

## **Industrial Electrician**

### **Task 5: Installing Electrical Conduit**

#### **Acknowledgement**

*The Alberta Construction Safety Association (ACSA) with the cooperation of member companies and their electrical contractors/workers, the Electrical Contractors Association of Alberta and Jason Shepherd Physical Therapy Inc. developed this electrical industry Physical Demands Analysis.*

#### **Disclaimer**

*The job tasks described in this report & related video footage may vary, please contact the company directly to confirm this job description is accurate.*

#### **Purpose of Task Analysis**

Job demands information that can be utilized for assistance in selecting suitable job candidates, developing proactive injury prevention interventions and effective, sustainable disability management programs.

#### **General Description**

The electrician is responsible for the installation of electrical conduit and associated electrical components as per the building's electrical blueprints.

#### **Work Organization**

Journeyman and Apprentice Electrician numbers vary by work site and company. Depending on the construction phase/type, an Electrician may be part of a crew performing this task for several weeks before rotating to another task.

#### **Work Schedule**

8+ hour shifts  
Regular breaks spaced throughout workday: Usually two 15-minute coffee breaks and one 30-minute lunch break per shift

### **Essential Job Functions**

- Drilling holes into concrete
- Installing metallic/non-metallic conduit
- Laying out conduit in concrete slab (core line)
- Bending/cutting pipe
- Clean-up (Sweeping, picking up waste materials)
- Materials handling

### **Equipment used to perform the job & Frequency of Use:** **(May include, but not exclusive to the following)**

<b>Assessment Criteria Used</b>		
<b>Frequency Key</b>		
<b>FREQUENCY</b>	<b>% OF WORKDAY</b>	<b>HOURS OF 8-HOUR WORKDAY</b>
<b>Not required (N/R)</b>	<b>0%</b>	<b>0</b>
<b>Seldom (S)</b>	<b>0 - 5%</b>	<b>Not performed on a daily basis</b>
<b>Rare (R)</b>	<b>1 – 5%</b>	<b>&lt; 29 min/day</b>
<b>Occasional (O)</b>	<b>6 - 33%</b>	<b>29 min to 2 hours 42 min per day or 1 rep/30 min</b>
<b>Frequent (F)</b>	<b>34 - 66%</b>	<b>2 hours 43 min to 5 hours 21 min per day or 1 rep/2 min</b>
<b>Constant (C)</b>	<b>67 – 100%</b>	<b>5 hours 22 min to 8 hours per day or 1 rep/30 sec</b>

#### **Frequent**

- Tool box/belt
- Tools (wire cutters, pliers, knives, drills, screwdrivers, saws, hammers, files)
- Pipe benders – mechanical, hydraulic, hand benders
- Ladders
- Tape measure

#### **Occasional**

- Flashlight
- Level
- Chalk-line
- Floodlight

#### **Rare**

- Knock-out sets
- Broom
- Powder-actuated tools

## **Personal Protective Equipment Recommended**

- ✓ Safety Glasses
- ✓ Hearing Protection (Task-specific)
- ✓ Hard Hat
- ✓ Steel Toed Boots
- ✓ Gloves
- ✓ Overalls (Optional)
- ✓ Fall Protection Equipment (Task-specific)
- ✓ Respiratory Protection (Task-specific)

## **Environment Conditions**

### **Inside/Outside Work:**

Inside 99%; Outside 1%

### **Working Temperature:**

Although the temperature varies, conduit installation is generally completed within the confines of a temperature-regulated facility, however, installing conduit during some phases of construction may involve exposure to hot or cold weather conditions

### **Walking Surfaces:**

Rebar, concrete with slippery areas (water puddles, mud, construction debris)

### **Dust:**

Mild; can be high when debris is being blown off slab forms (air hose blow down), when drilling into concrete or if jackhammer is being utilized nearby

### **Lighting:**

Adequate, indoor lighting in most areas. Natural lighting may vary with season &/or weather conditions.

### **Vapour/Fumes:**

Mild – Fumes from mobile equipment, PVC glue

### **Noise Levels (measured with Audiometer):**

Can exceed 100 dBA if heavy equipment, portable generators, power tools, saws or hammers are being utilized nearby

### **Vibration:**

Mild - Power tools

Moderate – Powder-actuated tools

### **Moving Objects:**

Cranes, mobile equipment

### **Risks/Hazards:**

Slips/Trips/Falls, skin punctures, muscle strains/soreness, pinch points, cuts/abrasions, electric shock

### **Size of Work Space:**

Usually adequate, although the worker may have to maneuver into tight spots in order to complete task on the rare occasion

## **Sensory Requirements**

All of the following are required to complete essential job functions and remain safe at all times:

**Hearing** (Conversation or Sounds)

**Vision** (Near/Far, Colour, and Depth)

**Feeling** (Tactile sensory discrimination)

**Reading** (English)

**Speech/Comprehension** (English)

## **Other Work Factors**

### **Traveling:**

Seldom – Leaving work site for materials/supplies

### **Working Alone:**

Worker may have to perform task at a work site without colleagues or other trades people, on a rare basis

### **Working Independently / in Group:**

Required to work independently for the majority of the shift, although he/she may be asked to assist a co-worker or request assistance for him-/herself when required

### **Work Pace (self or machine):**

Self-Motivated – Moderate to Fast pace, depending on complexity

### **Interacting with Others:**

Required to work with colleagues and other trades people

### **Operation of Mobile Equipment:**

Aerial work platform

**Assessment Criteria Used**

<b>Frequency Key</b>		
<b>FREQUENCY</b>	<b>% OF WORKDAY</b>	<b>HOURS OF 8-HOUR WORKDAY</b>
<b>Not required (N/R)</b>	<b>0%</b>	<b>0</b>
<b>Seldom (S)</b>	<b>0 - 5%</b>	<b>Not performed on a daily basis</b>
<b>Rare (R)</b>	<b>1 – 5%</b>	<b>&lt; 29 min/day</b>
<b>Occasional (O)</b>	<b>6 - 33%</b>	<b>29 min to 2 hours 42 min per day or 1 rep/30 min</b>
<b>Frequent (F)</b>	<b>34 - 66%</b>	<b>2 hours 43 min to 5 hours 21 min per day or 1 rep/2 min</b>
<b>Constant (C)</b>	<b>67 – 100%</b>	<b>5 hours 22 min to 8 hours per day or 1 rep/30 sec</b>

<b>FORCE LEVEL</b>	<b>WEIGHT HANDLED</b>
<b>Light</b>	<b>Less than 20 lbs.</b>
<b>Medium</b>	<b>20-49 lbs.</b>
<b>Heavy</b>	<b>50-99 lbs.</b>
<b>Very-Heavy</b>	<b>100+ lbs.</b>

### Critical Job Demands

MANUAL HANDLING	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Lift: Floor to Waist	Light force: Tools, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs); Medium force: Tool box, ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); Heavy force: Ladder (12 <sup>+</sup> foot), pipe bender (2-person task), larger-sized pipe bender shoes (~ 90 lbs), metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Lift: Waist to Waist	Light force: Tools, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs); Medium force: Tool box, ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); Heavy force: Ladder (12 <sup>+</sup> foot), pipe bender (2-person task), larger-sized pipe bender shoes (~ 90 lbs), metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Lift: Waist to Chest	Light force: Tools, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs); Medium force: Ladder (up to 12 foot), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); Heavy force: Ladder (12 <sup>+</sup> foot), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)				X		
Lift: Waist to Overhead	Light force: Tools; metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); <b>Heavy force:</b> Metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Front carry	Light force: Tools, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs); Medium force: Tool box, ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); Heavy force: Ladder (12 <sup>+</sup> foot), pipe bender (2-person task), larger-sized pipe bender shoes (~ 90 lbs), metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Right side carry	Light force: Tools; metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Tool box, ladder (up to 12 foot), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)				X		
Left side carry	Light force: Tools; metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Tool box, ladder (up to 12 foot), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)				X		
Static push	Light force: Installing conduit (up to 1 <sup>1/4</sup> inch); Medium force: Drilling holes into concrete, installing conduit (1 <sup>1/2</sup> - 2 inch); <b>Heavy force:</b> Metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Static pull	<b>Medium to Heavy force:</b> Bending various sizes of metallic pipe/conduit with hand bender				X		
Dynamic push	Light force: Installing conduit, knock-out set; Medium force: Drilling holes into concrete				X		
Dynamic pull	Light force: Knock-out set; <b>Medium to Heavy force:</b> Bending various sizes of metallic pipe/conduit with hand bender				X		

GRIP STRENGTH /COORDINATION	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Bilateral repetitive use of hands	Installing conduit, drilling holes in concrete					X	
Repetitive use of dominant hand	Utilizing tools to install conduit					X	
Repetitive use of non-dominant hand	Utilizing Tools to install conduit				X		
Bilateral power grip	Medium force: Ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), drill, saw, metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); Heavy force: Ladder (12 <sup>+</sup> foot), pipe bender, larger-sized pipe bender shoes (~ 90 lbs), metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Power grip with dominant hand	Light force: Utilizing Tools, handling metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs), metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)					X	
Power grip with non-dominant hand	Light force: Utilizing Tools, handling metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs), metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)				X		
Bilateral fine dexterity skills	Utilizing Tools, installing conduit components, utilizing chalk-line/tape measure				X		
Fine dexterity with dominant hand	Utilizing Tools, handling conduit components					X	
Fine dexterity with non-dominant hand	Utilizing Tools, handling conduit components				X		
Bilateral manual handling	Light force: Drill, saw, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs); Medium force: Ladder (up to 12 foot), medium-sized pipe bender shoes (~ 50 lbs), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch); Heavy force: Ladder (12 <sup>+</sup> foot), pipe bender (2-person task), larger-sized pipe bender shoes (~ 90 lbs), metallic/non-metallic conduit (2 <sup>1/2</sup> - 4 inch)				X		
Manual handling with dominant hand	Light force: Tools, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs), metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Tool box, ladder (up to 12 foot), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)					X	
Manual handling with non-dominant hand	Light force: Tools, metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch), pipe bender, smaller-sized pipe bender shoes (~15 lbs), metallic/non-metallic conduit (up to 1 <sup>1/4</sup> inch); Medium force: Tool box, ladder (up to 12 foot), metallic/non-metallic conduit (1 <sup>1/2</sup> - 2 inch)				X		
Tool usage bilaterally	Light force: Drill, saw, broom; Medium force: Drill, pipe bender; Heavy force: Hand pipe bender				X		
Tool usage with dominant hand	Light force: Tools, knock-out set					X	
Tool usage with non-dominant hand	Light force: Tools, knock-out set				X		

POSITIONAL/ MOBILITY	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Sitting	Floor, box/crate			X			
Standing	Installing conduit, drilling holes into concrete					X	
Walking: Level surfaces	Clean up, materials handling, installing conduit					X	
Rough surfaces	Construction debris/materials, rebar				X		
Slopes	Work site terrain			X			
Climbing: Regular stairs	Accessing designated work areas					X	
Ladders	Installing conduit, drilling holes into concrete				X		
Other climbing	N/R	X					
Jumping	N/R	X					
Running	N/R	X					
Balancing	Installing conduit while standing on rebar, installing conduit/drilling holes into concrete while on a ladder				X		
Static bending	Installing conduit, drilling holes into concrete				X		
Variable bending	Installing conduit, drilling holes into concrete, bending pipe					X	
Static twisting	Installing conduit				X		
Variable twisting	Installing conduit, bending pipe				X		
Kneeling	Installing conduit				X		
Crouching	Installing conduit			X			
Crawling	Installing conduit			X			
Repetitive squatting	Installing conduit		X				
Reaching: Above shoulder	Installing conduit, drilling holes into concrete, utilizing chalk-line/tape measure					X	
Reaching: Below shoulder	Installing conduit, drilling holes into concrete, utilizing chalk-line/tape measure, handling materials					X	
Neck Postures/Movements	All neck positions required (180 <sup>0</sup> , up, down, side-to-side)						X
Throwing	N/R	X					
Foot Action	Bending pipe with hand bender				X		
Forceful/Jerky movements	Drilling holes into concrete, bending pipe				X		



## Psychosocial Demands

### Seldom/Rare/Occasional/ Frequent/Constant

#### **A. Understanding and memory:**

Remember locations and routine procedures	Constant
Understand and remember short and simple instructions	Constant
Understand and remember detailed instructions	Constant

#### **B. Sustained concentration and persistence:**

Carry out short and simple instructions	Constant
Carry out detailed instructions	Constant
Maintain attention and concentration for extended periods	Constant
Perform activities within a schedule	Constant
Sustain an ordinary routine without supervision	Constant
Make simple decisions	Constant
Solve simple straightforward problems	Constant
Solve complex problems	Occasional

#### **C. Social interaction:**

Interact with the general public	Seldom
Ask questions or request assistance	Occasional
Accept instructions and feedback	Occasional
Get along well with others without distracting them	Constant
Get along well with others without being distracted by them	Constant

#### **D. Adaptation:**

Respond to changes in the environment or tasks	Constant
Aware of normal hazards and take appropriate precautions	Constant
Travel in unfamiliar places or use public transportation	Seldom
Set realistic goals or make plans independently of others	Occasional
Juggle tasks and prioritize	Occasional

### Yes/No

#### **E. Responsibility and accountability:**

Is work place without the pressure of deadlines?	No
Does the work involve occasional pressure to meet deadlines?	Yes
Does the work involve significant pressures?	Yes

#### **F. Language Requirements:**

Is English required for safety purposes?	Yes
Is English required for professional purposes?	Yes

#### **G. Educational Requirements:**

Is grade 12 diploma required?	No (recommended)
Is post-secondary required?	No (recommended)
Is additional skill training required?	Yes*

\*(Fall Protection, Aerial Work Platform, Powder-Actuated Tools)

## Injury Prevention Recommendations

1. Stretch-regularly used muscles throughout the shift – neck, shoulders, chest, elbows, forearms, wrists, hands, lower back, thighs and calves/ankles – paying particular attention to the postural muscles (low back and neck) to prevent risk of soft tissue injuries related to prolonged bending/twisting postures
2. Neck, back, upper and lower extremity warm-up exercises recommended before undertaking manual handling tasks to reduce the chance of soft tissue injuries
3. To help prevent low back strain/sprain from incorrect manual handling techniques – incorporate proper manual handling techniques at all times; utilize dolly, cart, hoist or forklift for all items over 50 lbs or of awkward shape whenever possible; maintain physical conditioning to a **Heavy** manual handling level
4. To help prevent lower extremity joint/muscle pain due to general deconditioning, poor cushioning in footwear and spending extended periods weightbearing on concrete surfaces – ensure proper fitting footwear with adequate cushioning; take regular stretch breaks hourly
5. When wearing a tool belt for prolonged periods, it is recommended that workers utilize tool belts with shoulder straps/suspenders to better distribute/carry the weight
6. To prevent knee injuries, knee pads should be utilized when kneeling on hard &/or rough surfaces (i.e. rebar)