



Physical Demands Analysis



Commercial Electrician

VIDEO CLIP

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. has 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 Tasks

- Installing Bus Duct
- Installing Switch Gear
- Installing Cable Trays
- Installing Conduit
- Cable Termination
- Cable Pull
- Installing Light Fixtures
- Installing Wall Plugs
- Prepping Steel Wall Studs
- Pulling BX Cable
- Pulling Wire Through Conduit
- Clean-up (Sweeping, picking up waste materials)
- Materials handling

Equipment used to perform the job: **(May include, but not limited to the following)**

Tools

- Up to 20 lbs: Drills (cordless/electric), pliers, wire cutters, knives, hammers, level, screwdrivers, wrenches, saws (hand/electric), measuring tape, vacuum, flashlight, crowbar, knock-out sets (foot/hydraulic/mechanical), sledgehammer, grinder, Allen keys, stapler gun, shovel, powder-actuated tools, steel fish tape, slings, crimpers, ratchet cutters
- 20-49 lbs: Tool box/belt
- 50-99 lbs: Portable generators

Electrical Equipment

- 20-49 lbs: Floodlight, ladders (up to 12 feet), vacuum
- 50-99 lbs: Ladders (12⁺ feet)

Electrical hardware

- Up to 20 lbs: Electrical panels, smaller light fixtures, plugs/sockets (boxes of hardware-screws, bolts, nuts, collars), conduit (up to 1^{1/4} inch)
- 20-49 lbs: Larger light fixtures, conduit (1^{1/2} - 2 inch)
- 50-99 lbs: Conduit (2^{1/2} - 4 inch)

Personal Protective Equipment Recommended

- ✓ Safety Glasses
- ✓ Hearing Protection
- ✓ Hard Hat
- ✓ Steel Toed Boots
- ✓ Gloves
- ✓ Overalls (Optional)
- ✓ Knee Pads (Optional)
- ✓ Fall Protection Equipment (Task-specific)
- ✓ Respiratory Protection Equipment (Where required)
- ✓ Face shield (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

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

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

Critical Job Demands

MANUAL HANDLING	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Lift: Floor to Waist	Light force: Tools, conduit (up to 1 ^{1/4} inch), pipe bender shoes (~15 lbs), wire reels, light fixtures, electrical components; Medium force: Tool box, floodlight, ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), conduit (1 ^{1/2} - 2 inch), light fixtures, switch gear components, cable trays; Heavy force: Ladder (12 ⁺ foot), pipe bender (2-person task), pipe bender shoes (~ 90 lbs), conduit (2 ^{1/2} - 4 inch), portable generator, cable trays				X		
Lift: Waist to Waist	Light force: Tools, conduit (up to 1 ^{1/4} inch), pipe bender shoes (~15 lbs), wire reels, light fixtures, electrical components; Medium force: Tool box, floodlight, ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), conduit (1 ^{1/2} - 2 inch), light fixtures, switch gear components, cable trays; Heavy force: Ladder (12 ⁺ foot), pipe bender (2-person task), pipe bender shoes (~ 90 lbs), conduit (2 ^{1/2} - 4 inch), portable generator, cable trays				X		
Lift: Waist to Chest	Light force: Tools, conduit (up to 1 ^{1/4} inch), pipe bender shoes (~15 lbs), wire reels, light fixtures, electrical components; Medium force: Ladder (up to 12 foot), conduit (1 ^{1/2} - 2 inch), light fixtures, switch gear components, cable trays; Heavy force: Ladder (12 ⁺ foot), conduit (1 ^{1/2} - 2 inch), cable trays				X		
Lift: Waist to Overhead	Light force: Tools, conduit (up to 1 ^{1/4} inch), light fixtures; Medium force: Conduit (1 ^{1/2} - 2 inch), switch gear components, cable trays, light fixtures; Heavy force: Conduit (2 ^{1/2} - 4 inch), switch gear cabinets, cable trays				X		
Front carry	Light force: Tools, conduit, wire reels, pipe bender shoes (~15 lbs), electrical components; Medium force: Tool box, ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), conduit (1 ^{1/2} - 2 inch), switch gear components; Heavy force: Ladder (12 ⁺ foot), pipe bender (2-person task), pipe bender shoes (~ 90 lbs), conduit (2 ^{1/2} - 4 inch), switch gear cabinets, cable trays				X		
Right side carry	Light force: Tools, conduit (up to 1 ^{1/4} inch), wire, cable, electrical components; Medium force: Tool box, ladder (up to 12 foot), conduit (1 ^{1/2} - 2 inch), switch gear components, cable trays				X		
Left side carry	Light force: Tools, conduit (up to 1 ^{1/4} inch), wire, electrical components; Medium force: Tool box, ladder (up to 12 foot), conduit (1 ^{1/2} - 2 inch), switch gear components, cable trays				X		
Static push	Light force: Installing conduit (up to 1 ^{1/4} inch), light fixtures; Medium force: Drilling holes into concrete, installing conduit (1 ^{1/2} - 2 inch), switch gear components, cable trays, terminating cable, light fixtures; Heavy force: Conduit (2 ^{1/2} - 4 inch), switch gear cabinets, cable trays, terminating cable				X		
Static pull	Medium to Heavy force: Bending various sizes of metallic conduit with hand bender, terminating cable				X		
Dynamic push	Light force: Installing conduit, knock-out set; Medium force: Drilling holes into concrete, switch gear components, cable trays, terminating cable; Heavy force: Conduit (2 ^{1/2} - 4 inch), switch gear cabinets, cable trays, terminating cable				X		
Dynamic pull	Light force: Knock-out set, starting generator; Medium to Heavy force: Bending various sizes of metallic conduit with hand bender, cable trays, terminating cable; Heavy force: Conduit (2 ^{1/2} - 4 inch), switch gear cabinets, cable trays, terminating cable				X		

GRIP STRENGTH /COORDINATION	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Bilateral repetitive use of hands	Installing conduit/switch gear/cable trays/light fixtures, drilling holes in concrete, terminating cable, pulling cable					X	
Repetitive use of dominant hand	Utilizing tools to install conduit/switch gear/cable trays/light fixtures, pulling cable					X	
Repetitive use of non-dominant hand	Utilizing tools to install conduit/switch gear/cable trays/light fixtures, pulling cable				X		
Bilateral power grip	Medium force: Ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), drill, saw, conduit (1 ^{1/2} - 2 inch), switch gear components, cable trays, terminating cable, pulling cable; Heavy force: Ladder (12 ⁺ foot), pipe bender, pipe bender shoes (~ 90 lbs), conduit (2 ^{1/2} - 4 inch), switch gear cabinets, cable trays, terminating cable				X		
Power grip with dominant hand	Light force: Utilizing Tools, handling conduit (up to 1 ^{1/4} inch), pipe bender, pipe bender shoes (~15 lbs), conduit (up to 1 ^{1/4} inch), cable trays, pulling cable; Medium force: Ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), conduit (1 ^{1/2} - 2 inch); switch gear components					X	
Power grip with non-dominant hand	Light force: Utilizing Tools, handling conduit (up to 1 ^{1/4} inch), pipe bender, pipe bender shoes (~15 lbs), conduit (up to 1 ^{1/4} inch), cable trays, pulling cable; Medium force: Ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), conduit (1 ^{1/2} - 2 inch), switch gear components				X		
Bilateral fine dexterity skills	Utilizing tools, installing conduit/switch gear/cable tray/light fixture components, utilizing chalk-line/tape measure				X		
Fine dexterity with dominant hand	Utilizing tools, handling conduit/switch gear/cable tray/light fixture components					X	
Fine dexterity with non-dominant hand	Utilizing tools, handling conduit/switch gear/cable tray/light fixture components				X		
Bilateral manual handling	Light force: Drill, saw, conduit (up to 1 ^{1/4} inch), pipe bender, pipe bender shoes (~15 lbs); Medium force: Ladder (up to 12 foot), pipe bender shoes (~ 50 lbs), conduit (1 ^{1/2} - 2 inch), cable tray, terminating cable; Heavy force: Ladder (12 ⁺ foot), pipe bender (2-person task), pipe bender shoes (~ 90 lbs), conduit (2 ^{1/2} - 4 inch), cable tray, terminating cable				X		
Manual handling with dominant hand	Light force: Tools, conduit (up to 1 ^{1/4} inch), pipe bender, pipe bender shoes (~15 lbs), conduit (up to 1 ^{1/4} inch); Medium force: Tool box, ladder (up to 12 foot), conduit (1 ^{1/2} - 2 inch), switch gear components, cable tray					X	
Manual handling with non-dominant hand	Light force: Tools, conduit (up to 1 ^{1/4} inch), pipe bender, pipe bender shoes (~15 lbs), conduit (up to 1 ^{1/4} inch); Medium force: Tool box, ladder (up to 12 foot), conduit (1 ^{1/2} - 2 inch), switch gear components, cable tray				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/switch gear/cable tray/light fixtures, drilling holes into concrete, terminating cable, pulling cable/wire					X	
Walking: Level surfaces	Clean up, materials handling, installing conduit/switch gear/cable tray/light fixtures					X	
Rough surfaces	Construction debris/materials, rebar				X		
Slopes	Work site terrain			X			
Climbing: Regular stairs	Accessing designated work areas					X	
Ladders	Installing conduit/switch gear/cable tray/light fixtures, drilling holes into concrete				X		
Other climbing	N/R	X					
Jumping	N/R	X					
Running	N/R	X					
Balancing	Installing conduit/switch gear/cable tray /light fixtures/drilling holes into concrete while on a ladder				X		
Static bending	Installing conduit/switch gear/cable tray/light fixtures/wall plugs, drilling holes into concrete, pulling cable/wire				X		
Variable bending	Installing conduit/switch gear/cable tray/light fixtures/wall plugs, drilling holes into concrete, terminating cable, pulling cable/wire					X	
Static twisting	Installing conduit/switch gear/cable tray/light fixtures, terminating cable, pulling cable/wire				X		
Variable twisting	Installing conduit/switch gear/cable tray/light fixtures, bending pipe, terminating cable, pulling cable/wire				X		
Kneeling	Installing conduit/switch gear/cable tray, terminating cable, pulling cable/wire				X		
Crouching	Installing conduit/switch gear/cable tray, terminating cable, pulling cable/wire			X			
Crawling	Installing conduit/switch gear/cable tray, terminating cable, pulling cable/wire			X			
Repetitive squatting	Installing conduit/switch gear/cable tray, terminating cable		X				
Reaching: Above shoulder	Installing c conduit/switch gear/cable tray/light fixtures, drilling holes into concrete, utilizing chalk-line/tape measure, pulling cable/wire					X	
Reaching: Below shoulder	Installing conduit/switch gear/cable tray/light fixtures/wall plugs, drilling holes into concrete, utilizing chalk-line/tape measure, handling materials, terminating cable, pulling cable/wire					X	
Neck Postures/Movements	All neck positions required (180°, up, down, side-to-side)						X
Throwing	N/R	X					
Foot Action	Bending pipe with hand bender, terminating cable				X		
Forceful/Jerky movements	Drilling holes into concrete, bending pipe, terminating cable, pulling cable/wire				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 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?	Yes
Is post-secondary required?	Yes
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)