Electrical Task Analysis Document

Access Card Reader Installation, Fire Alarm Component Installation, and Lighting Circuit Installation

CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

What is this document for?

This document contains task-specific conditions and recommendations compiled from onsite observations and interviews with electrical workers and industry practitioners. It addresses safety and health hazards as well as production challenges associated with the task. This document can be used for training, hazard analysis, and pre-task planning. This information was gathered from new construction projects including a data center, a mixed use office building, a gas-insulated substation, and a commercial distribution warehouse, as well as retrofit projects including a mixed use office building and a public museum.

Task Description:

- **Access Card Reader Installation** is usually performed next to doorways and involves drilling holes through door frames or studs for wires to pass through. It also involves planning pathways for conduit runs from a card reader box to a power source.
- **Fire Alarm Component Installation** involves installing fire alarm horns, strobes, smoke detectors, and other related devices. It requires measuring, cutting, and bending conduit pipes to specific angles unique to a job layout. It also involves planning pathways for conduit runs, wire pulling, and connecting components. Required equipment includes manual or hydraulic benders. Ladders or lift equipment may be required for overhead installations.
- **Lighting Circuit Installation** involves installing lighting systems and components such as work boxes and lighting tracks. It requires planning pathways, pulling wires, and distinguishing between power sources for connections. Required equipment includes manual or hydraulic benders. Ladders or lift equipment may be required for overhead installations.

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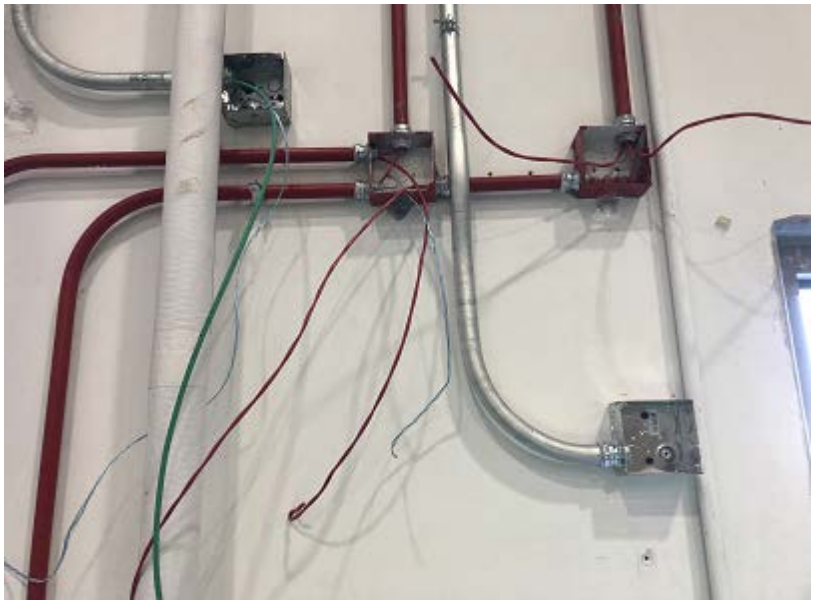
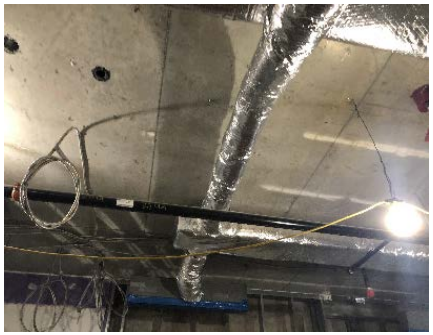
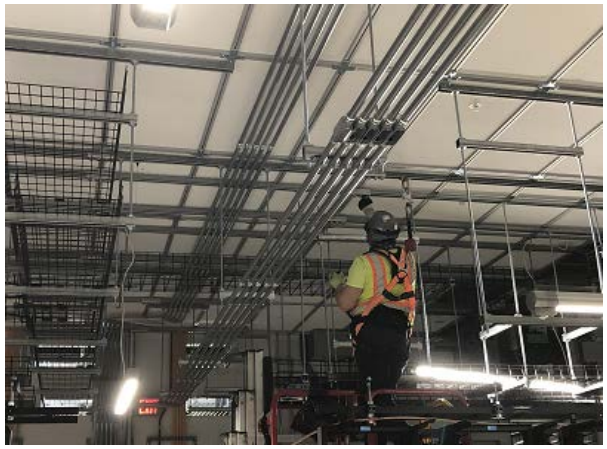
CONDITIONS	RECOMMENDATIONS
Pulling heavy wire through studs: Manually pulling heavy access card reader wires and guiding them through studs can raise the risk of ergonomic injuries and lacerations.	• Wear kevlar sleeves when placing hands through studded areas • Puller attachment for cordless drill
Pulling fragile wires: Pulling fragile fire alarm wires through conduit bends can be time-consuming and can lead to rework if the wire is damaged. 	• Use manual cable pullers with associated cable heads

CONDITIONS	RECOMMENDATIONS
Repetitively pushing metal clad wires through walls: Pushing metal clad wire through the upper portion of the wall for long periods of time can lead to fatigue and raise the risk of ergonomic injuries. 	• Increase the frequency of breaks • Rotate workers if feasible • Stretch and flex
Improperly connected wires: The fire alarms are interconnected. If one fire alarm is not properly wired, the alarms further down the chain will not work. This can lead to work delays due to troubleshooting. 	• Do a simple sketch of the installation layout • Review device instructions and wiring diagrams • Building Information Modeling (BIM)

CONDITIONS	RECOMMENDATIONS
Fixing incorrectly installed components: If doors, receptacle boxes, or wiring are installed incorrectly, workers must wait for them to be fixed before installation can continue, leading to delays. For example, if doors are installed backwards or are flipped to be mirror images of each other, workers must wait for them to be fixed before access card reader installation can continue.	• When rework is needed, a member of supervision needs to conduct a pre-task plan to ensure conditions have not changed • Building Information Modeling (BIM) • Pre-Task Planning (PTP) Guidelines and Resources for Construction
Planning wire route around obstructions: Figuring out where the main feed is located as well as identifying obstacles and the best path to the installation point is critical to prevent mistakes and resulting rework. For example, planning an optimum route from a card reader to an overhead cable tray while avoiding overhead ducts.	• Coordinate work sequencing with other trades prior to beginning work • Building Information Modeling (BIM)
Working around historical artifacts in a museum renovation: Ensuring vertical lighting supports are not bent during installation between and around fragile historical artifacts.	• Building Information Modeling (BIM)
Ensuring fire alarm components are not grounded during installation: If combination devices like fire alarm speakers are grounded during installation, there will be audible static.	• Use appropriate insulation materials • Conduct thorough testing after installation to ensure the device is functioning correctly and not experiencing any static issues

CONDITIONS	RECOMMENDATIONS
Distinguishing power source for connections under time pressure: Figuring out which circuit to connect to under time pressure can lead to misclassification and faulty connections. 	• Label and color code wires, lighting, and power sources based on the circuit numbers and color codes in the drawings • Circuit tracer
Restrictive fall protection harnesses: Fall protection harnesses may restrict movement while working on a boom lift, which can lead to poor body postures and work disruption. 	• Consult with fall protection manufacturer for adequate equipment selection • Don formfitting fall protection harness based on employee size and ensure a snug fit before commencing work

CONDITIONS	RECOMMENDATIONS
Prolonged use of tools overhead: Repetitively lifting and holding tools overhead for lighting installation can lead to fatigue and raise the risk of ergonomic injuries.	• If feasible, use overhead drill press or overhead ratchet drill • Install permanent recessed anchor thread system • Best Built Plans for safe material handling • Embedded anchor point system
Installing under time pressure: Construction tasks are usually tightly interdependent, which means that one step cannot start before the completion of the previous step. This time pressure can cause rushing and increase the likelihood of mistakes. For example, this can happen when receptacles must be installed in a short period of time between the wall studs going up and drywall installation.	• If feasible, prefabricate receptacles with pigtails for easier wiring connections • Building Information Modeling (BIM) • Pre-Task Planning (PTP) Guidelines and Resources for Construction • Last Planner® System; Last Planner® System Workbook

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