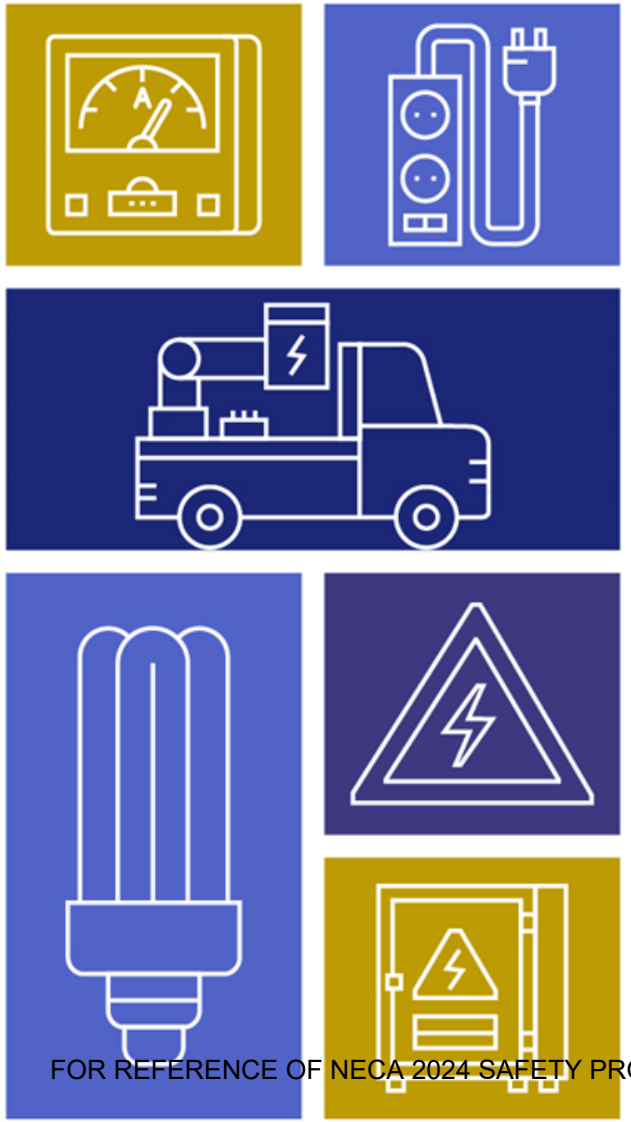
NECA SAFETY PROFESSIONALS CONFERENCE

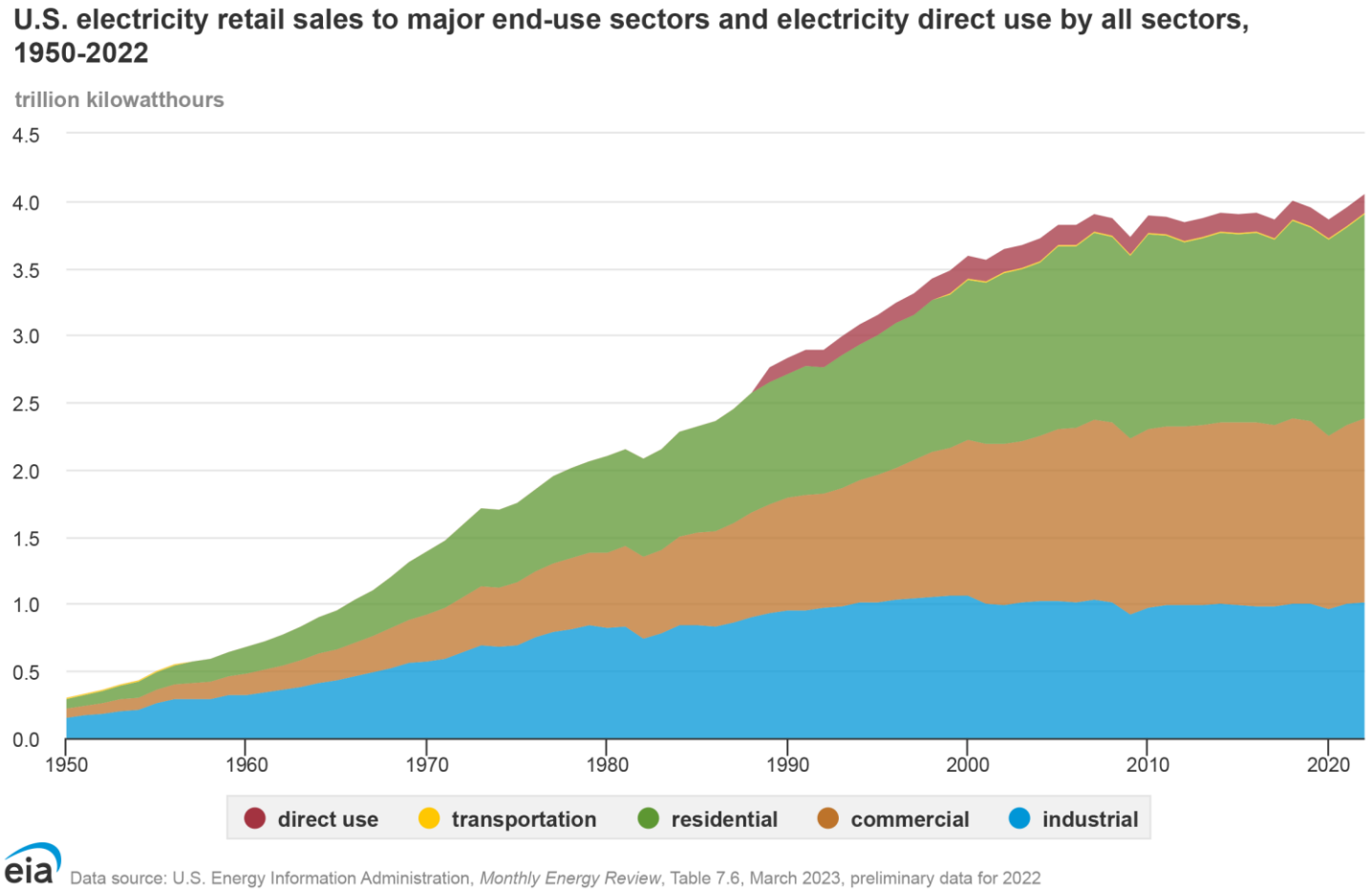


Electrical Safety in the Workplace

Brett Brenner – Electrical Safety Foundation
Daniel Majano – Electrical Safety Foundation

Electrification is on the Rise

According to the U.S. Energy Information Administration, the United States used a total of 4.07 trillion kilowatt hours of electricity in 2022, which is 14 times higher than electricity use in 1950.



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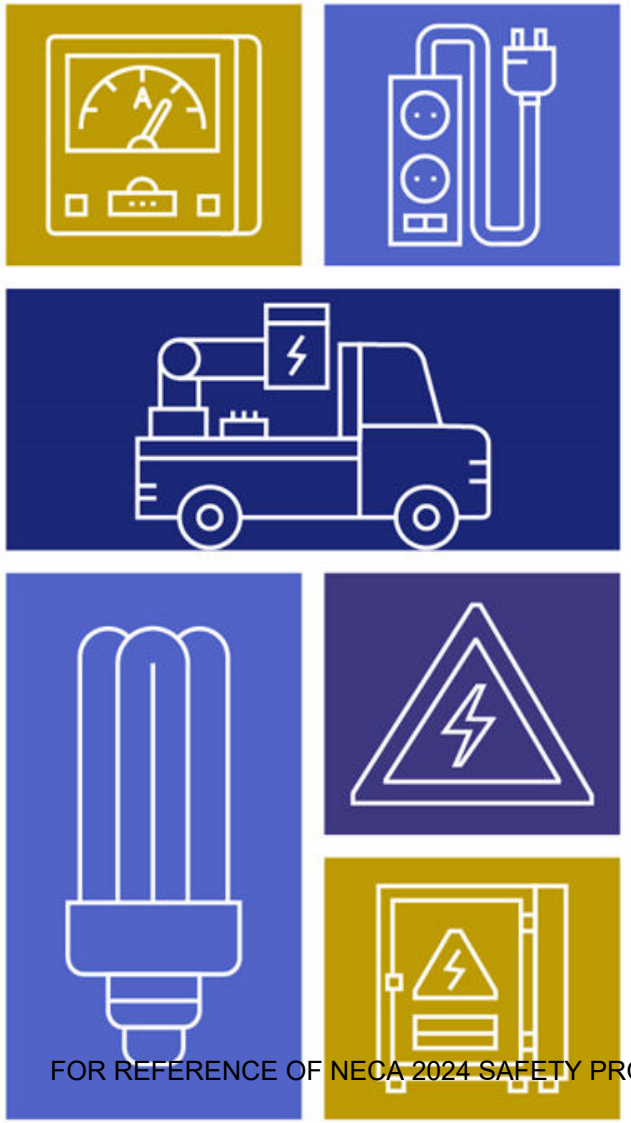


Electrical Fatality Trends: 2011 - 2022

Data Sources

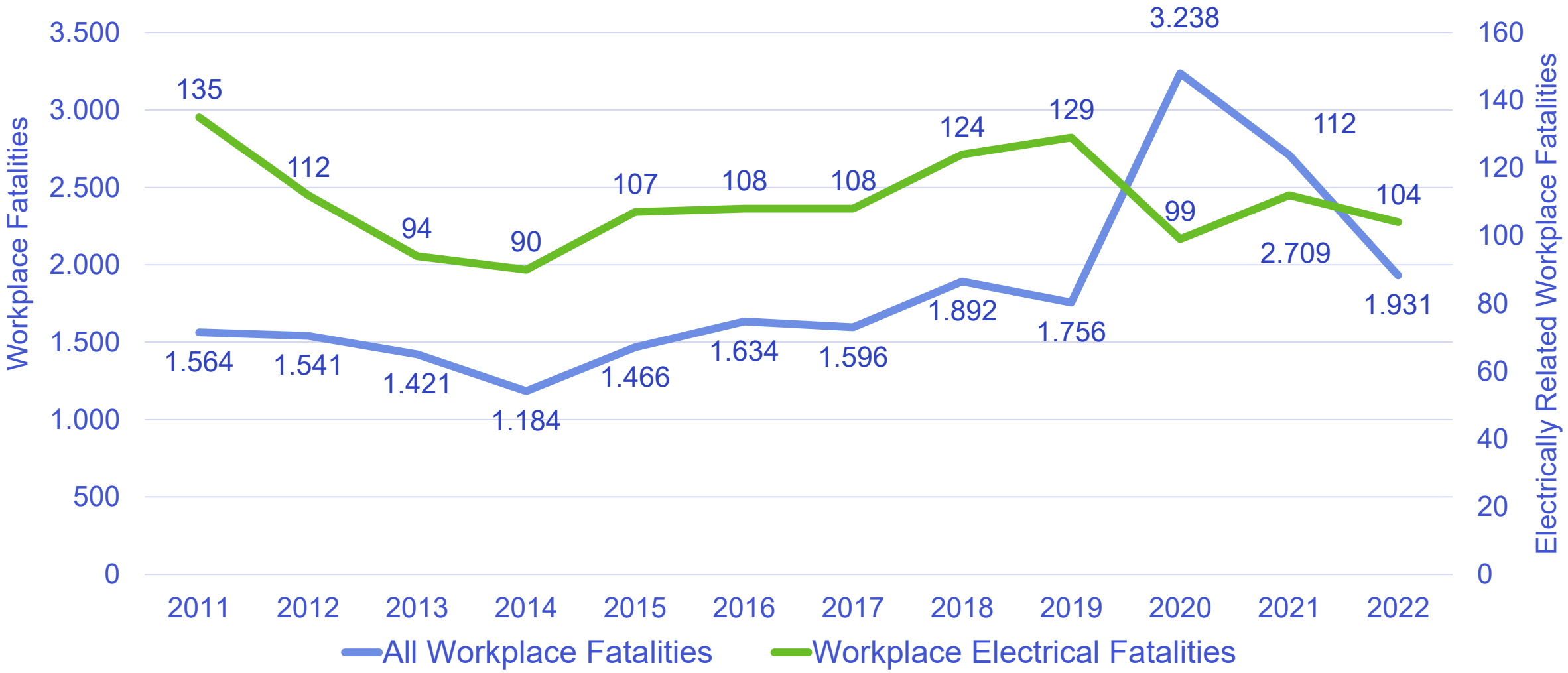
- **Occupational Safety and Health Administration Accident Investigation Summaries (OSHA 170 form)**
  - Provides the most details about the fatalities. Summaries must undergo a process for screening personal information and adding keywords that may cause some additional delay in posting.

- **Bureau of Labor Statistics: Census of Fatal Occupational Injuries (CFOI)**
  - “The Census of Fatal Occupational Injuries is the most complete count of fatal work injuries in the United States."

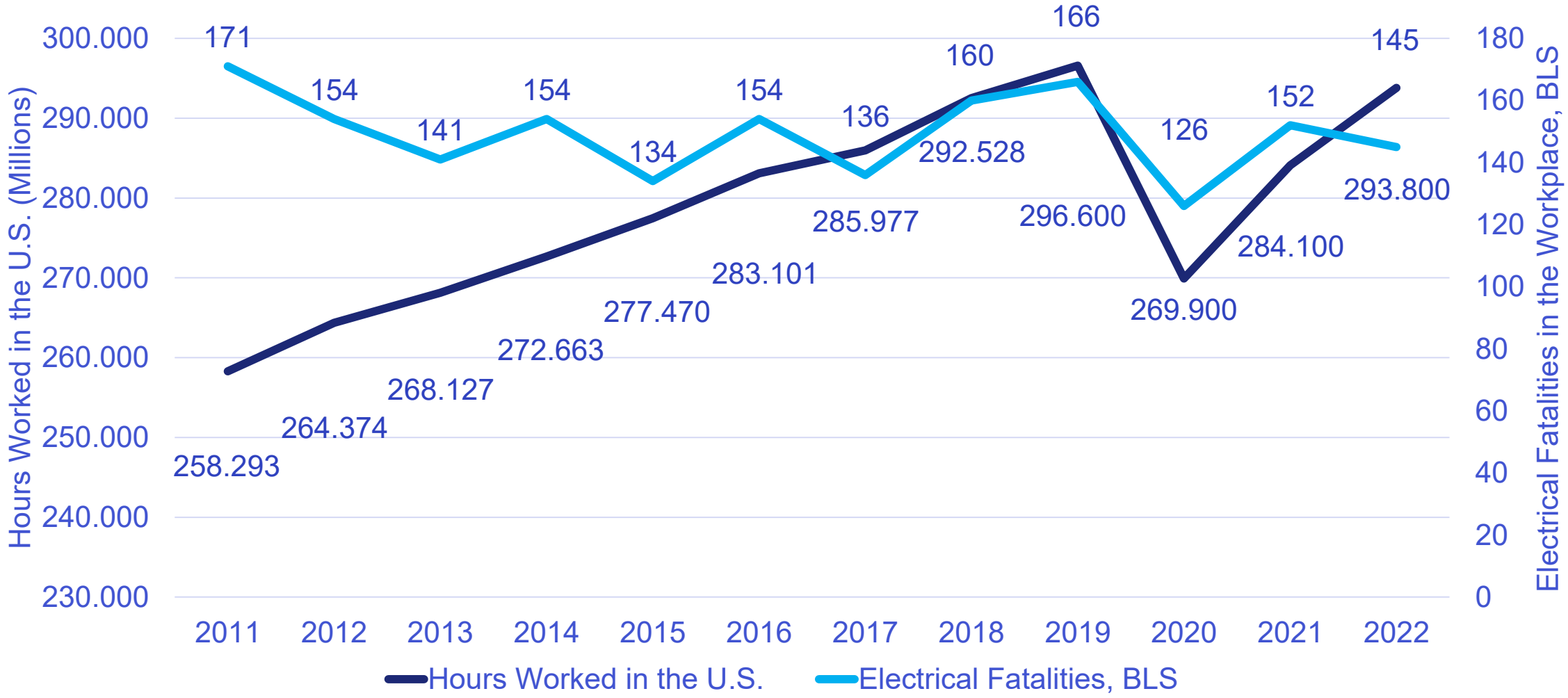
Electrical Fatalities in the Workplace

- Contact with or exposure to electricity continues to be one of the leading causes of workplace fatalities and injuries
- 1,322 workplace electrical fatalities between 2011 – 2021
- 6% of all workplace fatalities are caused by electricity
- 70% of fatalities occur in non-electrical occupations

Workplace Fatalities and Electrical Workplace Fatalities Reported in OSHA 170 Form, 2011 - 2022



Bureau of Labor Statistics: Electrical Fatalities v. Hours Worked in the United States, All Industries



Electrical Fatalities in the Workplace

- Electrical fatalities continue to stay consistent year over year
  - 8% drop in electrical fatalities from 2021 to 2022
  - There is an average change of -1.5% in electrical fatalities year over year
- Electrical fatalities account for 6% of all workplace fatalities
- Non-electrical occupations account for 70% of workplace electrical fatalities
- Leading fatality causes:
  - Working on or near energized equipment or parts: 48%
  - Overhead power line contact: 41%

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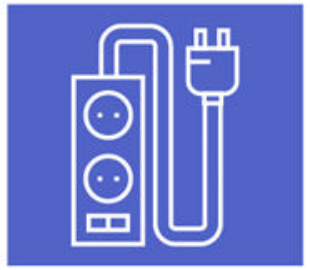
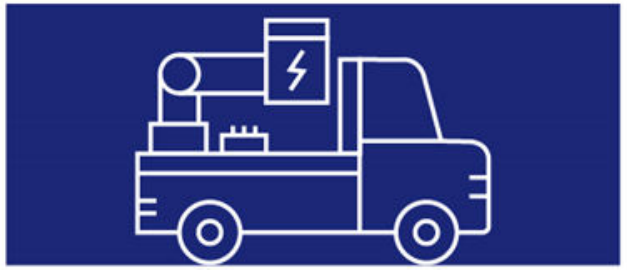
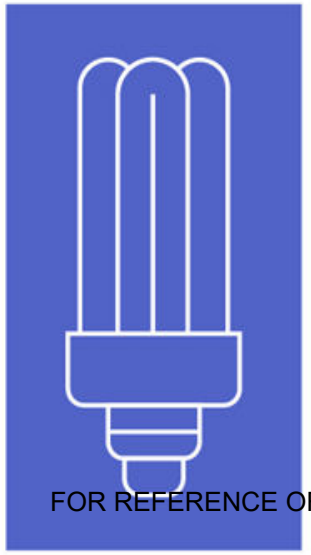






Occupations Involved in Electrical Fatalities

Occupations Involved in Electrical Fatalities

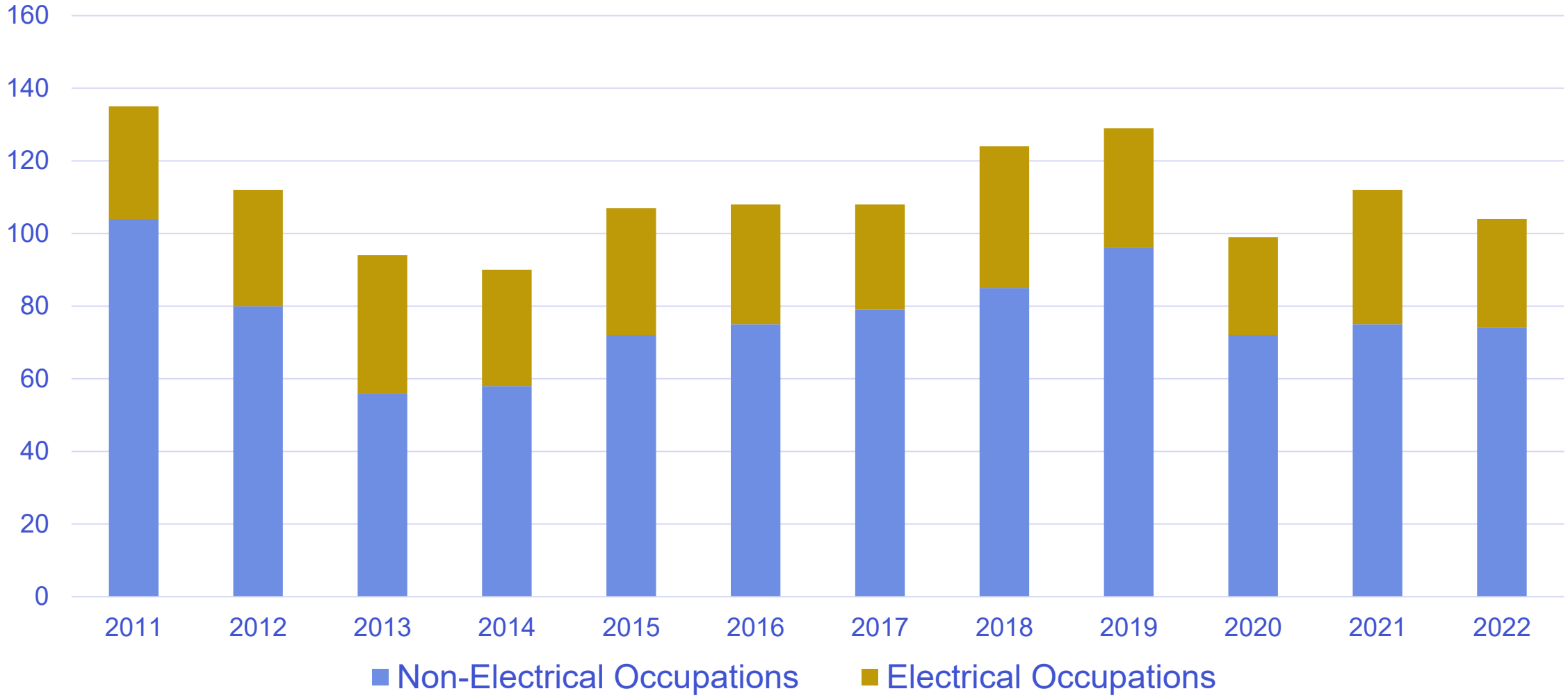
OSHA 170 form categorizes occupations into one of 573 recognized occupations, including occupations listed as “not applicable,” “occupation not reported,” or “occupation not listed.”

- A total of 118 occupations were involved in electrical fatalities
- 30% of fatalities were in electrical occupations
- 70% of fatalities were in non-electrical occupations
- Non-electrical occupation fatalities decreased an average of 1.6%
- Electrical occupation fatalities **increased** an average of 1.5%
- Ten occupations account for 60% of all electrical fatalities in the workplace, with three being electrical occupations

Occupations Involved in Electrical Fatalities

ELECTRICAL OCCUPATIONS
Electrical and electronic engineers
Electrical and electronic equipment assemblers
Electrical and electronic technicians
Electric power installers and repairers
Electricians
Electricians’ apprentices
Electronic repairers, communications, and industrial equipment
Supervisors in above fields

OSHA: Electrical Occupation v. Non-Electrical Occupation Electrical Fatalities 2011 - 2022



Occupations Involved in Electrical Fatalities

Occupation	Fatalities
Electricians	195
Construction laborers	119
Laborers, except const.	117
Occupation not reported	117
Electrical power installers and repairers	109
Tree trimming occupations	94
HVAC and refrig. mechanics	42
Electricians' apprentices	37
Truck drivers; heavy	35
Roofers	29
Painters, const. and maintenance	28

Occupation	Fatalities
Installers and repairers	26
Telecomm: line installers & repairers	23
Electrical and electronic engineers	22
Machinery maintenance occ.	22
Carpenters	19
Technicians, n.e.c	13
Electrical and electronic technicians	13
Welders and cutters	13
Helpers, construction trades	12
Construction trade, n.e.c	11
Farm workers	11

WORKPLACE SAFETY

KNOW WHEN TO SAY WHEN – KNOW WHEN TO STOP WORK

While qualified electrical line workers and electricians are often willing to go above and beyond the call, some jobs require specific knowledge and experience. That's why it's important to stop and reassess a situation if there is ever doubt about a job's task or a procedure's requirement. As qualified electrical workers, it is our jobs to ensure all trades are aware of danger related to unqualified electrical work.

ALWAYS ASK YOURSELF:

1. Have I been properly trained to safely complete this job task?

2. Have I worked on this task before, and do I have the right training and experience?

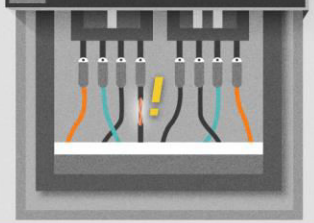
3. Do I have the proper tools for this job?

4. Is the hierarchy of risk controls being followed to ensure that preventive and protective risk controls are being implemented?

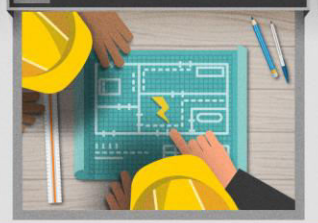
5. Has a proper risk assessment been performed?

6. Are all conductors and circuit parts in an electrically safe working condition?

7. Are these parts properly guarded to reduce the likelihood of electrical contact or arcing faults?



8. Are all applicable procedures and job planning procedures completed?



9. Am I confident about completing this job without risk or putting others at risk?

KNOW WHEN TO SAY WHEN – IT CAN SAVE YOUR LIFE, AND THE LIVES OF THOSE WORKING WITH YOU.

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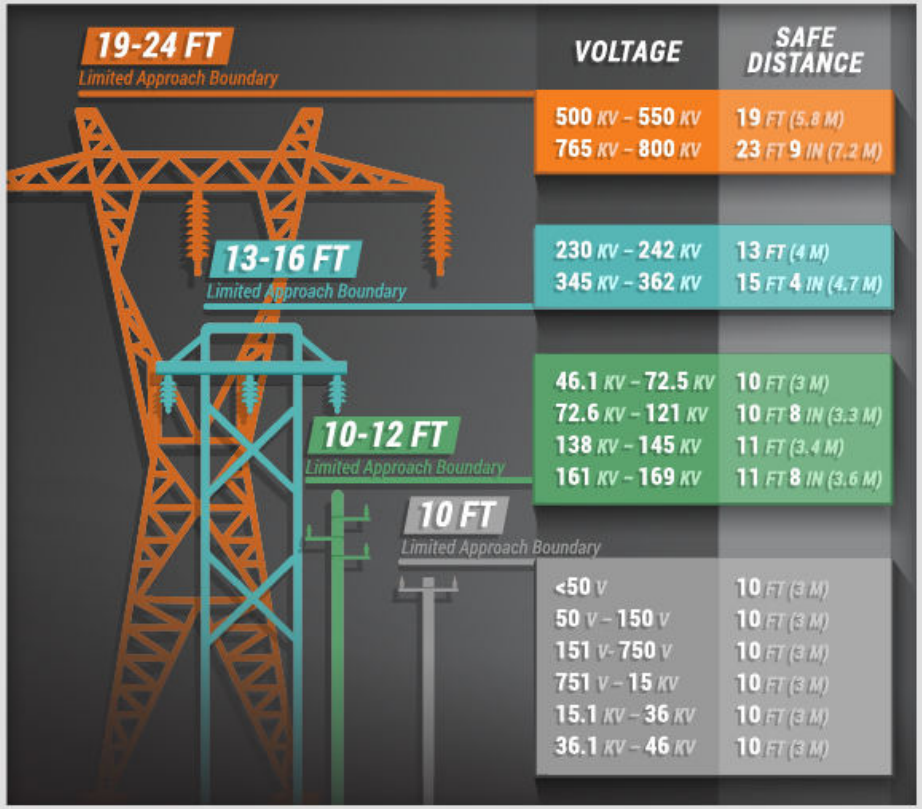
ALWAYS LOOK UP ALWAYS

It's no surprise that a construction job site can be an incredibly dangerous workplace. With so many safety protocols and procedures to follow, it can seem overwhelming. But the truth is, most accidents involving electricity, are caused by non-electrical workers inadvertently contacting power lines.

KEEP THE FOLLOWING DISTANCE FROM OVERHEAD POWER LINES:



VOLTAGE	SAFE DISTANCE
500 KV – 550 KV	19 FT (5.8 M)
765 KV – 800 KV	23 FT 9 IN (7.2 M)
230 KV – 242 KV	13 FT (4 M)
345 KV – 362 KV	15 FT 4 IN (4.7 M)
46.1 KV – 72.5 KV	10 FT (3 M)
72.6 KV – 121 KV	10 FT 8 IN (3.3 M)
138 KV – 145 KV	11 FT (3.4 M)
161 KV – 169 KV	11 FT 8 IN (3.6 M)
<50 V	10 FT (3 M)
50 V – 150 V	10 FT (3 M)
151 V- 750 V	10 FT (3 M)
751 V – 15 KV	10 FT (3 M)
15.1 KV – 36 KV	10 FT (3 M)
36.1 KV – 46 KV	10 FT (3 M)

SO WHEN YOU ARE ON THE JOB SITE REMEMBER TO ALWAYS LOOK UP. ALWAYS. IT COULD SAVE YOUR LIFE AND THE LIVES OF THOSE AROUND YOU.

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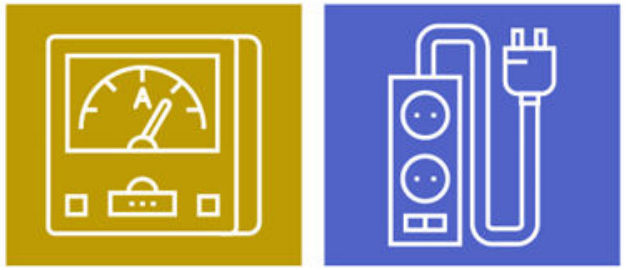
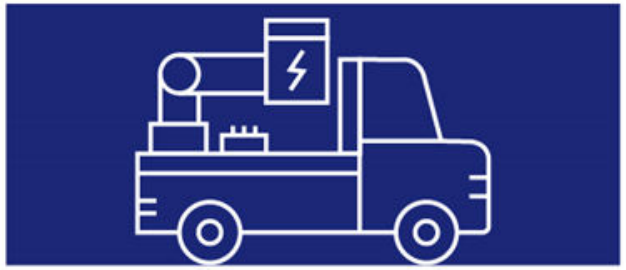




Causes of Electrical Fatalities

Causes of Electrical Fatalities

a) **Working on or near energized conductors / energized parts:** The fatal injury occurred due to contact with energized conductors or equipment. This occurred from the equipment being worked on or nearby equipment or wires, excluding overhead power lines.

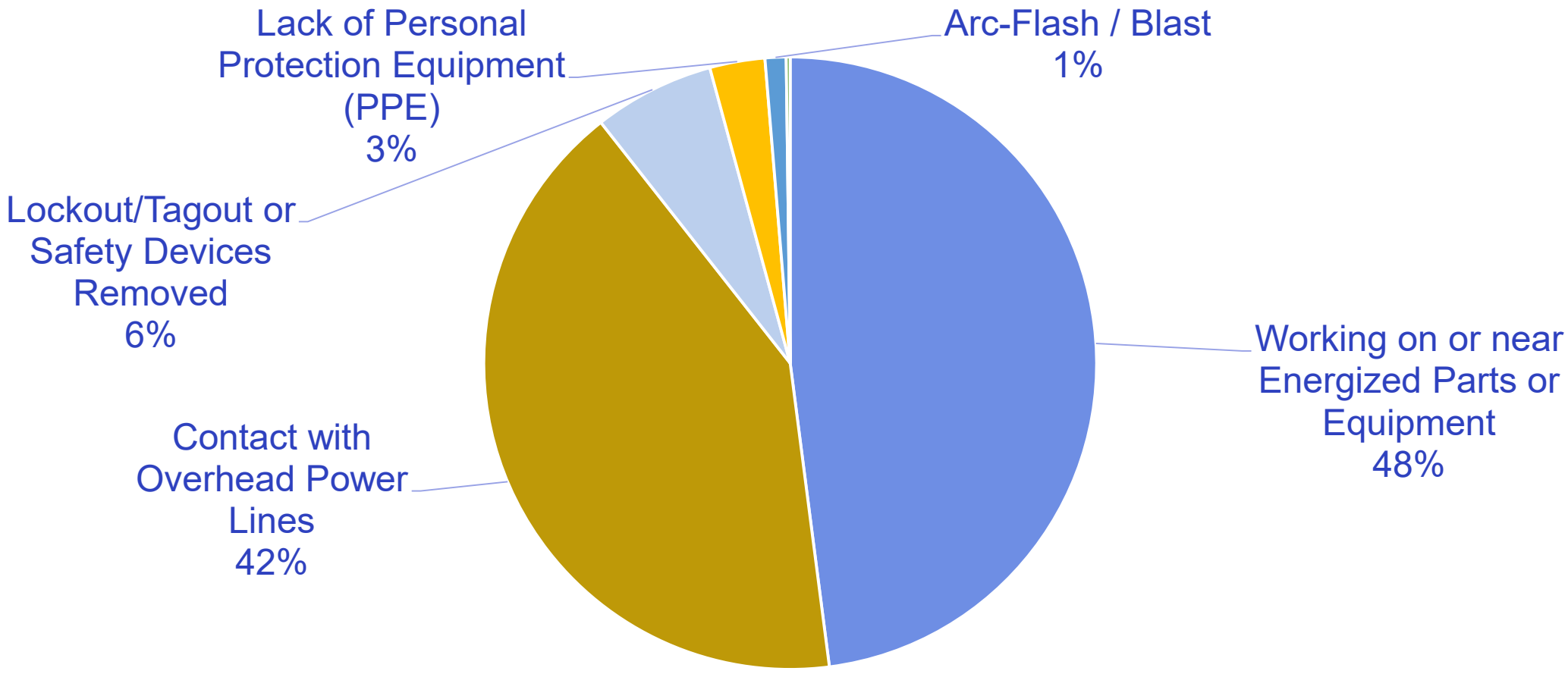
b) **Contact with overhead power lines:** The fatal injury occurred from contact with overhead power lines. This excludes contact with other energized equipment or wires. This also includes arcing events caused by overhead power lines.

c) **Lockout / tagout procedure failure or safety controls removed**: The fatal injury narrative mentions the removal of safety devices or a failure of a lockout / tagout procedure.

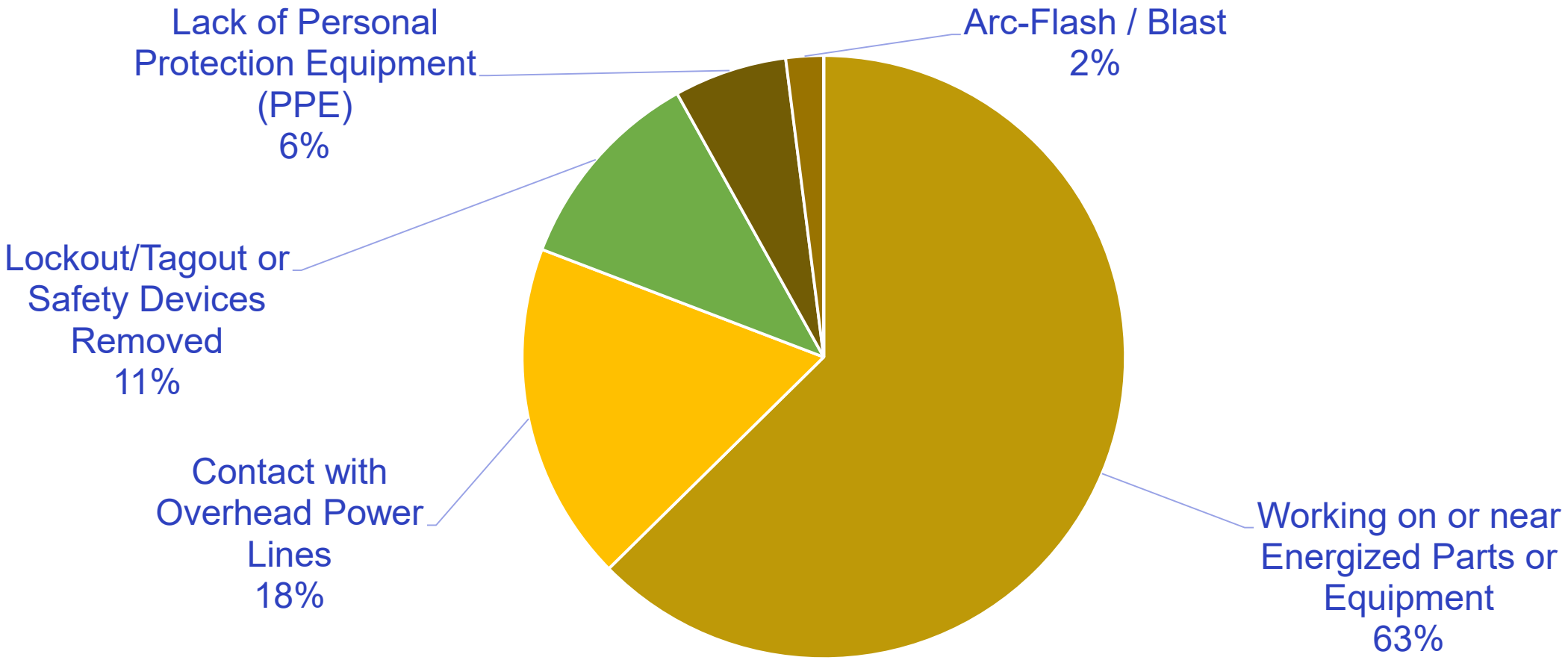
d) **Lack of personal protection equipment (PPE):** The narrative mentions the lack of personal protective equipment when the fatal injury occurred.

e) **Arc flash / blast:** The fatal injury occurred due to a reported arc-flash or blast.

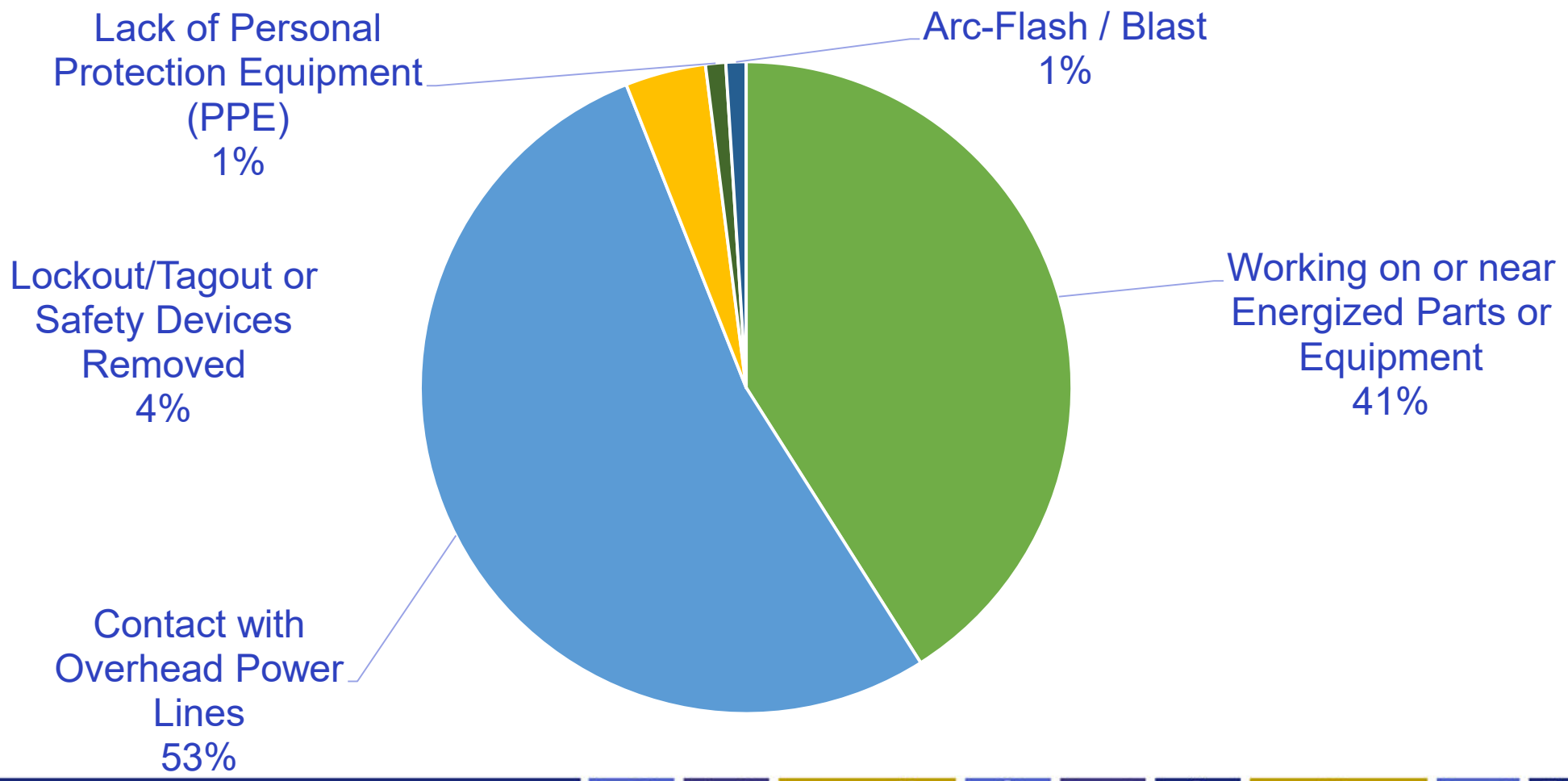
Causes of Electrical Fatalities: All Occupations



Causes of Electrical Fatalities: Electrical Occupations



Causes of Electrical Fatalities: Non-Electrical Occupations



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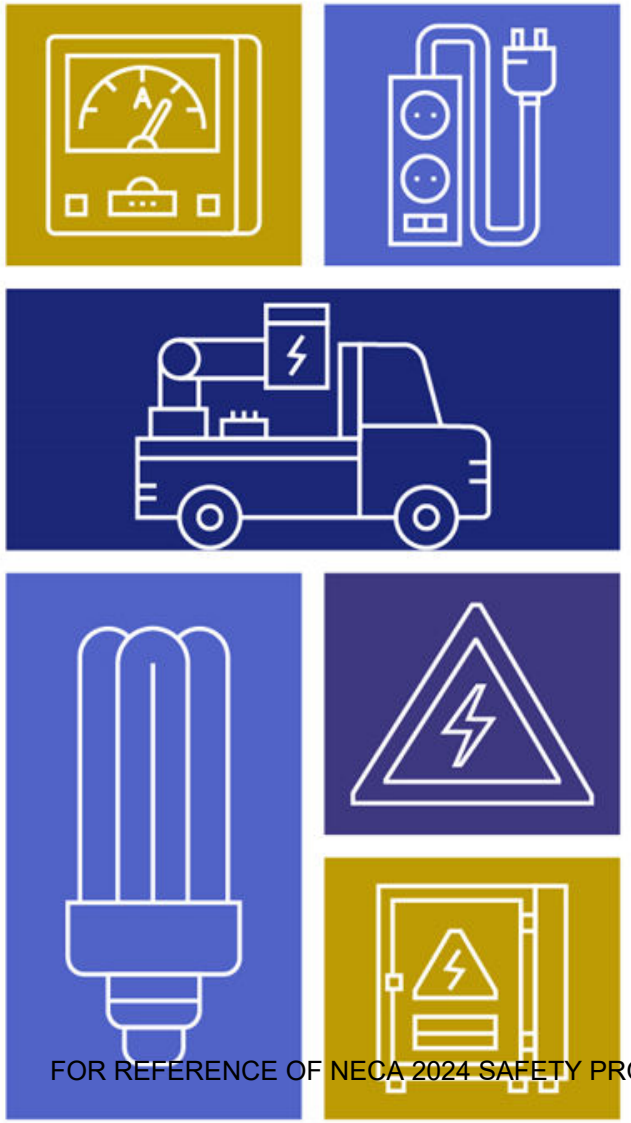
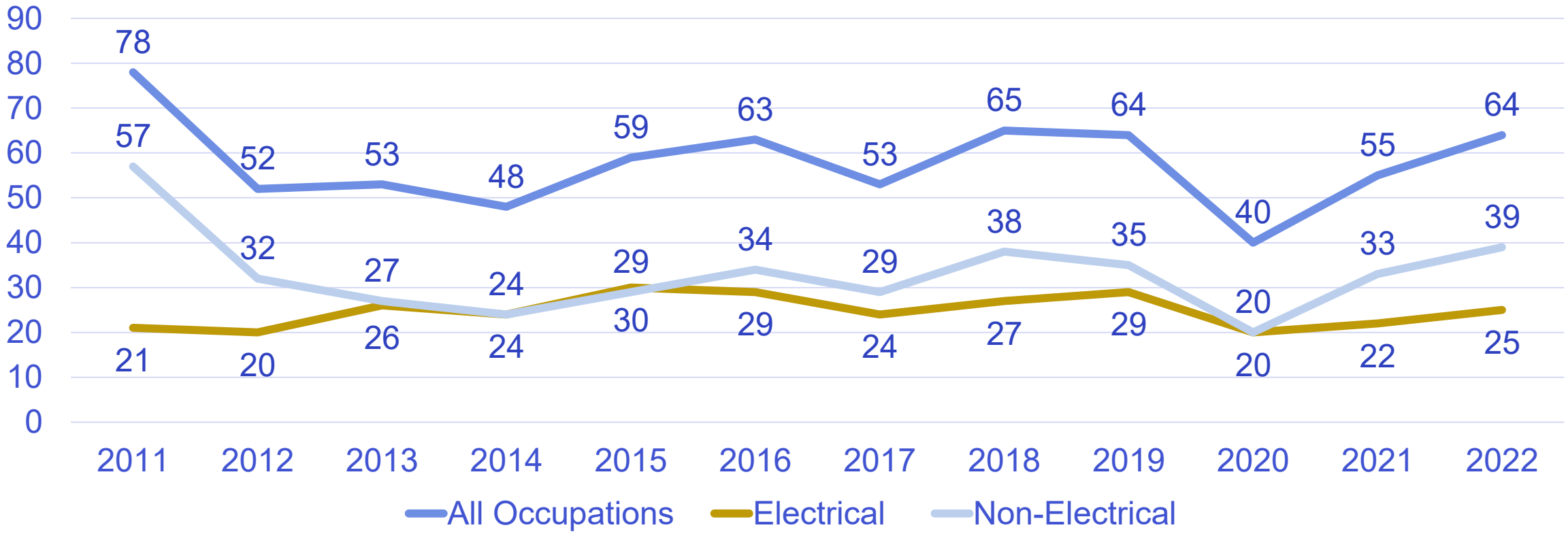


Working on or Near Energized Wires and Equipment

Working on or Near Energized Parts / Equipment



Average of a 1% increase year over year in working on or near energized parts or equipment fatalities

Working on or Near Energized Parts / Equipment

Occupations With 10 or More Fatalities Caused by Working on or Near Energized Parts

Occupation	Fatalities
Electricians	175
Electrical power installers & repairers	45
Laborers, except construction	44
Construction laborers	41
Heating, air conditioning, and refrig. mechanics	38
Electricians' apprentices	33

Occupation	Fatalities
Machinery maintenance occupations	20
Electrical and electronic engineers	18
Installers and repairers	16
Tree trimming occupations	14
Electrical and electronic technicians	13
Welders and cutters	13

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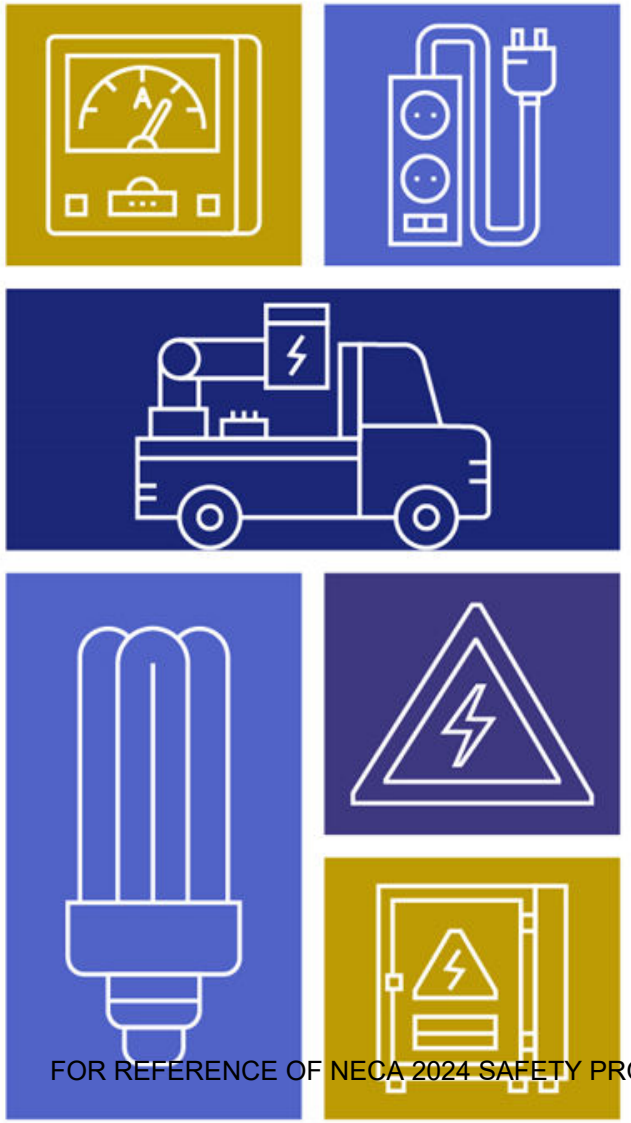
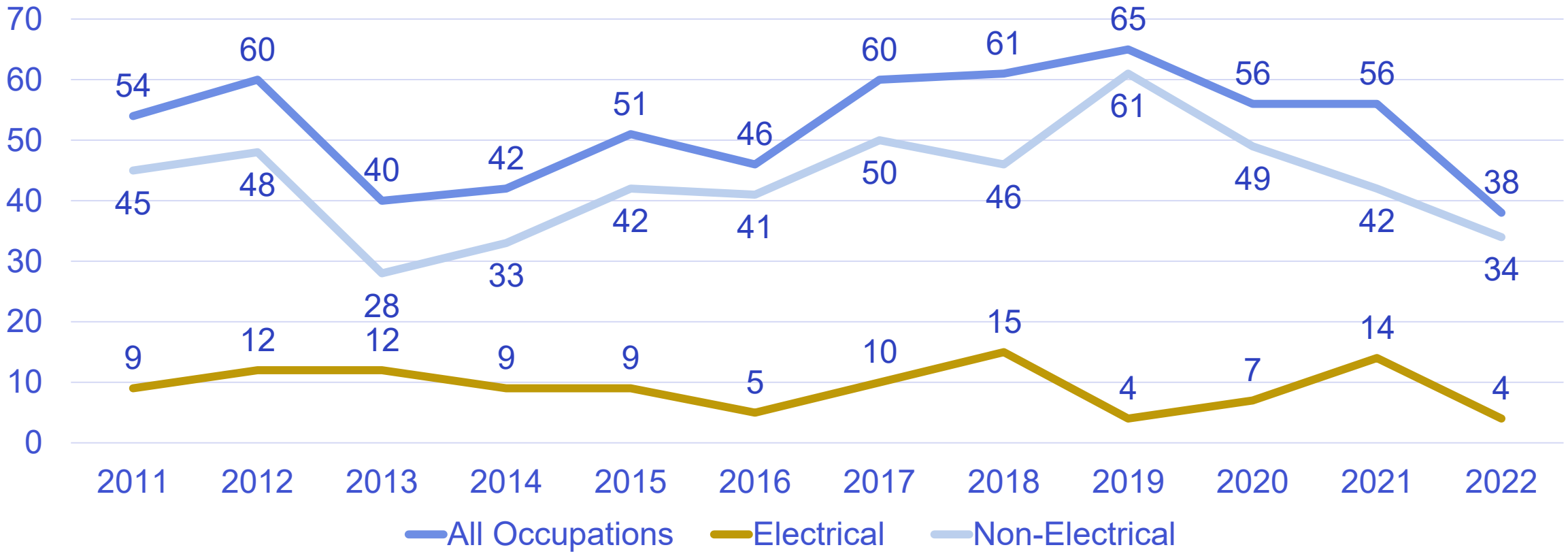


Overhead Power Line Contact

Overhead Power Line Contact



Average change of -1.18% overhead power line fatalities year over year

Overhead Power Line Contact

Occupations With 10 or More Fatalities Caused by Overhead Power Line Contact

Occupation	Fatalities
Tree trimming occupations	86
Electrical power installers & repairers	77
Laborers, except construction	75
Construction laborers	59
Truck drivers, heavy	26

Occupation	Fatalities
Roofers	25
Painters, construction & maintenance	25
Telecomm: line installers & repairers	21
Electricians	18
Carpenters	12

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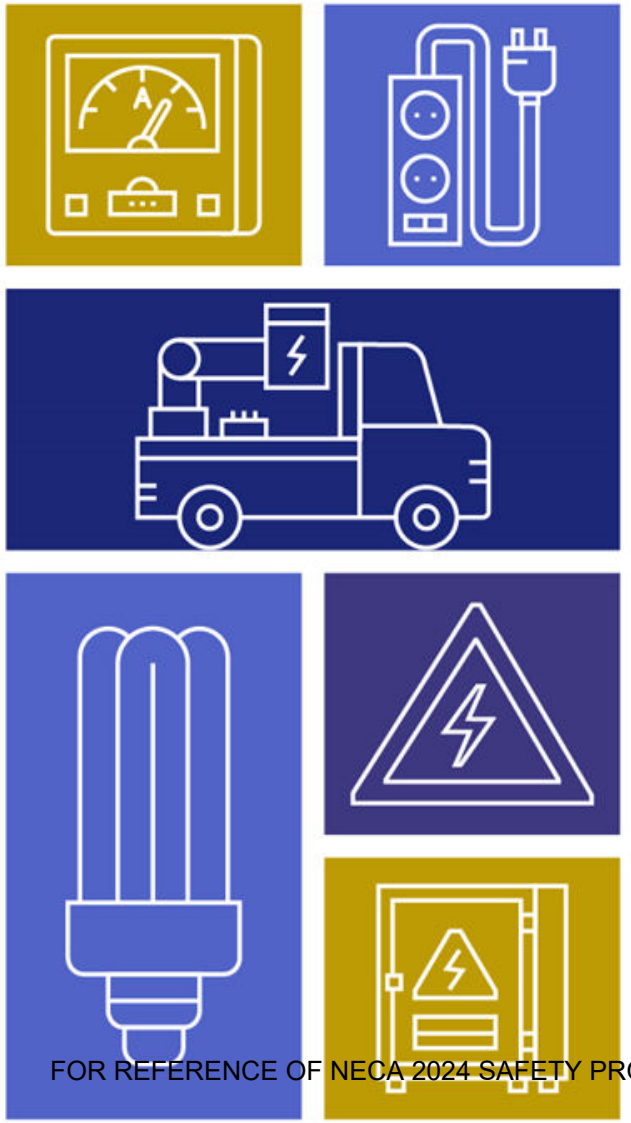
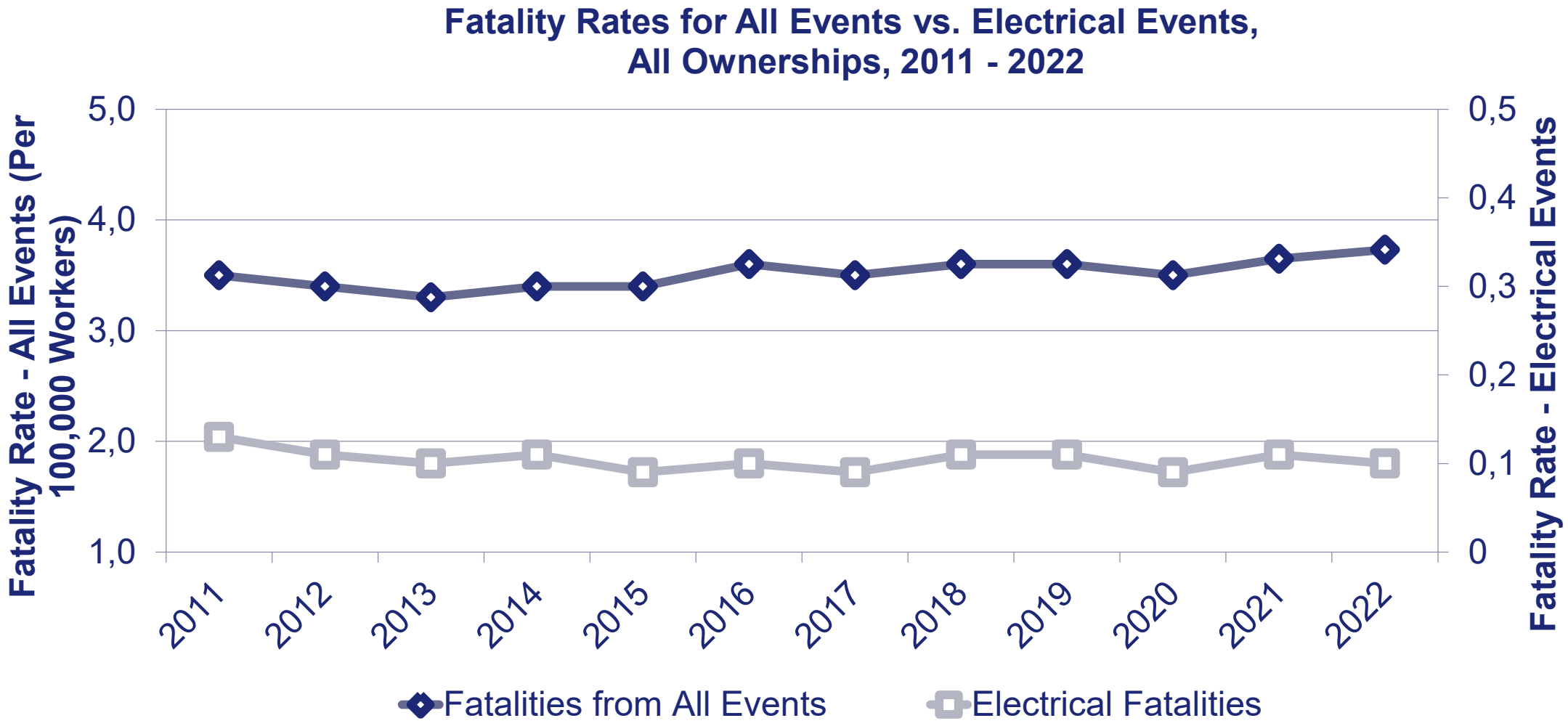


Bureau of Labor Statistics: Electrical Fatality Rates

Electrical Fatality Rates



Electrical Fatality Rates

Industries:

The construction industry had the highest number of electrical fatalities at 789 fatalities between 2011 and 2022.

- Professional and Business Services: 212 fatalities
- Trade, Transportation, and Utilities: 139 fatalities
- Natural Resources and Mining: 138 fatalities
- Manufacturing: 120 fatalities

Fatality rates:

- Electrical fatality rates per 100,000 workers have remained consistent while overall fatality rates have increased.
- Hispanic or Latino workers have the highest rate of electrical fatalities, and this rate is increasing.
- Construction and Extraction occupations, Installation, Maintenance, and Repair occupations, and Building and Grounds Cleaning and Maintenance occupations have the highest rate of electrical fatalities.

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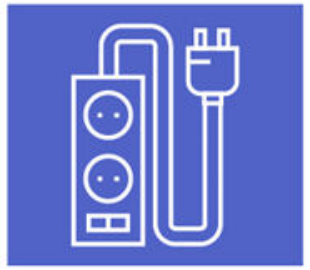
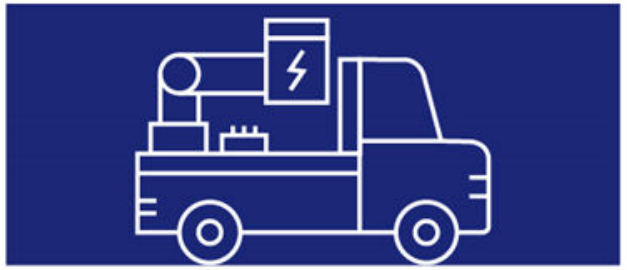
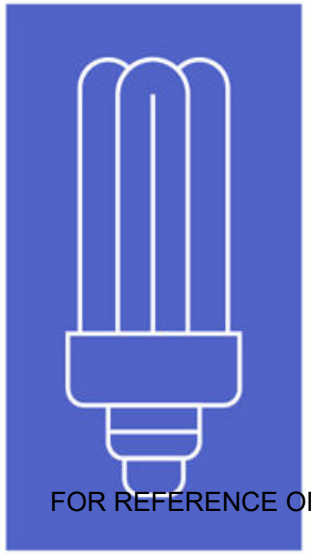






Emerging Technology Safety: Electric Vehicles

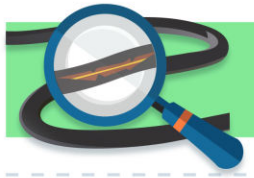
Electric Vehicle Supply Equipment Safety

Electric vehicles (EV) and EV supply equipment (EVSE) are safe as long as:

- All EV chargers are installed by qualified workers
- EV chargers are properly maintained and used
- Only approved adapters and chargers are used
- EVs and chargers are not modified

Electric Vehicle Charging Safety

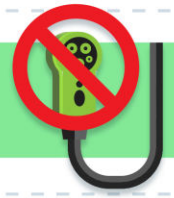
Stay **safe** while **charging** your electric vehicle



Visually inspect the charging cable before use. Never use a damaged charger

Follow the manufacturer's instructions on how to charge

Never use an extension cord or multiplug adapter when charging electric vehicles



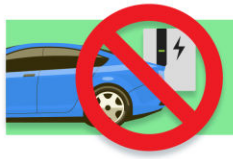
Only use manufacturer provided or approved charging cables.

Never alter or modify your electric vehicle or its battery

Properly store chargers when not in use to prevent damage

Cover chargers to manufacturer's specifications to avoid water damage

Ensure you have proper GFCI protection to protect against electric shocks



Be aware of your surroundings. Do not accidentally come in contact with chargers when driving or parking

Make sure your charging equipment has been certified by a Nationally Recognized Testing Laboratory

All electric vehicle chargers should be **installed by a qualified electrician**

Please ***share*** this ***free*** resource to save lives

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CONNECTED to SAFETY

Understanding Electric Vehicles

Are you thinking about purchasing, or have you recently purchased an electric vehicle? Learn about the different charging options you have and how to charge your electric vehicle safely.

HOME CHARGING EVSE

Electric Vehicle Supply Equipment

Before using a charger, ensure the equipment has been listed by a Nationally Recognized Testing Laboratory (NTRL).

Have a qualified electrician inspect your home to ensure your electrical system can handle charging.

Ensure both the charger and charging cord do not have damage before use.

LEVEL 1 EVSE CHARGING

Provides charging through a standard household plug. 2-5 miles of range per hour.

Ensure your charger or receptacle has GFCI protection to prevent accidental shocks and electrocution.

Ensure you are using a dedicated circuit to charge your vehicle. The circuit should not provide power to any other appliance.

Use a manufacturer provided charging cord.

LEVEL 2 EVSE CHARGING

Provides charging through specialized 240v charging equipment. 10 – 60 miles of range per hour.

Must be installed by a qualified electrician.

May require an electrical service upgrade to install.

Only use outdoor rated charging stations outdoors.

Ensure the charging station cannot come in contact with the electric vehicle.

Keep the charging cable off the floor to avoid tripping hazards and maintain the life of the cord.

LEVEL 3 EVSE CHARGING

Fastest charging option. Not available for residential installation.

WARNING

- Electric vehicles have high voltage batteries
- All maintenance should be completed by the manufacturer
- Avoid contact with high-voltage orange cables

Please share this free resource to save lives

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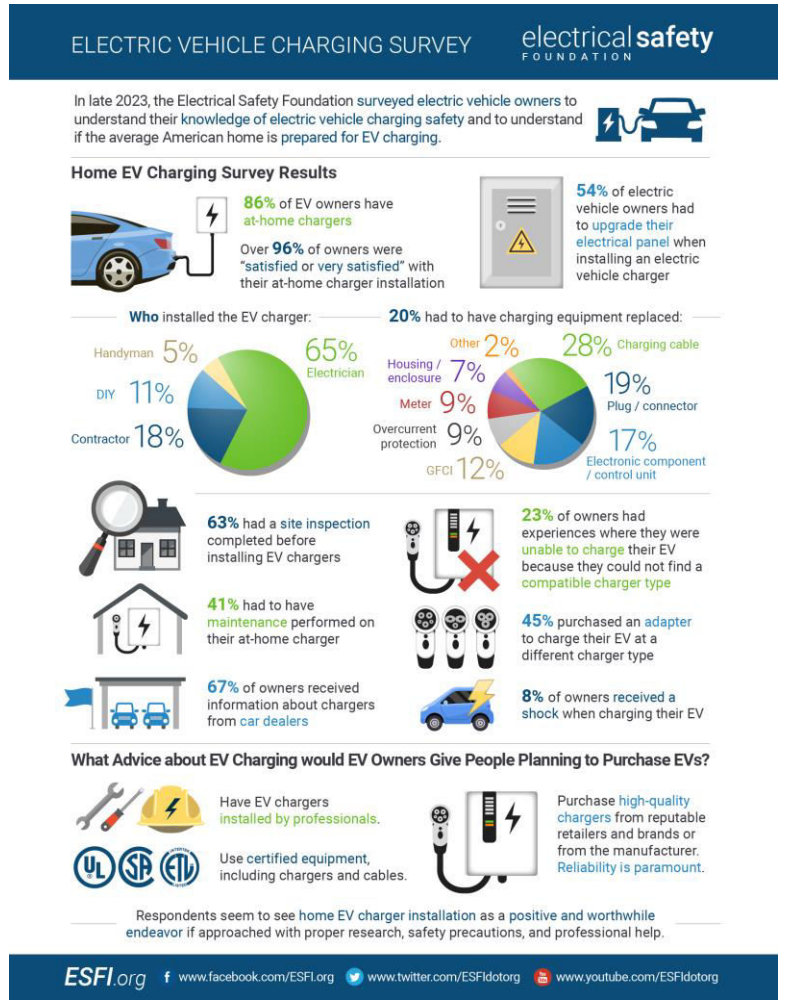
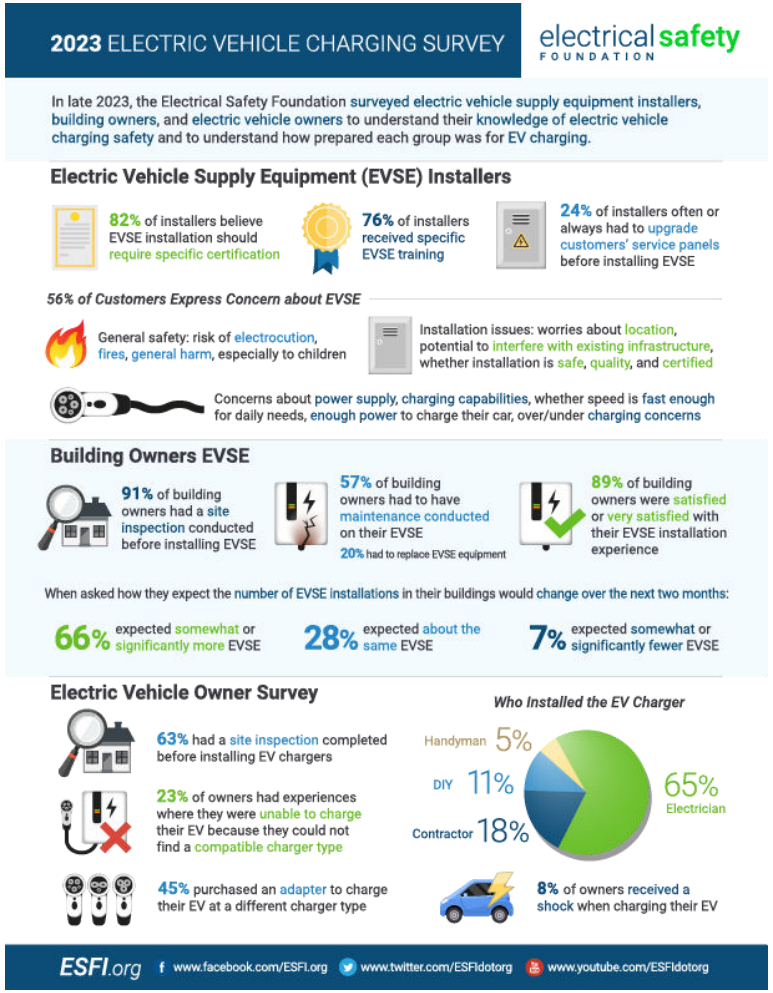
Electric Vehicle Supply Equipment Safety

- **85%** of EV owners have at-home chargers
  - **Over 95%** of owners were “satisfied or very satisfied” with their at-home charger installation
  - **65%** had the chargers installed by an electrician
- **65%** of electric vehicle owners had to upgrade their electrical panel when installing an electric vehicle charger
- **63%** had a site inspection completed before installing an EV charger
- **41%** had to have maintenance performed on their at-home charger



Electric Vehicle Supply Equipment Safety



EV Installers:

- 82% of installers believe EVSE installation should require specific certification
- 76% of installers received specific EVSE training
- 56% of customers expressed concern about EVSE

Building Owners EVSE:

- 91% of building owners had a site inspection conducted before installing EVSE
- 57% of building owners had to have maintenance conducted on their EVSE

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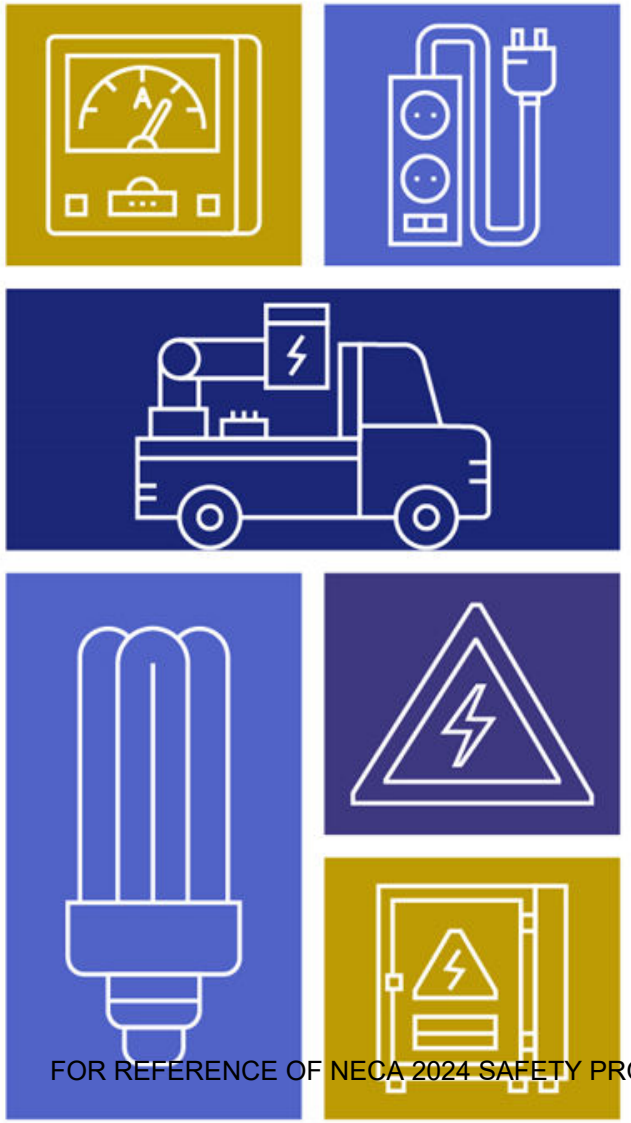


Emerging Technology Safety: Lithium-ion Battery Safety

Lithium-ion Battery Safety

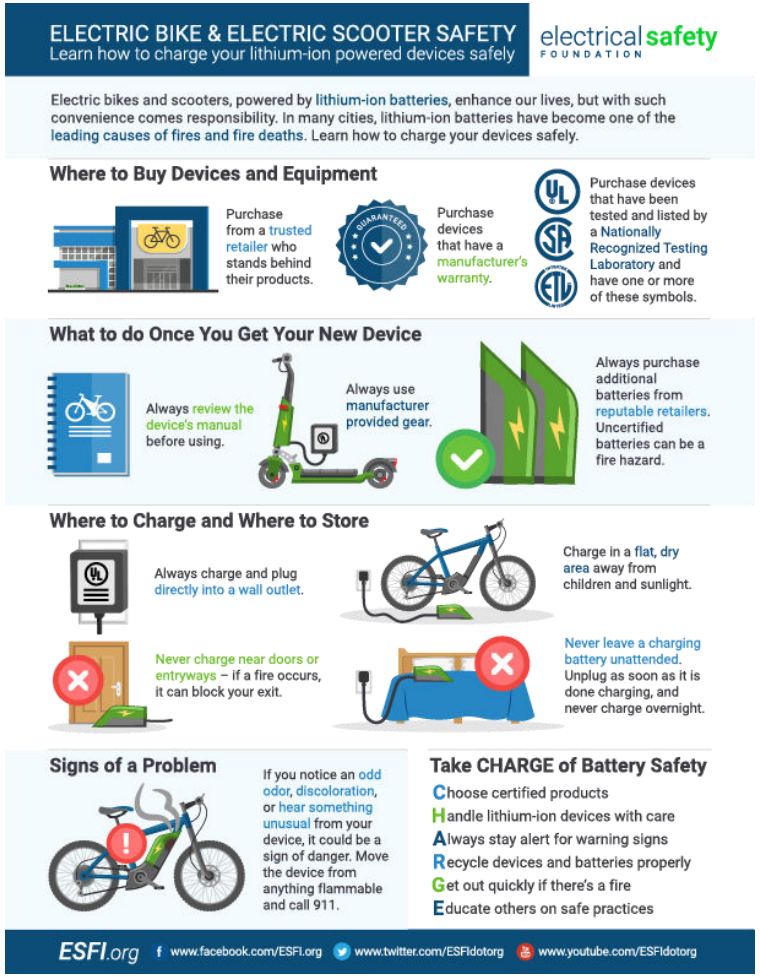
Background:

- Lithium-ion batteries can be found in all types of everyday electronics, including e-mobility devices, electric vehicles, cell phones, laptops, toothbrushes and more.
- Lithium-ion batteries, when sourced and used correctly, are safe.
- Improper sourcing, charging, or disposing of lithium-ion batteries may lead to fires, injuries, or even death.

Statistics

- Over 25,000 incident reports to the CPSC related to lithium-ion batteries.
- 10 deaths and 226 injuries in NYC alone between 2021 – 2022.
- More than 5,000 fires a year at recycling facilities are caused by lithium-ion batteries.

Lithium-ion Battery Safety



Where to purchase:

- From a trusted retailer
- Purchase only tested and listed devices
- What to do when you get a new device:
  - Always read the device's manual before using
  - Always use manufacturer-provided or authorized gear

How to charge the device:

- Always plug directly into the wall
- Never charge near doors or entryways
- Never leave a charging battery unattended

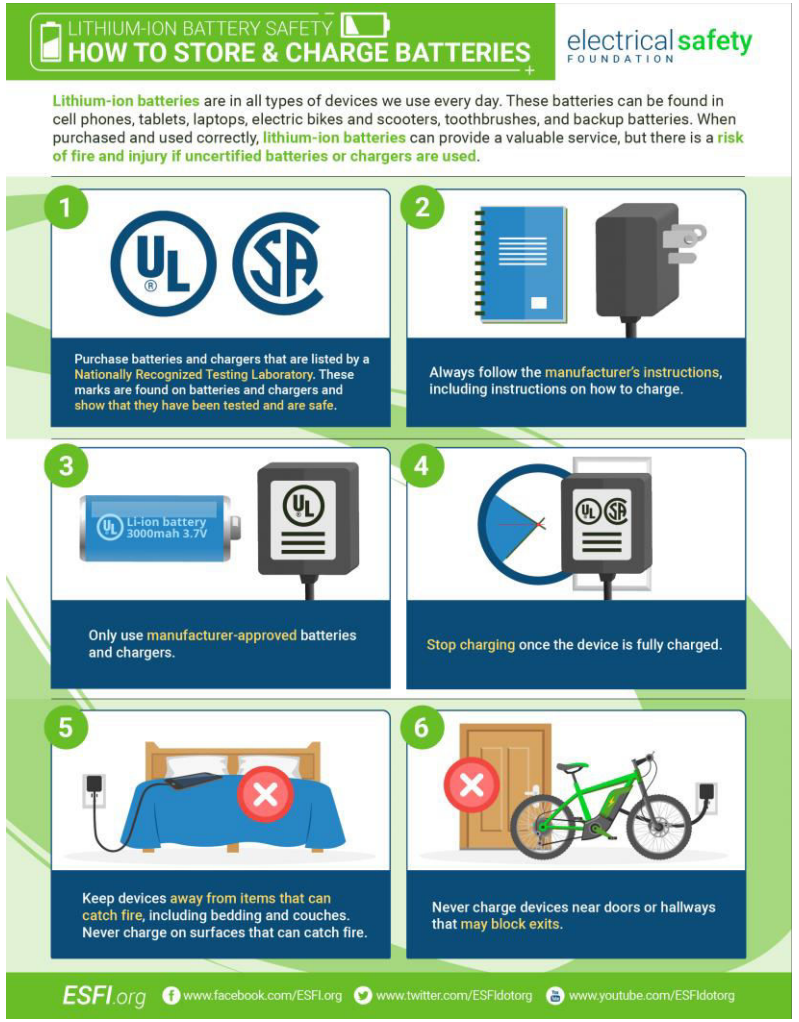
Lithium-ion Battery Safety: Consumer

Infographics:

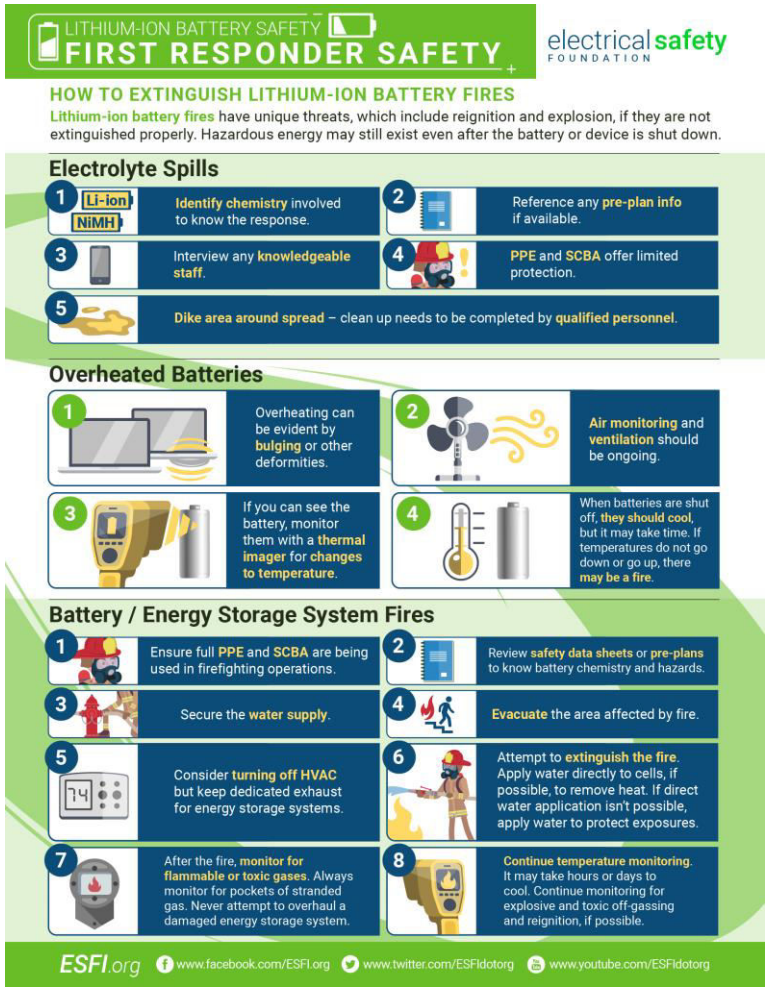
- How to Store and Charge Batteries
- How to Identify a Battery Problem
- How to Recycle

Videos:

- How to Store and Charge Batteries
- Where to Purchase Batteries
- How to Identify a Battery Problem
- How to Recycle (coming in spring 2024)



Lithium-ion Battery Safety: First Responder



Train the Trainer Program (Summer 2024):

An online virtual awareness program to educate first responders (fire, EMS, police) on how to identify battery fires and the unique dangers associated with them.

Infographics:

- How to Identify a Battery Fire
- How to Extinguish a Battery Fire

Lithium-ion Battery Safety: Transportation

Train the Trainer Program (Summer 2024):

An online virtual awareness program to educate transporters (tow trucks, waste management, recyclers) on how to identify battery-powered devices and how to transport and handle them correctly to avoid fires.

Infographics:

- Electric Vehicle Transportation
- Importance of Proper Recycling

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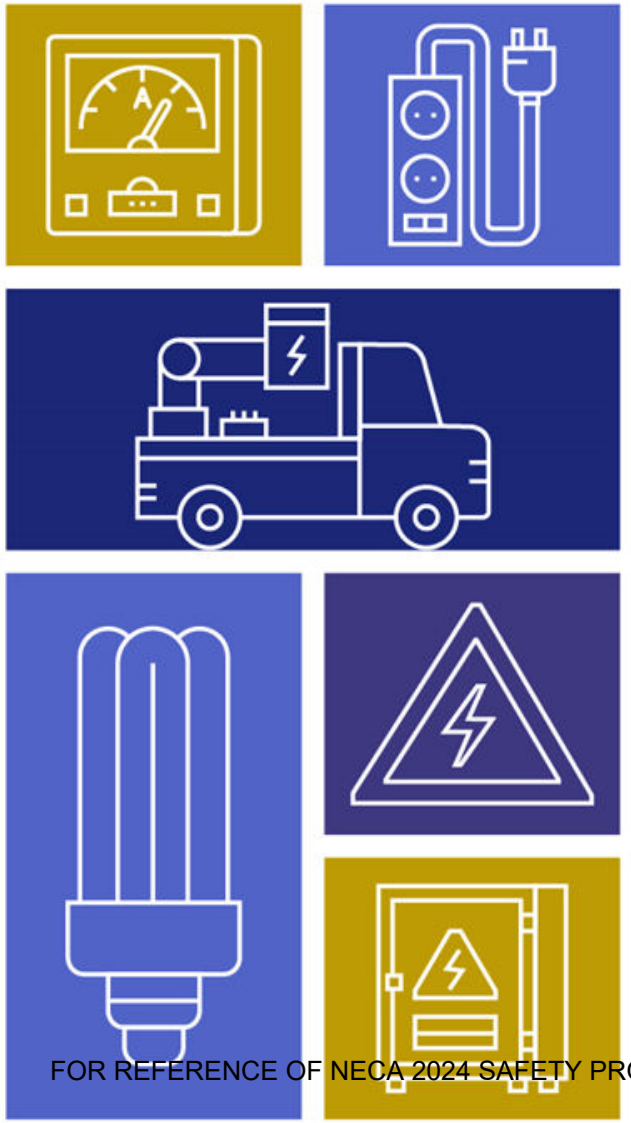
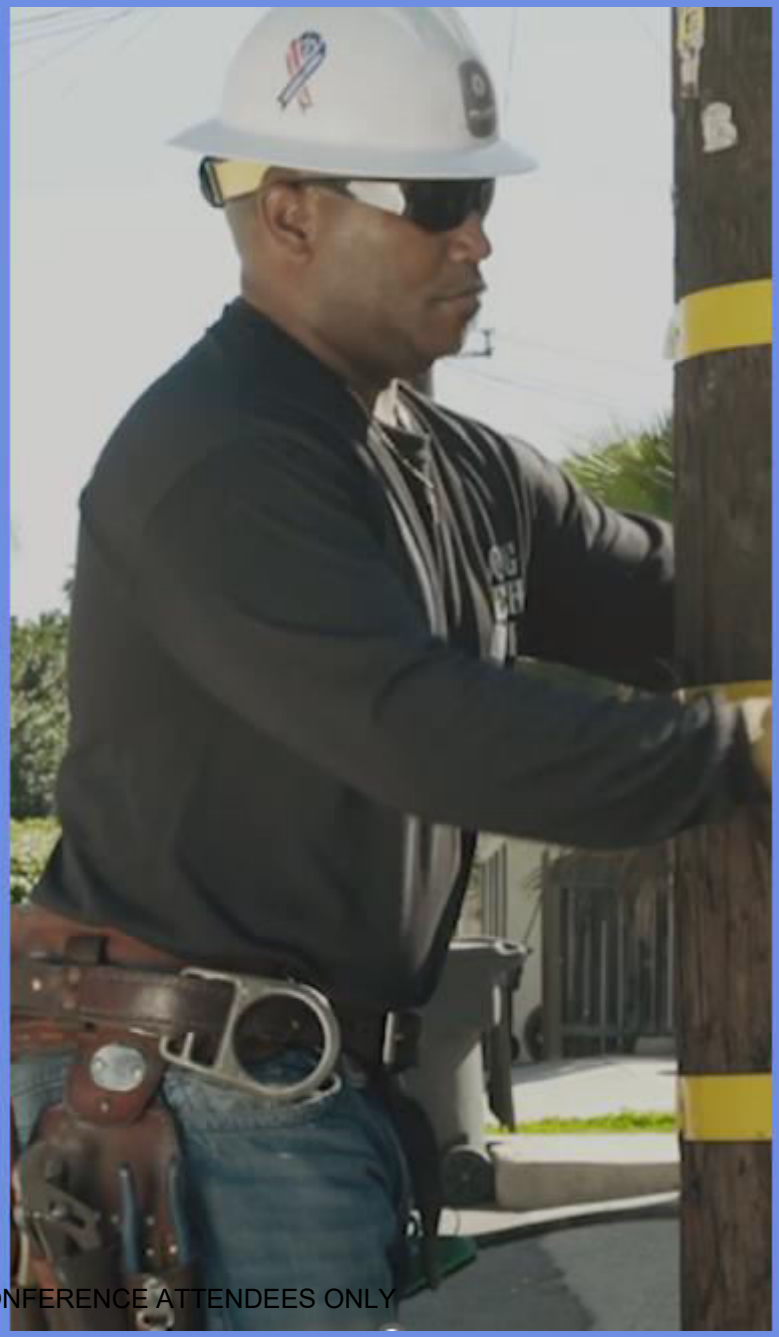


Conclusion



Conclusion

- Electrification is on the rise
  - Emerging areas of electrical safety: solar, energy storage systems, lithium-ion batteries, electric vehicles / electric vehicle supply equipment
- All electrical work should be completed by qualified workers
  - 70% of workplace electrical fatalities occur in non-electrical occupations
- Leading electrical fatality causes:
  - Working on or near energized equipment or parts: 48%
  - Overhead power line contact: 41%
- The construction industry has the highest rate of electrical fatalities

Conclusion

How to prevent electrical fatalities:

- Unexpected contact with electricity could be prevented by reminding qualified workers to always test before they touch or to check to see if parts are energized before work is completed.

- Overhead power line fatalities could be prevented by educating all workers on the dangers of overhead power line contact and reminding workers to always be aware of their surroundings, and to always look up in all ways when working on any job site.

- Non-electrical workers should be trained on how to understand normal operating conditions and recognize damaged wiring. Safety devices, such as permanently installed safety devices, could also prevent injuries by notifying workers of present voltage.

Thank you!

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Please Complete the Online Evaluation

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