Number o	Number of Fires									
Assembly	240	???? ????????????????????????????????									
Business and personal services	185	?????????????????????									
Care and detention	155	?????????????? ?????									
Industrial	523	<u>5555</u>									
Mercantile	232	331									
Residential	6,271	??? ??????????????????????????????????									

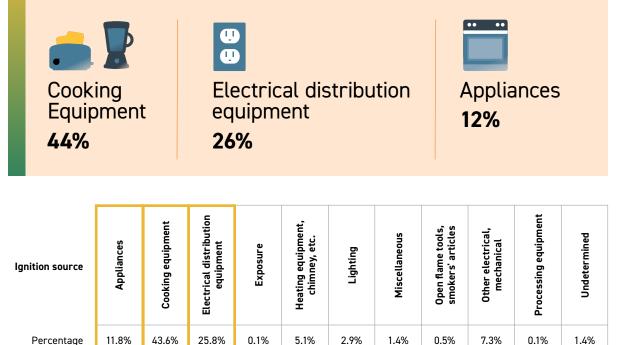
Source: OFM records

Conclusion

Residential structures were the most common structures (82%) for fires where electricity was the fuel of the ignition source between 2018 and 2022.

PERCENTAGE OF RESIDENTIAL FIRES WITH ELECTRICITY AS THE FUEL OF THE IGNITION SOURCE BY IGNITION SOURCE IN ONTARIO, 2018-2022

The leading sources in residential fires when electricity fuelled the ignition source included:



Source: OFM records

4

Conclusion

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Cooking equipment (44%) and electrical distribution equipment (26%) were the leading sources in residential fires when electricity fuelled the ignition source.



Cooking Fires with Electricity as the Fuel of the Ignition Source of the Fire

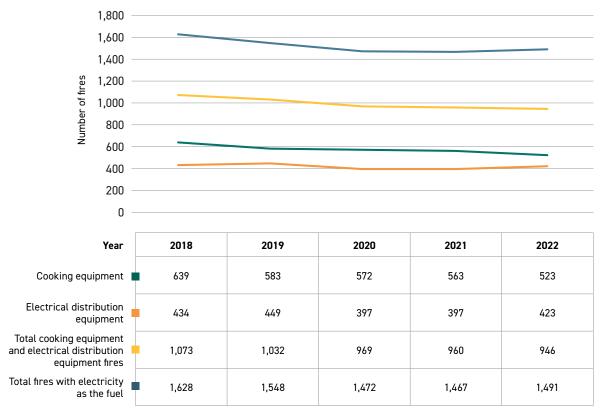
The National Fire Protection Association found that households that used electric ranges had a higher risk of cooking fires and associated losses than those using gas ranges. Their research also showed that a disproportionate share of home cooking fires were reported in apartments or other multi-family homes (Ahrens, 2017).

The most common cause of residential fires is cooking fires. Cooking fires have led to major injuries and fatalities, as well as significant financial losses. In most cooking fires, the ignition occurred due to the presence of cooking oil, which is highly ignitable, and could contribute to its spread (Hamida et al., 2019). Electricity is frequently used to ignite these stoves.

From 2018 to 2022, there were 2,880 structure fires in Ontario, where the ignition source was cooking equipment fuelled by electricity. Of those, 95% occurred in homes, and there has been a 17% decrease in this type of residential fire since 2018. Stove and range-top burners were the leading ignition source, followed by the oven and other cooking items. The overwhelmingly cited possible cause to these cooking fires was leaving the stove or range-top burner unattended.

The OFM fire-loss reporting system identified cooking equipment as one of the leading ignition sources associated with preventable home injuries. Structure fires that were ignited from cooking equipment that used electricity accounted for an annual average of 88 injuries among civilians and an average of four fatalities between 2018 and 2022. In this time period, the stove and range-top burners were the leading ignition source in fires where electricity fuelled the ignition source.

NUMBER OF COOKING EQUIPMENT AND ELECTRICAL DISTRIBUTION EQUIPMENT FIRES IN ONTARIO, 2018–2022 (OBC STRUCTURES ONLY)



Source: OFM records

Conclusion

The number of structure fires from cooking equipment (where electricity fuelled the ignition source) and electrical distribution equipment (where electricity fuelled the ignition source) in 2022 has decreased by 12% when compared to 2018.

NUMBER OF COOKING EQUIPMENT FIRES WITH ELECTRICITY AS THE FUEL OF THE IGNITION SOURCE BY SOURCE IN ONTARIO, 2018–2022 (OBC STRUCTURES ONLY)



Stoves and **range-top burners** were the leading sources (75%) of cooking equipment fires between 2018 and 2022.

Year	2018	2019	2020	2021	2022
Stove, range-top burner	490	441	428	428	379
Range hood	4	8	9	5	7
Oven	92	69	78	76	70
Other cooking items	29	38	26	34	46
Open fired barbeque — fixed or portable	1	0	1	0	1
Microwave	13	18	20	12	10
Deep fat fryer	10	9	10	8	10

Source: OFM records

Conclusion

Stoves and range-top burners were the leading sources (75%) of cooking equipment fires between 2018 and 2022.

Other cooking items include toasters, kettles, and electric frying pans.

NUMBER OF STOVE-TOP FIRES VS. COOKING EQUIPMENT FIRES BY POSSIBLE CAUSE IN ONTARIO, 2018–2022 (OBC STRUCTURES ONLY)



Leaving equipment unattended was

the most common possible cause of electrical fires for both cooking equipment (48%) and stove-top fires (56%) between 2018 and 2022.

Possible cause	Children playing (ages 11 and under)	Design/construction/installation/ maintenance deficiency	Electrical failure	Improper handling of ignition source or ignited material	Improper storage	Improperty discarded	Mechanical failure	Natural cause	Other misuse of ignition source/ materials ignited	Other unintentional cause, not classified	Rekindle	Routine maintenance deficiency (e.g., creosote, lint, grease buildup)	Suspected arson	Suspected vandalism	Suspected youth and vandalism (ages 12–17)	Unattended	Undetermined	Unintentional, cause undetermined	Unknown, not reported	Used for purpose not intended	Used or placed too close to combustibles
Stove-top fires	3	10	38	213	25	9	0	2	69	261	0	30	20	3	1	1,213	49	97	4	11	108
Cooking equipment fires	4	23	163	254	53	12	19	2	109	344	1	87	24	4	1	1,389	76	132	7	33	143

Source: OFM records



Electrical Distribution Equipment Fires with Electricity as the Fuel of the Ignition Source of the Fire

The OFM defines electrical distribution equipment as electrical wiring, devices, or equipment where the primary function is to carry current from one location to another. Thus, wiring, extension cords, terminations, electrical panels, and cords on appliances are considered electrical distribution equipment. This is not to be confused with utility equipment from Local Distribution Companies.

Among OBC structures, in the five-year period between 2018 and 2022, the OFM identified 2,100 fires as electrical distribution equipment fires with electricity as the fuel of the ignition source, in which 95% were identified as loss fires. The five-year rolling average of electrical distribution equipment loss structure fires has decreased by 7% between 2013–2017 and 2018–2022.

The most common ignition source of electrical distribution equipment fires was circuit wiring (aluminum and copper), and the number of fires from this source has decreased by 11% when comparing 2013–2017 and 2018–2022. Electrical failure is the most common possible cause in these types of fires.

Between 2012 and 2016, there was an estimated average of 35,150 home fires involving electrical distribution and lighting equipment in the U.S. This caused an estimated average of 490 deaths, 1,200 injuries each year in 2012–2016, as well as an estimated \$1.3 billion in direct property damage per year (Campbell, 2019).

Electrical distribution and lighting equipment remain one of the leading causes for home fires and fire casualties in the U.S. (Hall, 2023). It is also the leading cause of home fire property damage. Electrical wiring and cable insulation accounted for 5% of all home fires and 4% of all home fire deaths. Cords or plugs were involved in only 1% of fires, but 6% of deaths. Extension cords dominated the cord or plug category. Electrical failures or malfunctions can occur in any type of equipment powered by electricity. Between 2016 and 2020, Hall (2023) reported that half of these fires involved electrical distribution or lighting equipment.

Statistics Directly Related to the ESA's Harm Reduction Priorities

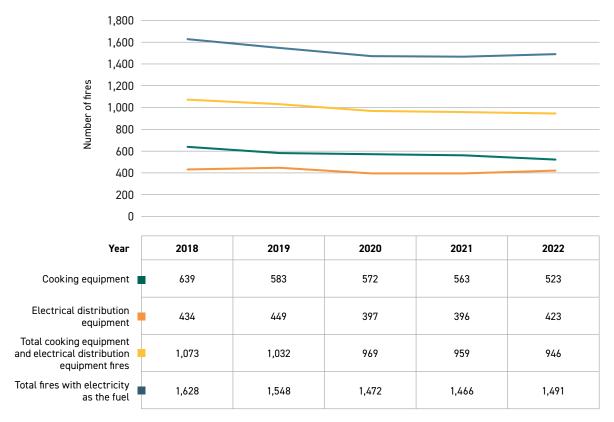


AGING INFRASTRUCTURE AND DISTRIBUTION EQUIPMENT FIRES

Number of electrical wiring-related fires: this includes fires from copper and aluminum wiring, extension cords, appliance cords, terminations, and electrical panels — electrical devices categorized by the OFM as electrical distribution equipment.

The five-year rolling average for electrical distribution equipment structure loss fires related to aging infrastructure has decreased by 7% between 2013–2017 and 2018–2022.

NUMBER OF COOKING EQUIPMENT AND ELECTRICAL DISTRIBUTION EQUIPMENT FIRES IN ONTARIO, 2018–2022 (OBC STRUCTURES ONLY)

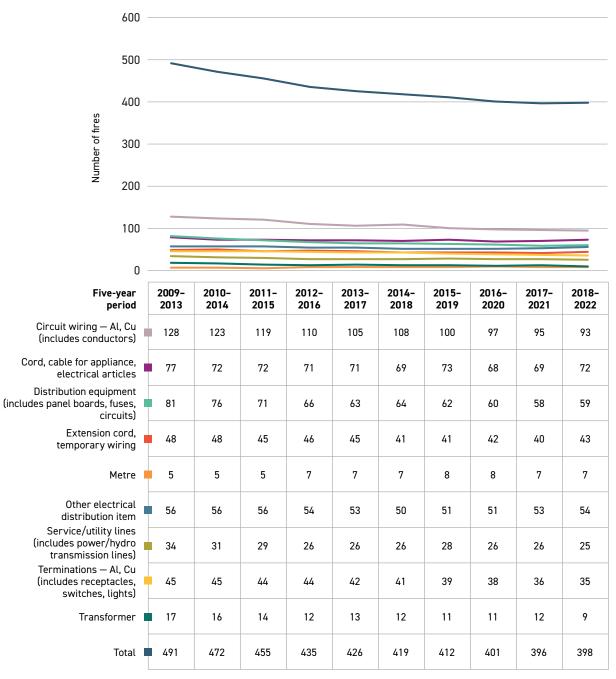


Source: OFM records

Conclusion

The number of electrical distribution equipment structure fires has decreased 2% since 2018.

2 FIVE-YEAR AVERAGE NUMBER OF ELECTRICAL DISTRIBUTION EQUIPMENT STRUCTURE-LOSS FIRES BY IGNITION SOURCE IN ONTARIO, 2009–2022 (OBC STRUCTURES ONLY)



Source: OFM records

Conclusion

Circuit wiring — aluminum and copper remained the leading ignition source in electrical distribution equipment fires between 2009 and 2022. The five-year rolling average of electrical distribution equipment loss structure fires shows a 7% decrease between 2013–2017 and 2018–2022.



The leading possible causes in electrical distribution equipment fires between 2018 and 2022:

Electrical failure and design/construction/ installation/maintenance deficiency.

Possible cause	Children playing (ages 11 and under)	Design/construction/installation/ maintenance deficiency	Electrical failure	Improper handling of ignition source or ignited material	Improper storage	Improperty discarded	Mechanical failure	Natural cause	Other misuse of ignition source/ material ignited	Other unintentional cause, not classified	Routine maintenance deficiency (e.g., creosote, lint, grease buildup)	Suspected vandalism	Unattended	Undetermined	Unintentional, cause undetermined	Used for purpose not intended	Used or placed too close to combustibles	Vehicle collision
Number of electrical distribution fires	2	117	1,509	11	8	1	24	12	21	83	9	2	10	84	53	14	27	4

Source: OFM records

1 2 3 4 5 6

Conclusion

Electrical failure was the leading cause of electrical distribution structure fires between 2018 and 2022.



5.0

Product Safety

Ontario Regulation 438/07 *Product Safety* enables the ESA to address the safety of electrical products and equipment. ESA has oversight for product safety related to the approval of electrical products, including consumer electrical products, before they are sold, used, offered, advertised or displayed in Ontario. ESA also responds to unsafe industrial and commercial products and publicizes product safety notices (including recalls) to protect end users.

0. Reg 438/07 authorizes the ESA to protect the public against potentially unsafe electrical products. ESA utilizes a risk-based oversight model to:

- Respond to product safety reports.
- Remove reported potentially unsafe, counterfeit, and unapproved electrical products from sale; and
- Provide education to public and retailers on their obligation to electrical safety

The *Canada Consumer Product Act* was enacted in 2011 and provides product safety oversight for consumer electrical products, including mandatory reporting obligations to Health Canada. On an ongoing basis, ESA routinely works with Health Canada to remove the sale of unapproved consumer electrical products, including removing listings by online retailers. All incidents involving consumer electrical products are required to be reported to Health Canada.

In 2022, Health Canada received 2,280 product reports, of which 132 reports were about electric ranges or ovens, where the top hazards included excessive heat/overheating, fire, and sharp edges or points. None of these reports was associated with deaths, although 32% mentioned injuries. Electrical injuries, such as shocks and burns, were reported from products including ranges or ovens, telephones or accessories, and refrigerators (Health Canada, 2023).

Since 2014, there has been a 75% increase in the number of product incidents reported to the ESA. In 2023, there were 553 reports. Compared to the previous year of 2022, this is a 21% increase.

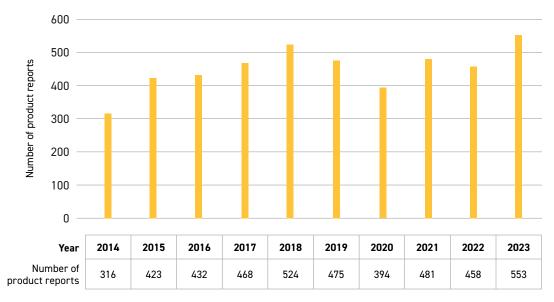
At ESA, product safety reports are deemed high, medium or low risk by a risk assessment tool based on specific parameters. Some of these parameters include but are not limited to:

- Estimating the likelihood of the product being or becoming defective by evaluating factors such as product certification, use environment, history of compliance or previous product issues, ability to detect defect prior to product use, and pattern of incidents;
- Estimating the likelihood of serious negative effects by evaluating factors such as exposure characteristics, human/device interaction, undetected overheating, and impact of warnings; and
- Assessing severity of the potential impact by evaluating the loss severity as major, moderate, minor, or significant.

In 2023, all product safety investigations initiated by the ESA were a result of voluntary reporting, and each report was assigned a priority based on its risk profile. Eighty-four percent (466 reports) were assigned as medium risk.

In 2023, 91% of product incident reports were concerned with unapproved products (products that have not been tested and evaluated to the applicable Canadian safety standards and may not be safe to use). A smaller percentage of reports dealt with certified products (products that were properly certified but reported to have a safety problem or a perceived safety problem).

NUMBER OF PRODUCT INCIDENT REPORTS SUBMITTED TO THE ESA IN ONTARIO, 2014–2023

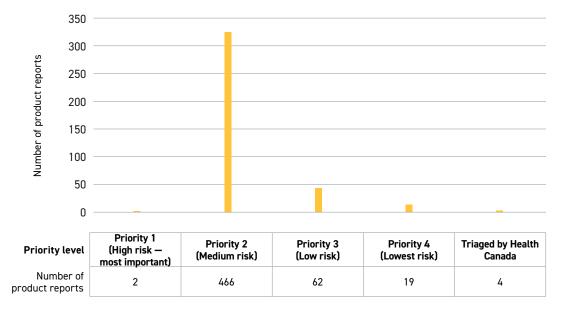


Source: ESA records

Conclusion

Between 2014 and 2023, there has been a 75% increase in product incident reports.

2 NUMBER OF PRODUCT INCIDENT REPORTS BY PRIORITY LEVEL IN ONTARIO, 2023

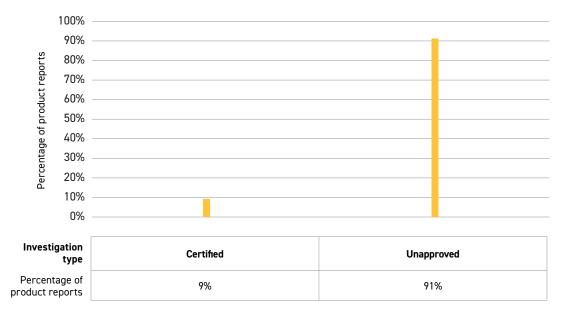


Source: ESA records

Conclusion

In 2023, 84% of electrical incident reports to the ESA were classified as Priority 2.

3 PERCENTAGE OF PRODUCT INCIDENT REPORTS BY TYPE IN ONTARIO, 2023



Source: ESA records

Conclusion

In 2023, 91% of electrical incident reports were from unapproved electrical products.

6.0 | Electrical Incident Review



Electrical Incident Review

The ESA collects information about reported electrical incidents so that a trend analysis can be made. This allows the ESA to understand the current and potential electrical risks, and to assess compliance with applicable legislative and regulatory requirements. An incident review is conducted for all known incidents that are electrical in nature, or have the potential to be electrical in nature, which involve equipment/tools/devices that fall under the jurisdiction of the ESA, and meets one or more of the following criteria:

- 1. The incident review has the potential to provide ESA, or the Authority Having Jurisdiction requesting the review, the opportunity to gain a better understanding of the potential harm;
- 2. Conducting the incident investigation may potentially address key electrical safety concerns in a proactive manner; and/or
- 3. When the circumstances of the current electrical incident warrant greater surveillance including, but not limited to, situations where newer technology is involved or the electrical incident fits within the scope of a high-risk harm.

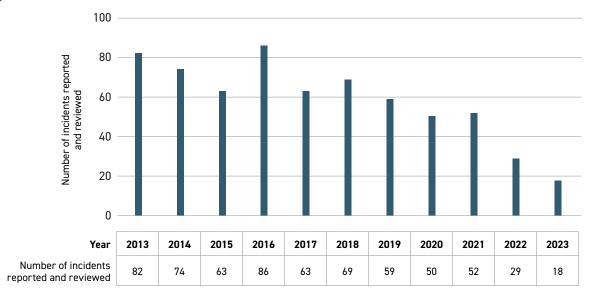
The following information is a summary of what is reported to the ESA's electrical incident database. This includes:

- 1. General incidents, which are serious or non-serious electrical incidents, where the cause and conditions leading to the incident are apparent and straightforward, and do not require an in-depth fact-finding inquiry; and
- 2. Root cause incidents, which are conducted for serious or non-serious electrical incidents, where the cause and conditions leading to the incident are complex in that there are multiple causes and/or many conditions present that could contribute to the incident, and it requires an in-depth fact-finding inquiry.

Between 2014 and 2023, 597 electrical incidents were reported and reviewed by the ESA. Seven fatalities and six injuries related to unapproved consumer electrical products were reported during this time.

In 2023, 18 incidents were reported to and reviewed by the ESA. This is a 38% decrease from 2022. Eleven percent of these incidents involved utility infrastructure, and 28 of these incidents involved powerlines. Sixty-seven percent of reported incidents were occupational. Aside from unknown (39%), the most common cause of these incidents was improper use/procedure (22%). A list of incidents reviewed from 2014 to 2023 can be found in Appendix A of this report.

NUMBER OF INCIDENTS REPORTED TO AND REVIEWED BY THE ESA



Source: ESA records

Conclusion

In 2023, 18 incidents were reported to and reviewed by the ESA; this is a 38% decrease from 2022.

Acknowledgements

The ESA acknowledges and thanks the Ministry of Labour, Immigration, Training and Skills Development of Ontario (MLITSD) for providing information, notifying the ESA of occupational electrical injuries, and co-operating with the ESA in the investigation of these incidents.

The ESA thanks the Office of the Fire Marshal and Emergency Management (OFM) for its continuing support in providing information on fire-related electrical incidents, partnering with the ESA on stove-top fire initiatives, and notifying the ESA of electrical fire incidents.

The ESA also thanks the following organizations for their support:

- The Office of the Chief Coroner for Ontario for sharing coroners' information on electrical-related fatalities and other deaths in Ontario;
- The Workplace Safety and Insurance Board of Ontario (WSIB) for providing occupational injury information; and
- The Canadian Institute of Health Information (CIHI) for providing information on emergency department visits for electrical injury.

Development of this report was led by a team from the ESA, including Freda Lam, Anna Turkalj, Patrick Falzon, Mel Pace, and Patience Cathcart with assistance from staff of the ESA's Utility Regulations, Product Safety, and Communications departments.

Methodology

The ESA receives data from various resources to compile this report. These include the Office of the Chief Coroner, the MLITSD, the OFM, and the WSIB. The ESA then cross-references these data with the coroners' reports, OFM's reports, and the ESA's incident review data to ensure accuracy and understanding of the incidents. Data on non-serious incidents are taken as provided.

The Electrical Safety Authority's Data

The ESA uses Ontario population estimates and projections from Ontario's Ministry of Finance (Population Projections Scenarios for Ontario by Age and Sex, 2022–2046) to determine electrocution and death by fire as rate per population, and Statistics Canada labour force characteristics (Table 14-10-0017-01) to determine occupational injury rates.

The 2014 to 2023 electrocution statistics are based on Ontario coroners' reports, ESA records, and MLITSD reports. At time of writing, OFM fire fatality information is only partially completed due to pending investigations and confirmations.

Data provided by the Office of the Chief Coroner takes precedence over other data in the event of discrepancies.

The electrocution and electrical burn fatality cases in the report are unintentional in nature. Suicide and deliberate attempts to injure are excluded, as well as deaths by lightning strikes. Electrocution from criminal activities such as theft of power, vandalism, pranks, or vehicles hitting a utility pole are counted as part of the statistics but are not included as part of preventable deaths. Death resulting from a fall but initiated by an electrical contact to a worker would not be recorded as an electrical-related fatality and therefore would not be accounted for in electrical injury data.

This report separates occupational and non-occupational (the general public) incidents for reasons of stakeholder interest and to aid in identifying strategies to reduce harm.

Workplace Safety Insurance Board Data

The WSIB defines lost time injuries (LTIs) as all allowed claims by workers who have lost wages as a result of a temporary or permanent impairment. LTI counts include fatalities. This data is provided by WSIB Enterprise Information Warehouse, as of July 2, 2024, for all injury years.

Allowed LTIs for electrical burns and electrical-related fatalities are based on the following CSA Z795-96 nature of injury codes:

- 05200 Electrical burns;
- 05201 First-degree electrical burns;
- 05202 Second-degree electrical burns;
- 05203 Third-degree electrical burns;
- 05290 Electrical burns, N.E.C.; and
- 09300 Electrocutions, electric shocks.

Emergency Department Visits

Separations data from the National Ambulatory Care Reporting System were provided by the Canadian Institute for Health Information (CIHI). Emergency department separation data used in this report are classified according to the Canadian Modification of the 10th revision of the International Classification of Diseases (ICD-10-CA). The inclusion criterion for the report was the presence of T75.4, T75.0, W85, W86, W87, or X33 codes indicating an electrical injury, including being a victim of lightning, among any of the diagnosis or external cause codes assigned to a record.

Reliability of Data

The numbers and figures in this report are based on current information provided to the ESA as of July 2024. Parts of this material are based on data and information provided by the Canadian Institute for Health Information, and are current as of July 5, 2024. However, the analyses, conclusions, opinions, and statements expressed herein are those of the author, and not necessarily those of the Canadian Institute for Health Information. These numbers may change in subsequent reports due to additional information received after the publication of the report. These changes and explanations will be noted in future reports.

While the information is considered to be true and correct at the time of publication, the author does not warrant that it is free from errors or omission. The ESA prepares this report and makes it available on the understanding that the ESA and its employees and agents shall bear no liability of any kind to users of this report for any loss, damage, costs of expense incurred or arising from the use or reliance on the report, whether caused by any error, negligence, omission, or misrepresentation in the report or otherwise.

Fire Source Data

The OFM reports its data by calendar year. Data collection and verification for the year has a one-year lag in reporting in the OESR. The OFM does not publish Ontario statistics until all fire departments have reported. The larger departments — Toronto and Hamilton — generally do not finish their filing until June of the following year. At the time of writing, some OFM data for 2023 is unavailable and data for 2022 is presented instead. The number of fire incidents and fire fatalities are current as of June 4, 2024, and are the most accurate at this point in time.

The OFM provides information on all fire incidents except for those on federal or First Nations properties. Likewise, information on fire fatalities does not include those on federal or First Nations properties, nor fire deaths in vehicle accidents.

The ESA reports fire incidents based on data provided by the OFM to the ESA on:

- All fires where the ignition source was reported as "electrical distribution equipment" or the fuel of the ignition source was reported as "electricity"; and
- Fire incidents and fire fatalities investigated by the OFM where the ignition source was reported as "electrical distribution equipment" or the fuel of the ignition source was reported as "electricity".

In addition, the ESA conducts its own investigation of fires when called by the local fire department to assist or when jointly investigating fire incidents with the OFM. The ESA presents data that are consistent with the reporting convention of the OFM. Fires are reported by ignition source where the fuel of the ignition source was reported as electricity. It is worth noting that, with the exception of fires identified as having either electrical distribution equipment or electricity as the fuel of the ignition source by the fire departments or the OFM, electricity was not the primary fuel associated with the fire. These situations are illustrated below.

In the OESR, these fires will be categorized into two types of fires. These are:

 Fires caused by the ignition of combustibles (liquids and solids) around an electrical device, equipment, appliance, or installation, but which were not the direct result of a failure of electrical equipment, devices, electrical current, or arc flash coming into contact with the object. When the primary fuel associated with the fire is not electricity (such as leaving a stove unattended with the oil catching fire), the OFM labels these fires as cooking fires rather than electrical fires. In addition, the OFM does not recommend using numbers of fire deaths to identify trends and key issues.

Typically, these types of fires were the direct result of misuse of the equipment, device, or appliance. Some examples of these types of fires are:

- grease fires on an electrical stove top as a result of cooking left unattended;
- clothing catching fire while cooking;
- clothes dryer catching fire caused by the appliance overheating due to improper cleaning of the lint cache; and
- combustibles catching fire around heaters or electronics when they are placed too close to the heat source.
- 2. Fires caused by the ignition of combustibles around an electrical device, equipment, appliance, or installation and were the direct result of the failure of the device, equipment, or installation. In these cases, typical fires are caused by insulation surrounding electrical wiring failing and igniting a combustible in close proximity, or equipment or devices failing, causing them to overheat and later start a fire. Insulation failure could be caused by natural aging, premature aging resulting from overloading, or by mechanical breakdown of the insulation. Fires related to wiring and wiring devices are classified by the OFM as distribution equipment. Please note that the definition of distribution equipment in the fire section is quite different than the distribution equipment in the powerline section of the report.

Examples of these fires are:

- Carpet igniting caused by heat build-up of an extension cord placed under a carpet. Over time the insulation of the extension cord fails due to foot traffic on the cord, which leads to mechanical breakdown of the insulation.
- Electrical wires poorly terminated and an installation performed without using any protective enclosure. Arcing occurs over time, resulting in a fire of combustibles around the wires.
- Fire caused by a failure of a seized motor powered by electricity.

When fire fatality rates are calculated, the ESA displays data as it is calculated by the OFM, which uses Statistics Canada population estimates as the denominator. When fire fatality data is added to electrical-related death data, Ministry of Finance population estimates are used as the denominator.

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