

## U.S. Electrician Workforce

- 762,600 U.S. Electricians (excluding self-employed workers)
- Electricians represent one of the largest skilled construction trades in North America

Industry	Employment
Building Equipment Contractors	522,600
Employment Services	24,590
Local Government, excluding Schools and Hospitals	15,280
Nonresidential Building Construction	13,140
Utility System Construction	11,130

**Industries with the Highest Levels of Employment in Electricians**

*Occupational Employment and Wage Statistics (OEWS), May 2023, U.S. Bureau of Labor Statistics*

## Injuries and Illnesses

- Electricians, 2016-2020

**Chart 1. Number of nonfatal occupational injury and illness cases involving days away from work, electricians, private industry, 2016-2020**

**Chart 2. Incidence rate of nonfatal occupational injury and illness cases involving days away from work, electricians, private industry, 2016-2020**

*Source: U.S. Bureau of Labor Statistics, Survey of Occupational Injuries and Illnesses*

*The incidence rate per 10,000 full-time equivalent (FTE) workers*

## Injuries, Illnesses, and Fatalities

- Most Common Injury Types and Body Parts Affected Among U.S. Electricians (2020)

Category	Selected Injury/Event Pattern	Number of Cases
Nature of injury	Soreness / pain	1,840
	Sprains, strains, tears	1,670
	Cuts, lacerations	800
Body part affected	Knee injuries	860
	Hand injuries	750
	Back injuries	610

U.S. Bureau of Labor Statistics, Survey of Occupational Injuries and Illnesses, 2020.



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## Injuries, Illnesses, and Fatalities

- Common Injury Events and Exposures Among U.S. Electricians (2020)

Category	Selected Injury/Event Pattern	Number of Cases
Event/exposure	Struck by object/equipment	1,380
	Fall to lower level	880
	Exposure to harmful substances/environments	730

U.S. Bureau of Labor Statistics, Survey of Occupational Injuries and Illnesses, 2020.



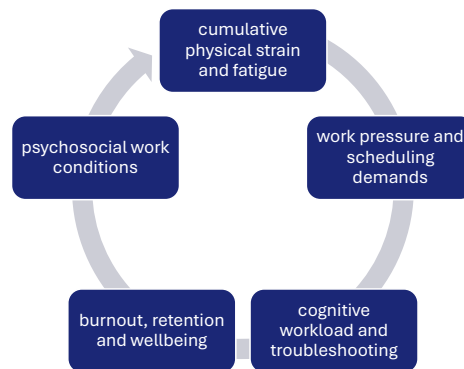
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## Beyond Electrical Hazards: Expanding the Conversation

National injury data show the burden electricians face. But injuries alone do not fully explain:

- management and peer/coworker support
- work pressure and role overload
- burnout and retention
- cumulative physical strain and fatigue
- psychosocial work conditions

**Key question: How do work organization, safety climate, resilience, and psychosocial factors influence electricians' safety and wellbeing?**



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## Ontario Construction Safety Surveys

- Quasi-longitudinal Onsite Worker Surveys, Ontario, Canada

Survey Period	Sample Size	Focus
2004–2006	911 workers, lead by Dr. Brenda McCabe U of T (retired)	safety climate, physical symptoms, psychological stress, unsafe events
	84 non-residential construction sites	
2015–2016	800 workers	<b>resilience safety climate</b> (management/supervisor/coworker support reporting, learning, anticipation, awareness), physical symptoms, psychological stress, unsafe events
	Over 60+ construction sites	



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### Ongoing U.S. Construction Safety Survey Efforts

- 2015–2016: 400+ onsite construction worker surveys collected in the United States
- 2024–2025: 188 surveys collected across 38 construction sites in North Carolina and South Carolina
- **Current Challenge**
- Electricians represented only a small portion of the U.S. samples (*fewer than 10 electricians in each survey round*)



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## Ontario Construction Safety Surveys (2004–2006)

- 911 construction workers surveyed directly on active construction sites
- Broad representation of frontline trades and supervisory personnel
- Electricians represented one of the largest skilled trade groups in the dataset

Trade	n (%)
Labourer	221 (24.3%)
Carpenter	183 (20.1%)
Plumber-Pipefitter	72 (7.9%)
<b>Electrician</b>	<b>67 (7.4%)</b>
Ironworker	52 (5.7%)
Sheet Metal	44 (4.8%)
Painter-Drywall-Taper	39 (4.3%)
Management/Supervision	72 (7.9%)
Other Trades	221 (24.3%)



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## Ontario Construction Safety Surveys (2004–2006)

- Workforce Characteristics (67 Electricians)

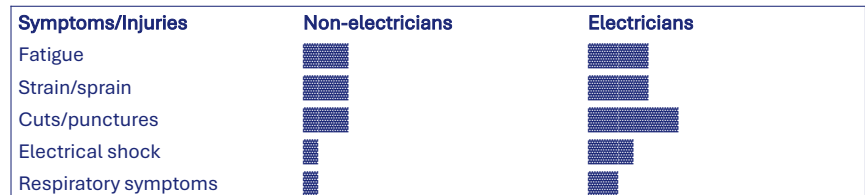
Variable	Interpretation
Age, 38	mid-career workforce
Construction experience, 15 years	experienced trade workers
Employer tenure, 6 years	moderate organizational stability
No. of projects in past 3 years, 6	dynamic/multi-project work
Weekly work hours, 42 hrs/week	regular work time



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## Ontario Construction Safety Surveys (2004–2006)

- Electricians reported greater physical symptom/injury burden (experiences during the previous 3 months on the job before taking the survey):
  - Electricians: Mean = 7.09
  - Non-electricians: Mean = 5.73



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## Ontario Construction Safety Surveys (2004–2006)

- Electricians reported greater psychological stress burden
  - Electricians: 4.17
  - Non-electricians: 3.52

Survey Question	Non-electricians	Electricians
Unable to concentrate on work-related tasks		
Felt constantly under strain		
Unable to enjoy normal day-to-day activities		
Felt incapable of making decisions		



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## Ontario Construction Safety Surveys (2004–2006)

- Electricians reported greater unsafe-event exposure
  - Electricians: 3.71
  - Non-electricians: 3.35

Unsafe Event / Exposure	Non-electricians	Electricians
Chemical / gas / fume exposure		
Slipped, tripped, or fell on same level		
Struck against fixed/stationary object		



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## Ontario Construction Safety Surveys (2004–2006)

- Statistically significant differences between electricians and other trades

Factor	Definition	Non-Electricians (Mean)	Electricians (Mean)	Direction	p-value
Conscientiousness	Careful and mindful when performing tasks	4.11	4.25	Higher among electricians	.019
Role overload	Feeling of having too many work tasks	2.37	1.94	Lower among electricians	.001

Likert Scale 1-5; 1: Strongly Disagree-5: Strongly Agree

Mann-Whitney U tests were used to compare electricians and non-electricians



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## Ontario Construction Safety Surveys (2004–2006)

- Statistically significant differences between electricians and other trades

Factor	Definition	Non-Electricians (Mean)	Electricians (Mean)	Direction	p-value
Management safety perception	Perception of management's commitment to safety	3.80	3.62	Lower among electricians	.047
Physical symptom burden	Cumulative work-related physical symptoms/injuries	5.73	7.09	Higher among electricians	.036

Mann-Whitney U tests were used to compare electricians and non-electricians



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## Ontario Construction Safety Surveys (2004–2006)

Factor	Physical Symptoms	Psychological Stress Symptoms	Unsafe Events
Work pressure	●	●	●
Interpersonal conflict	●	●	●
Supervisor safety perception	●	●	●
Leadership	●	○	●
Coworker safety perception	●	●	●

### Organizational Factors Associated with Electrician Outcomes

Where:  
 ● = associated with worse outcomes  
 ● = protective association  
 ○ = not significant.



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## Key Takeaways from the 2004–2006 Ontario Surveys

- Electricians consistently reported:
  - greater physical symptom burden
- Work pressure and interpersonal conflict were strongly positively associated with:
  - physical symptoms
  - psychological stress
  - unsafe events
- Supervisor and coworker safety support were strongly negatively associated with:
  - physical symptoms
  - psychological stress
  - unsafe events



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## Evolution of the Ontario Construction Safety Surveys

- The 2004–2006 findings emphasized traditional safety climate, physical burden, work pressure, and leadership.
- Over time, construction safety research expanded **toward resilience, adaptation, and organizational learning.**

2004–2006	2015–2016
<b>Traditional Safety Climate</b> <ul style="list-style-type: none"> <li>• physical symptoms</li> <li>• psychological stress</li> <li>• unsafe events</li> <li>• leadership &amp; supervision</li> <li>• coworker support</li> <li>• work pressure</li> </ul>	<b>Resilience-Oriented Safety</b> <ul style="list-style-type: none"> <li>• individual resilience</li> <li>• anticipation</li> <li>• awareness</li> <li>• learning culture</li> <li>• reporting culture</li> <li>• adaptive safety capacity</li> </ul>



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## Ontario Construction Safety Surveys (2015–2016)

- 800 surveys collected on site, from around 60+ sites
- 76 electricians, around 9.5%

Variable	Electricians (N = 76)	Key Observation
Age	36 years	relatively young skilled workforce
Construction experience	14 years	experienced trade workers
Employer tenure	6 years	moderate organizational stability
Number of employers (past 3 years)	2	relatively stable employment history
Number of projects (past 3 years)	10	dynamic multi-project work environment



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## Ontario Construction Safety Surveys (2015–2016)

Variable	Electricians (N = 76)	Key Observation
Weekly work hours	41 hrs /week	typical full-time construction schedule
Union membership	71%	majority unionized workforce
Safety committee participation	44%	substantial safety involvement

## Ontario Construction Safety Surveys (2015–2016)

Variable	Non-Electricians	Electricians	p-value
Age	36.8 years	36.0 years	.516
Construction experience	14.3 years	13.9 years	.760
Employer tenure	6.09 years	6.43 years	.651
Number of employers	2.33	1.60	.046*
Number of projects	10.25	10.01	.905
Weekly work hours	44.8 hrs	41.3 hrs	< .001

## Ontario Construction Safety Surveys (2015–2016)

- Safety climate and individual resilience comparison

Scale	Electrician Trend
Individual Resilience	slightly higher
Anticipation	slightly higher
Safety Knowledge	slightly lower
Management Commitment	slightly lower

## Ontario Construction Safety Surveys (2015–2016)

- Work pressure and interpersonal conflicts at work

Scale	Interpretation
Work Pressure (WP)	slightly higher among electricians
Role Overload (RO)	slightly lower among electricians
Conflict with Coworkers (ICWc)	slightly lower among electricians
Conflict with Supervisors (ICWs)	significantly lower among electricians

## Ontario Construction Safety Surveys (2015–2016)

- Physical symptoms, psychological stress, and unsafe Events

Outcome Measure	Non-Electricians	Electricians	p-value
Physical Symptoms	6.04	7.54	.049*
Psychological Stress	3.67	3.53	.820
Unsafe Events	3.67	4.16	.365

Physical symptom burden remained consistently elevated among electricians across analyses.



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## Ontario Construction Safety Surveys (2015–2016)

Factor	Physical Symptoms	Psychological Stress	Unsafe Events	Work Pressure	Interpersonal Conflict
Awareness	●	○	●	●	●
Learning	○	○	○	●	●
Anticipation	○	○	○	●	○
Management Commitment	○	○	○	●	○
Work Pressure	●	●	●	—	●
Role Overload	○	●	○	●	○
Interpersonal Conflict	○	●	●	●	—

Bootstrap Spearman Correlations, Electricians Only, N = 35

● = protective association  
● = associated with worse outcomes  
○ = non-significant relationship



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## Ontario Construction Safety Surveys (2015–2016)

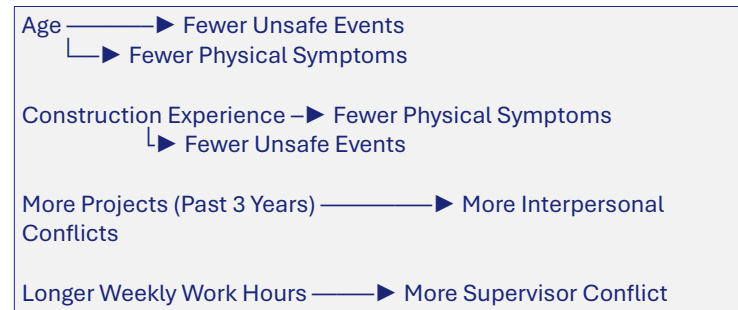
Finding	Implication
Work pressure ↑	greater psychological stress and more unsafe events
Awareness ↑	fewer unsafe events, lower work pressure and fewer workplace conflicts
Learning culture ↑	lower work pressure and fewer workplace conflicts
Interpersonal conflicts ↑	greater psychological stress and more unsafe events

Bootstrap Spearman Correlations, Electricians Only, N = 35



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## Ontario Construction Safety Surveys (2015–2016)



Bootstrap Spearman Correlations, Electricians Only, N = 35



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## Key Takeaways from the 2015–2016 Ontario Surveys

- Electricians demonstrated:
  - stronger anticipation and individual resilience tendencies
  - lower interpersonal conflicts at work
  - elevated physical burden despite fewer work hours
- Greater safety awareness, stronger learning culture, and more management commitment were associated with more favorable worker wellbeing and safety outcomes.
- Work pressure remained one of the strongest factors associated with:
  - psychological stress
  - unsafe events



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## Electrician Voices from Reddit Data

### Reddit Dataset Overview

- Original dataset contained approximately **15,000+ worker-related Reddit posts**
- Posts represented discussions from workers across multiple occupations and industries
- The broader dataset was developed to examine occupational risk factors, such as heat stress and noise, and worker wellbeing



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## Electrician Voices from Reddit Data

### Electrician-Focused Subset

- 226 electrician-related posts were extracted for this analysis
- Quotes were included only when the user clearly identifies as electrician, apprentice, sparky, journeyman, or electrical-company role



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## Apprentice Electricians: Anxiety, Mistakes, and Cognitive Overload

*“Depressed over mistakes today - I’m an **Apprentice electrician** and made a few small and 1 big mistake*

*The main 1 was that I was opening big steel gates for my foreman to drive out of site. 1 side of the steel gates got blown by wind and it smacked into the back of his van. No major damage maybe just a scrape.*

*I struggle with depression and anxiety and this is just killing me. I’m 21 year old man and feeling really bogged down over it.”*



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## Apprentice Electricians: Anxiety, Mistakes, and Cognitive Overload

*"Anyone else hate it when people think you're dumb when it's actually anxiety? - For instance, I have a new job and it's in construction. There a lot of new people there that I don't know, there's a lot of new situations, it's pretty stressful and I don't know what I'm doing half the time because I'm an apprentice.*

*When I'm in these situations it's like my brain doesn't function, it doesn't think logically at all because it's stressful. It just doesn't work.*

*My boss was telling me very important information the other day and added a joke in the middle of it, although because I knew I had to listen and take the information in, I didn't catch the joke. Because I didn't catch it there was a few people who were laughing at me not getting it, thinking I was thick.*

*Anyone else feel like this?"*



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## Informal Learning and Safety in Real Field Conditions

*"Need some advice with concrete drilling - Ok so I'm drilling out 10mm holes (masonry bit with an 18v Hitachi hammer drill/drill/driver on hammer on fastest speed). I've burned through 2 bits already (I've done 52 holes so far and the concrete is all varied densities and strengths and probably material) and I've got about another 100 to do.*

*Now it could just be I've hit some really shitty spots, there's no rebar in these blocks, they are just a block with a single conduit in the centre which goes down far deeper than I'll drill, I'm an **apprentice sparky** so I've ensured everything's dead etc, we're replacing bollard lamps with solar powered ones.*

*Basically I started using water to keep the bit cool and help with a bit of chomping, just pouring it in the hole as I went. However is there a better way to go, more pressure, less pressure, etc.*



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## Heat, Schedule, and "Toughness" Culture

*"Why is waking up early viewed as a measure of how tough you are? - I'm an electrician and we work from 7am to 330pm. Sometimes we start at 6am in the summer and work until 230 because we are on alot of commercial roofs with tar and shit, **it gets too hot to move around up there.***

*Anyways, why the fuck do so many dudes flex about waking up at 4:30? "Oh I don't like to waste no time, I ain't one for being lazy and sleeping in" type of mentality. Who gives a fuck grandpa? You probably go to bed at 8. **I like to stay up later. You like to wake up earlier. What does it matter?** I will go work whenever I am needed as long as I feel like I am being fairly compensated. That doesn't mean I like it and I'm not a pussy for not liking it. It seems like some guys are gluttons for punishment."*



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## Cumulative Physical Injury Over Time

*"I'm an electrician and before that I poured and finished concrete and gypsum flooring. I'm 39 with 4 bulging lbar discs of varying degrees. **Spine health was never my concern until it had to be.**"*



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## When Electrical Hazards Are Not What They Seem

*"I'm an electrician. Got a service call from a GC on a newly built condo: 'Smelled electrical and is hot in garage.' My camera showed heat in the floor, but there were no electrical feeders in the area. We checked the panels, readings, and shut everything down — found zero electrical anomalies. They eventually started investigating the hot water route instead."*

## Burnout, Compensation, and Retention in the Electrical Trade

*"Everything about it is getting to me: waking up early, long drives, hard labor... My sleep is worse... I'm less motivated and less productive... The weekend isn't enough time off."*

*"Underpaid for the work we do. Lack of mental health support. No time for burnout. I'm going back to school to get a degree."*

## Conclusions

### Electrician safety extends beyond traditional electrical hazards

Across multiple datasets, electricians reported:

- elevated physical burden
- psychological strain
- unsafe-event exposure
- work pressure and fatigue challenges

## Conclusions

### Organizational and psychosocial factors matter

Electrician outcomes were strongly connected to:

- work pressure
- interpersonal conflicts at work
- Supervisor and coworker support
- learning and awareness
- resilience-oriented safety factors

## Conclusions

### From Reddit Narratives

#### Apprentices described:

- anxiety under uncertainty
- cognitive overload on unfamiliar jobsites
- pressure to avoid mistakes
- reliance on peer learning and field support

#### Burnout and retention concerns were strongly connected to:

- early schedules
- long drives
- hard labor
- limited recovery time
- compensation and career sustainability



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## Future Opportunity

### Expand Electrician-Centered Research

- Develop larger electrician-focused datasets across North America
- Conduct longitudinal studies on:
  - safety climate
  - burnout and retention
  - psychosocial work conditions
  - resilience and adaptive safety capac



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## Future Opportunity

### Industry–Research Collaboration

Future collaboration with:

- NECA
- electrical contractors
- apprenticeship programs
- safety professionals

could support:

- broader field data collection
- worker-centered safety research
- evidence-based intervention strategies



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