



Physical Demands Analysis



Commercial Electrician

Task 1: Materials Handling 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. 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 handling of a variety of electrical materials as per the building construction requirements

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

- Clean-up (Sweeping, picking up waste materials)
- Materials handling (items handled may range in weight from a few ounces (electrical hardware) to several hundred pounds (switch gear, reels of wire/cable).

Below is a list of some of the most commonly handled materials/items at the work site:

Tools

- **Up to 20 lbs:** Drills(cordless/electric), pliers, wire cutters, knives, hammers, level, steel fish tape, pipe benders, screwdrivers, wrenches, saws (hand/electric), measuring tape, vacuum, flashlight, crowbar, knock-out sets (foot/hydraulic, mechanical), tool belts, sledgehammer, grinder
- **20-49 lbs:** Tool box

Electrical hardware

- **Up to 20 lbs:** Electrical panels, breakers, smaller light fixtures, plugs/sockets (boxes of hardware-screws, bolts, nuts, collars), metallic/non-metallic conduit
- **20-49 lbs:** Cable baskets, larger light fixtures, reels of wire cable
- **50-99 lbs:** Cable trays, reels of wire/cable
- **100+lbs:** Switch gear, transformers, reels of wire/cable, Bus duct

Electrical Equipment

- **20-49 lbs:** Floodlight, ladders (up to 12 feet), cable rollers, hydraulic pipebender shoes
- **50-99 lbs:** Hydraulic pipebender shoes, ladders (12+ feet), portable generator
- **100+lbs:** Hydraulic pipebenders

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

Equipment used to perform the job & frequency of use may include, but not limited to the following:

Occasional (6-33% of the average workday)

- Dolly, cart

Rare (1-5% of the average workday)

- Pallet jack, crowbar, wire cutters, knives, metal bar, grinder

Personal Protective Equipment Recommended

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

Environment Conditions

Inside/Outside Work:

Inside 95%; Outside 5%

Working Temperature:

Although the temperature varies, materials handling is generally completed within the confines of a temperature-regulated facility, although depending on which phase of construction the building is in, this task may involve exposure to hot or cold weather conditions

Walking Surfaces:

Concrete with slippery areas (water puddles, mud, construction debris)

Dust:

Concrete dust – Mild; can be high during blow down or if jackhammer is being utilized nearby

Lighting:

Adequate, indoor lighting in most areas; dark spots in basements/parkades

Vapour/Fumes:

Mild – Diesel fumes from mobile equipment

Mild-Moderate - solvent vapours from other trades

Noise Levels (measured with Audiometer):

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

Vibration:

Not Applicable

Moving Objects:

Cranes, mobile equipment

Risks/Hazards:

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

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:**

Rare – Leaving the 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:

N/R

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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	<p>Light force: Tools, electrical panels, breakers, smaller light fixture, plugs/sockets, boxes of hardware, metallic/non-metallic conduit, hydraulic pipebender shoes;</p> <p>Medium force: Floodlight, ladder (up to 12 feet), cable rollers, cable basket, larger light fixtures, tool box, hydraulic pipebender shoes;</p> <p>Heavy force: Reel of wire/cable (turn on its side to roll), cable trays (2⁺-person lift), ladders (12⁺ feet), hydraulic pipebender shoes;</p> <p>Very-Heavy force: Reel of wire/cable (turn on its side to roll), cable trays (2⁺-person lift), Bus Duct</p>				X		
Lift: Waist to Waist	<p>Light force: Tools, electrical panels, breakers, smaller light fixture, plugs/sockets, boxes of hardware, metallic/non-metallic conduit, hydraulic pipebender shoes;</p> <p>Medium force: Floodlight, ladder (up to 12 feet), cable rollers, cable basket, larger light fixtures, tool box, hydraulic pipebender shoes;</p> <p>Heavy force: Reel of wire/cable (turn on its side to roll), cable trays (2⁺-person lift), ladders (12⁺ feet), hydraulic pipebender shoes;</p> <p>Very-Heavy force: Reel of wire/cable (turn on its side to roll), cable trays (2⁺-person lift)</p>				X		
Lift: Waist to Chest	<p>Light force: Tools, electrical panels, breakers, smaller light fixtures;</p> <p>Medium force: Cable basket, larger light fixtures;</p> <p>Heavy force: Cable trays (2⁺-person lift)</p>			X			
Lift: Waist to Overhead	<p>Light force: Tools, smaller light fixtures;</p> <p>Medium force: Cable basket, larger light fixtures;</p> <p>Heavy force: Cable trays (2⁺-person lift)</p>			X			
Front carry	<p>Light force: Tools, electrical panels, breakers, smaller light fixture, plugs/sockets, boxes of hardware;</p> <p>Medium force: Floodlight, ladder (up to 12 ft), cable basket, larger light fixture, hydraulic pipebender shoes;</p> <p>Heavy force: Ladders (12⁺ ft), portable generator (2-person task), hydraulic pipebender shoes</p>				X		
Right side carry	<p>Light force: Tools, electrical panels, breakers, smaller light fixtures, plugs/sockets, boxes of hardware, metallic/non-metallic conduit, hydraulic pipebender shoes;</p> <p>Medium force: Floodlight, ladder (up to 12 feet), cable rollers, cable basket, tool box, hydraulic pipebender shoes</p>				X		
Left side carry	<p>Light force: Tools, electrical panels, breakers, smaller light fixtures, plugs/sockets, boxes of hardware, metallic/non-metallic conduit, hydraulic pipebender shoes;</p> <p>Medium force: Floodlight, ladder (up to 12 feet), cable rollers, cable basket, tool box, hydraulic pipebender shoes</p>				X		
Static push	Very-Heavy force: Moving/installing switch gear, Bus Duct, transformers (multi-person task)		X				
Static pull	Very-Heavy force: Moving/installing switch gear, Bus Duct, transformers (multi-person task)		X				
Dynamic push	<p>Light to Medium force: Loading materials back into van/truck;</p> <p>Medium to Heavy force: Moving reels of wire, Bus Duct;</p> <p>Very-Heavy force: Moving/installing switch gear, transformers (multi-person task)</p>		X				
Dynamic pull	<p>Light to Medium force: Loading materials back into van/truck;</p> <p>Medium to Heavy force: Moving reels of wire, Bus Duct;</p> <p>Very-Heavy force: Moving/installing switch gear, transformers (multi-person task)</p>		X				

GRIP STRENGTH /COORDINATION	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Bilateral repetitive use of hands	N/R	X					
Repetitive use of dominant hand	N/R	X					
Repetitive use of non-dominant hand	N/R	X					
Bilateral power grip	Medium force: Ladder (up to 12 feet), cable basket, larger light fixtures, boxes of hardware; Heavy force: Reel of wire/cable, cable trays (2 ⁺ -person lift), ladders (12 ⁺ feet), hydraulic pipebender shoes; Very-Heavy force: Gripping pallet jack handle when maneuvering switch gear, transformers (multi-person tasks), reel of wire/cable), hydraulic pipebender shoes				X		
Power grip with dominant hand	Light force: Tools, electrical panels, breakers, smaller light fixtures, plugs/sockets, boxes of hardware, metallic/non-metallic conduit, hydraulic pipebender shoes; Medium force: Floodlight, ladder (up to 12 feet), cable rollers, cable basket), hydraulic pipebender shoes					X	
Power grip with non-dominant hand	As above				X		
Bilateral fine dexterity skills	Removing packaging from materials			X			
Fine dexterity with dominant hand	Removing packaging from materials				X		
Fine dexterity with non-dominant hand	Removing packaging from materials			X			
Bilateral manual handling	Medium force: Ladder (up to 12 feet), cable basket, larger light fixtures, boxes of hardware, hydraulic pipebender shoes; Heavy force: Reel of wire/cable, cable trays (2 ⁺ -person lift), ladders (12 ⁺ feet), boxes of hardware, hydraulic pipebender shoes; Very-Heavy force: Maneuvering switch gear, transformers, large cable reels (multi-person tasks), portable generator				X		
Manual handling with dominant hand	Light force: Tools, electrical panels, breakers, smaller light fixtures, plugs/sockets, Metallic/non-metallic conduit; Medium force: Floodlight, ladder (up to 12 feet), cable rollers, cable basket					X	
Manual handling with non-dominant hand	As above				X		
Tool usage bilaterally	Light force: Sweeping with broom; Medium to Heavy force: Moving tools, packages with dolly/cart; Very-Heavy force: Moving switch gear/transformers/Bus Duct with pallet jack/crowbar (multi-person task), lifting cable reels with metal bar (2-person task)			X			
Tool usage with dominant hand	Light force: Knives, wire cutters				X		
Tool usage with non-dominant hand	Light force: Knives, wire cutters			X			

POSITIONAL/ MOBILITY	Comments	FREQUENCY OF WORKDAY					
		N/R	S	R	O	F	C
Sitting	Driving work-van/truck to warehouse for materials			X			
Standing	Sorting/selecting materials, removing packaging from materials				X		
Walking: Level surfaces	Moving supplies/materials to work areas					X	
Rough surfaces	Construction debris/materials			X			
Slopes	Work site terrain		X				
Climbing: Regular stairs	Accessing designated work areas				X		
Ladders	N/R	X					
Other climbing	N/R	X					
Jumping	N/R	X					
Running	N/R	X					
Balancing	N/R	X					
Static bending	Sorting/selecting/handling material			X			
Variable bending	Sorting/selecting/handling materials				X		
Static twisting	Sorting/selecting/handling materials			X			
Variable twisting	Sorting/selecting/handling material				X		
Kneeling	Cutting/grinding rebar to allow for passage of switch gear/transformer, etc.		X				
Crouching	Sorting/selecting/handling materials			X			
Crawling	N/R	X					
Repetitive squatting	Sorting/selecting/handling materials			X			
Reaching: Above shoulder	Sorting/selecting/handling materials			X			
Reaching: Below shoulder	Sorting/selecting/handling materials					X	
Neck Postures/Movements	All neck positions required (180°, up, down, side-to-side)						X
Throwing	N/R	X					
Foot Action	Light force: Operating work truck/van pedals			X			
Forceful/Jerky movements	Large reels of cable, switch gear, transformers		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	Rare

B. Sustained concentration and persistence:

Carry out short and simple instructions	Constant
Carry out detailed instructions	Rare
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	Rare

C. Social interaction:

Interact with the general public	Rare
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	Rare
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?	No

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?	No

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 posture.
2. Warm-up exercises are recommended before undertaking manual handling tasks to reduce the chance of soft tissue injuries neck, back, upper and lower extremity
3. Incorporate proper manual handling techniques at all times to help prevent low back strain/sprain from incorrect manual handling techniques –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 and take regular stretch breaks hourly
5. To prevent knee injuries, knee pads should be utilized when kneeling on hard surfaces