

# Preventing Electrical Hazards through Pre-Task Planning

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# Project AIMS

**Project Title:** Prevention through Augmented Pre-Task Planning

**AIMS:** Enhance the quality of JHA and Pre-task Planning, particularly in electrical construction:

- Partner with electrical contractors of various sizes, unions, and associations
- Develop ready-for-impact “Electrical Task Challenges & Solutions” documents informed by workers’ input
- Disseminate findings and make them publicly available through CPWR’s R2P and Communications channels

# Partnership & Industry Advisory Group

## Unions & Associations

- NECA (DC & Seattle Chapters)
- IBEW

## General Contractors

- Clark Construction
- Penta Group

## Electrical Contractors

- Rosendin Electric
- MC Dean Building Intelligence
- FreeState Electric
- Contemporary Electric
- Valley Electric
- Aarow Electric

## Conducted 18 meetings to date to:

- Provide guidance on project direction
- Provide access to jobsites
- Provide feedback on research findings and outputs



# High-risk Electrical Tasks Repository



- Identified 14 high-risk electrical tasks/operations based on input from 15 electrical contractors.
- Identified contributing work factors.
- A manuscript on these findings was accepted for publication by the Professional Safety Journal (ASSP).

## High-risk Electrical Tasks and Contributing Work Factors

Babak Memarian, Sara B. Brooks, Jean Christophe Le, and Jerry E. Rivera

*Professional Safety Journal (Accepted – in print August 2022)*



# Enhanced JHA & Pre-task Planning



## JHA/JSA gap analysis; shortcomings, challenges, and effective practices

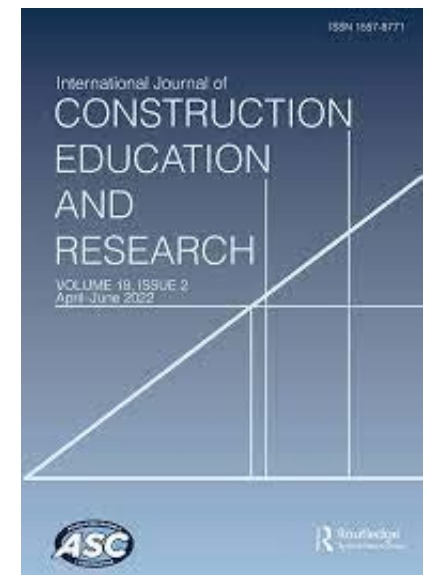
- Reviewed 30 sample JHA documents
- Interviewed 23 construction safety and health professionals representing 17 companies
- A peer-reviewed article published based on findings of this step

### **Obstacles and Solutions to Implementing Job Hazard Analysis in Construction: A Case Study**

Babak Memarian, Sara B. Brooks, and Jean Christophe Le.

*International Journal of Construction Education and Research* (January 2022)

<https://doi.org/10.1080/15578771.2022.2027053>



# Enhanced JHA & Pre-task Planning

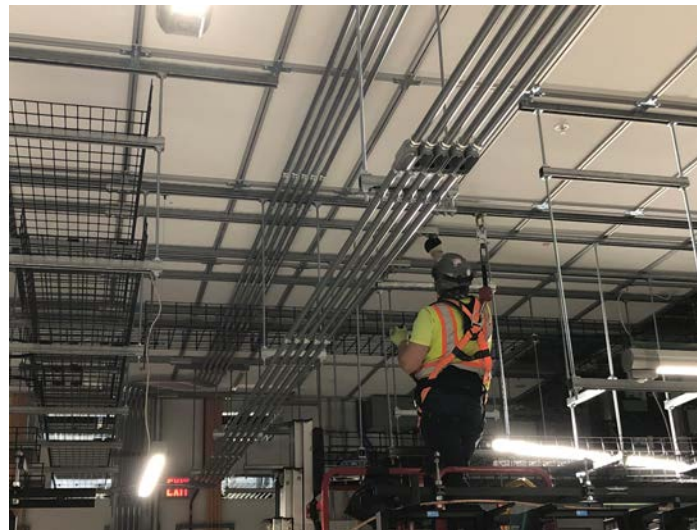
- Interviews with electrical workers to assess task difficulties and explore contributing work factors:
  - Physical
  - Mental
  - Temporal
  - Environmental
  - Frustration
  - Other
- Conducted 6 field studies to date.
- Conducted 80 in-person onsite interviews with electrical workers.



# Electrical Tasks Studied to Date

## 18 electrical tasks studied to date:

- Overhead Conduit Installation
- Installing Lighting Tracks & Supports
- Site Preparation and Layout
- Pulling Wire
- Terminations
- Electrical Demolition
- Cable Tray Installation
- Grounding
- Busway Installation
- Material Handling/Logistics
- Wiring AC Units
- Connecting Building-to-Building Conduit
- Access Card Readers Installation
- Fire Alarm Components Installation
- Receptacles Installation
- Branch Circuits Installation
- Pre-fabricated Components
- QA/QC



# “Electrical Task Challenges & Solutions” Documents

- Organized based on Task and Project Type
- Applicable for JHA, Pre-Task Planning, and Training
- Contains task-specific challenges raised by workers
- Visualizes the situation using images
- Recommends solutions
- Easy to download and use in PDF and MS Word format
- Customizable for specific project needs
- 33 ready-for-impact task-specific documents for different tasks under various project types

TASK: \_\_\_\_\_ PROJECT TYPE: \_\_\_\_\_

**Summary:**  
**Location:**

**The following page(s) list the challenges that workers identified while performing this task and recommendations for improvement.**

Challenges are organized into the following categories:

**Physical/Ergonomic** challenges pertain to musculoskeletal activity required to perform a task such as pushing, pulling, turning, controlling. Moreover, it gauges the biomechanical complexity versus simplicity in performing a task.

**Mental/Frustration** challenges pertain to mental and perceptual activity required to perform a task such as thinking, deciding, calculating, remembering, looking, searching. Moreover, it gauges worker discouragement, irritation, stress and annoyance versus security, gratification, contentment, and comfort.

Type	Workers' Challenge	Recommendations and Suggestions
Physical/Ergonomic		
Mental/Frustration		
Mental/Frustration and Physical/Ergonomic		



# “Electrical Task Challenges & Solutions” Documents (cont.)

TASK: Overhead Conduit Installation

PROJECT TYPE: Commercial Building Renovation

TASK: Overhead Conduit Installation PROJECT TYPE: Commercial Building Renovation

**Summary:** Overhead conduit and component installation took place in a partially closed public museum undergoing renovation and expansion in winter. Work was performed in the presence of fragile, unmovable historic artifacts.



**Location:** Urban center in US Mid-Atlantic region.

The following page(s) list the challenges that workers identified while performing this task and recommendations for improvement.

Challenges are organized into the following categories:

**Physical/Ergonomic** challenges pertain to musculoskeletal activity required to perform a task such as pushing, pulling, turning, controlling. Moreover, it gauges the biomechanical complexity versus simplicity in performing a task.

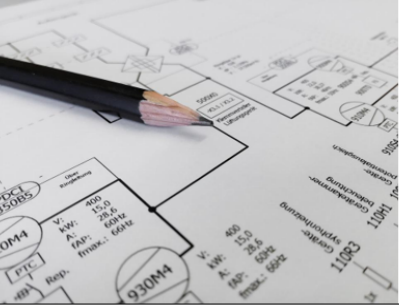

**Mental/Frustration** challenges pertain to mental and perceptual activity required to perform a task such as thinking, deciding, calculating, remembering, looking, searching. Moreover, it gauges worker discouragement, irritation, stress and annoyance versus security, gratification, contentment, and comfort.



Type	Workers' Challenge	Recommendations and Suggestions
Physical/Ergonomic	<p><b>Tight space:</b> Assembling conduit in tight spaces requires awkward postures.</p> 	<p><b>Substitution:</b></p> <ul style="list-style-type: none"> <li>Use manageable prefabricated components if feasible</li> </ul> <p><b>Administrative Control:</b></p> <ul style="list-style-type: none"> <li>Conduct daily pre-task planning with crew at beginning of work shift</li> </ul>
	<p><b>Manual wire pulling:</b> Cannot use tuggers for wire size 8 or smaller, or for larger wire when it is shorter than 300 ft.</p> 	<p><b>Engineering Control:</b></p> <ul style="list-style-type: none"> <li><a href="#">Use wire-dispensing cart</a></li> </ul> <p><b>Administrative Control:</b></p> <ul style="list-style-type: none"> <li>Conduct daily pre-task planning with crew at beginning of work shift</li> <li>Pull with a partner</li> <li>Rotate workers if feasible</li> <li>Plan for breaks</li> </ul> <p><b>Personal Protective Equipment:</b></p> <ul style="list-style-type: none"> <li>Use proper gloves for pulling</li> </ul>

# “Electrical Task Challenges & Solutions” Documents (cont.)

TASK: Overhead Conduit Installation

PROJECT TYPE: Commercial Building Renovation

Type	Workers' Challenge	Recommendations and Suggestions
<b>Mental/Frustration</b>	<p><b>Information retention:</b> Remembering circuits installed and conduits run months earlier.</p> 	<p><b>Administrative Control:</b></p> <ul style="list-style-type: none"> <li>Provide Toolbox Talks on <a href="#">Workplace Stress</a></li> </ul>
	<p><b>Poor communication and coordination:</b></p> <ul style="list-style-type: none"> <li>Miscommunication with GC, coworkers, and other trades onsite.</li> <li>Lack of coordination and proper work sequencing.</li> </ul> 	<p><b>Administrative Control:</b></p> <ul style="list-style-type: none"> <li>Use <a href="#">Safety Climate-Safety Management Information System</a></li> <li>Conduct daily pre-task planning with crew at beginning of work shift</li> <li>Involve all project stakeholders (subs, GC, engineers, architects) during pre-planning meetings</li> <li>Use a unified communication platform to coordinate information among all stakeholders</li> </ul>

Type	Workers' Challenge	Recommendations and Suggestions
<b>Mental/Frustration and Physical/Ergonomic</b>	<p><b>Working at heights:</b> Tying off and pulling wire on ladders at heights and in tight spaces.</p> 	<p><b>Engineering Control:</b></p> <ul style="list-style-type: none"> <li>Use <a href="#">scissor lift if feasible</a></li> <li>Use a tool harness or build a temporary table/shelf or beam clamp to hold material if feasible</li> <li>Install improved lighting</li> </ul> <p><b>Administrative Control:</b></p> <ul style="list-style-type: none"> <li>Conduct daily pre-task planning with crew at beginning of work shift</li> <li>Use signage to inform others worker of current location</li> <li>Use the buddy system</li> <li><a href="#">Provide ladder, fall protection, and ergonomics training, including visual aids and recent incidents</a></li> <li>Plan ahead to avoid multiple trips up/down the ladder</li> </ul>
	<p><b>Obstacle obstruction:</b> Multiple measurements required to bend materials to accommodate existing racks and ducts.</p> 	<p><b>Administrative Control:</b></p> <ul style="list-style-type: none"> <li>Use <a href="#">Building Information Modeling to pre-plan</a></li> <li>Conduct daily pre-task planning with crew at beginning of work shift</li> <li>Involve all project stakeholders (subs, GC, engineers, architects) during pre-planning meetings</li> </ul> <p>Use a unified communication platform to coordinate information among all stakeholders</p>

# Thanks!

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