



Electricity Human Resources Canada is a non-profit organization supporting the human resources needs of the Canadian electricity sector.

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# Job Demands Assessment: PV Installer



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# Job Demands Assessment: PV Installer

The purpose of a Job Demands Assessment (JDA) is to document the bona fide essential duties of a task. These assessments can be used for:

- Return to work planning
- Allowing medical professionals to evaluate job offers for suitability
- Determining job and task suitability
- Determining the likelihood that a job or task contributed to an injury
- Assisting Rehabilitation Specialists set up effective treatment protocols
- Training employees
- Hiring practices and Post Offer Pre-employment hiring programs
- Identifying ergonomic hazards

## Using the JDA

This JDA is purposely generic in nature to ensure applicability across various organizations. The JDA is meant to serve as a benchmark document that provides an overview of the most common physical demands associated with the occupation. Not all tasks could be observed during the assessment process; instead, the most common tasks have been assessed.

Where applicable, potential accommodations are noted to illustrate alternative means for achieving the required demand or action.

This JDA can be used by Medical Practitioners / Health Care Providers involved in return to work rehabilitation support, and workplace accommodations to identify the Major Essential Demands that can be Performed, Modified, or Avoided by an individual based on their capacity and ability.

## Acknowledgements

This JDA was completed by [ERGO Inc.](#), an Ergonomics, Injury Prevention & Safety Consulting & Training Firm that has been providing Canadian companies with practical ergonomic and injury prevention solutions for over 25 years.

Electricity Human Resources Canada and ERGO Inc. would like to thank [Skylit](#) for allowing us onsite to complete the JDA in Kentville, NS (November, 2021).

Position: **PV Installer**

Date of On-Site Assessment: **November 30, 2021**

## General Information

	<p><b>Statement of Overall Job Description:</b> PV Installers are part of a site assessment and installation team that assess, plan, assemble and install photovoltaic (PV) systems on residential and commercial roofs or other structures comprised of various materials with different pitches and shapes in compliance with site assessment and schematics. Typical tasks include measuring, cutting, assembling, and bolting structural framing and solar modules.</p> <p><b>Tasks of a PV Installer include:</b></p>	<p><b>Approx. % of Time Spent Performing Each Task</b></p>
<p><b>Job Description</b></p>	<p><b>1. Assess the location to create list of materials for install (not always done by PV Installer)*</b></p> <ul style="list-style-type: none"> <li>• Drive to site with truck and trailer (or just truck and ladder [up to 35' fiberglass ladder])</li> <li>• Erect ladder to roof</li> <li>• Climb ladder and measure roof</li> </ul> <p><i>*Note: Occasionally this task can be done using Google Maps</i></p>	<p><b>Up to 1% of overall project installation time; it is completed once, prior to installation</b></p>
	<p><b>2. Load truck and trailer with equipment and installation materials</b></p> <ul style="list-style-type: none"> <li>• Drive to warehouse</li> <li>• Use forklift to load pallet of solar panels into trailer</li> <li>• Load 20' x 3" rails onto roof of trailer and secure in place</li> <li>• Install charged batteries into hand tools</li> <li>• If necessary, replenish boxes of discs, roof mounts, spliceblocks, rodent guard fasteners, mid-clamps, end-clamps, caps, brackets, t-bolts, lock-nuts, lugs, cable ties, and trunk cables</li> <li>• Lift, carry, and lower boxes of inverters, rolls of rodent guard, truck cables and anti-chafing tubes into trailer</li> </ul>	<p><b>6% - 12% of shift; this task may not be required to be completed on every day of an install</b></p>
	<p><b>3. Drive to site in SUV or truck</b></p>	<p><b>Up to 12% of shift</b></p>
	<p><b>4. Install ladders or staging to access roof</b></p> <ul style="list-style-type: none"> <li>• Discuss with crew and agree on location for ladders or staging</li> <li>• Remove ratchet straps</li> <li>• Lift and carry ladders or staging as a team to location</li> <li>• Assemble as a team (lifting, carrying, and lowering)</li> <li>• Stabilize and secure in place</li> </ul>	<p><b>Up to 4% of shift</b></p>
	<p><b>5. Map out roof for installation (completed by lead PV Installer)</b></p> <ul style="list-style-type: none"> <li>• Measure roof area</li> <li>• Complete basic calculations and trigonometry to determine amount of materials required and what materials will need to be cut and spliced</li> <li>• Draw up an installation plan on paper</li> <li>• Mark on the roof where rails will be placed and where holes will need to be drilled to attach rails</li> </ul>	<p><b>11% - 22% of shift</b></p>

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### Job Description

**6. Install infrastructure for the rails that support solar panels (these tasks are typically completed by two additional PV Installers while the Lead is marking out locations on the roof)**

- Unpack, lay out and assemble trunk cables on ground
- Unpack and lay out the required types and number of inverters in the trailer
- Locate roofing trusses in coordination with grid marked on roof:
  - May have to complete measurement using 25' tape measure
  - Sound using hammer (banging on roof ~10x per each hole to be drilled) to locate roofing truss around marked location
  - Drill hole
  - Apply caulking to hole
  - Repeat approximately 90-120 cycles
- Layout in trailer or on ground or scaffold boxes of discs, roof mounts, L-brackets, and lock-nuts:
  - Preassemble, on ground or on scaffold, approximately 90-120 roof mount/disc systems
  - Install individual system roof mount/disc system with an impact driver in the pre-drilled hole
  - Place an L-bracket on the roof mount system
  - Thread a lock-nut on the roof mount system to hold the L-bracket in place
  - Tightening with a ratchet
  - Repeat approximately 90-120 cycles

*\*Note: The subtasks listed in tasks 5 and 6 are typically divided between the crew: (i) the Lead is measuring the roof, performing calculations to determine amount of materials required, and drawing up an installation plan on paper, and marking on the roof where rails will be placed and where holes will need to be drilled; (ii) one PV installer uses hammer (banging on roof ~10x per each hole to be drilled) to locate roofing truss around marked location, drills hole, applies caulking to hole; (iii) another PV Installer will preassemble, on ground or on scaffold, approximately 90-120 roof mount/disc systems and then install each with an impact driver in the pre-drilled hole and then place an L-bracket on the roof mount system, and finally thread a lock-nut on the roof mount system to hold the L-bracket in place, tightening with a ratchet. Sometimes, assistance with the L-bracket system installation is provided by a member of the electrical installation crew if time permits.*

**37% - 50% of shift**

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<b>Job Description</b>	<p><b>7. Install and level rails</b></p> <ul style="list-style-type: none"> <li>• Climb to trailer roof using ladder</li> <li>• Unsecure the rails from roof rack</li> <li>• Slide rails to end of roof rack and slide down to ground so that end point is on ground and top edge of rail is leaning against trailer</li> <li>• Measure rails</li> <li>• Cut rail to length</li> <li>• Lift and carry to side of house and lean against house/roof edge</li> <li>• Lift rail onto roof (from roof) and lay against L-bracket locations:             <ul style="list-style-type: none"> <li>– Mark and recut (in trailer) if necessary</li> </ul> </li> <li>• Install splice-blocks if required</li> <li>• Install T-bolts and lock-nut:             <ul style="list-style-type: none"> <li>– Tighten by hand then use ratchet (don't completely tighten)</li> </ul> </li> <li>• Fabricate rail extension, if required:             <ul style="list-style-type: none"> <li>– Determine length required while on roof</li> <li>– Measure and mark length to be cut</li> <li>– Cut length of rail in trailer using circular saw</li> <li>– Attach splice block to rail extension using cordless driver and self-tapping screws</li> <li>– Return to roof</li> <li>– Attach rail extension to rail using fasteners</li> </ul> </li> <li>• Level rails (10 mins/rail x 9 rails):             <ul style="list-style-type: none"> <li>– Measure and secure (fully tighten lock-nut of T-bolt) each end of rail a specific height from roof</li> <li>– Create a leveling jig using L-brackets as spacers, run a length of string across L-brackets along the rail length and secure the string at each end of the rail</li> <li>– Raise each rail contact point to string</li> <li>– Fully tighten lock-nut of T-bolt with ratchet</li> </ul> </li> </ul>	<p><b>50% - 80% of shift depending on project size</b></p>
	<p><b>8. Install grounding lugs on rails</b></p> <ul style="list-style-type: none"> <li>• Measure location of hole on top and bottom of locations on the ends of each rail</li> <li>• Mark hole location</li> <li>• Drill hole with cordless drill</li> <li>• Install grounding lug with lock-nut and screw</li> <li>• Repeat</li> </ul>	<p><b>6% - 12% of shift</b></p>
	<p><b>9. Install trunk cables and inverters</b></p> <ul style="list-style-type: none"> <li>• Connect trunk cables and lift/carry/climb with trunk cables up onto roof</li> <li>• Run cables along rails</li> <li>• Lift/carry/climb with inverters up onto roof</li> <li>• Place inverters at appropriate locations along rails between where solar panels will be mounted</li> <li>• Install end cap on trunk cable</li> <li>• Attach inverter to rail:             <ul style="list-style-type: none"> <li>– Mark appropriate center of each panel on the frame</li> <li>– Fix the screw on the rail</li> <li>– Hang inverter on the screw and tighten screw</li> <li>– Attach trunk cable to rail and fix in place with tie wraps</li> <li>– Attach inverter to trunk cable</li> <li>– Repeat process for each inverter</li> </ul> </li> </ul>	<p><b>15% - 30% of shift</b></p>

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<b>Job Description</b>	<p><b>10. Install solar panels on rails</b></p> <ul style="list-style-type: none"> <li>• Complete tasks 2 – 4</li> <li>• Load cordless tools, and hand tools required into 5-gallon bucket</li> <li>• Lift and carry to base of scaffold and attach hook to bucket handle</li> <li>• Installer at top of scaffold lifts bucket to top of scaffold and removes items and lowers bucket</li> <li>• Load bucket with fasteners (e.g., end clamps, mid clamps) to attach solar panels to rails</li> <li>• Lift and carry to base of scaffold and attach hook to bucket handle</li> <li>• Installer at top of scaffold lifts bucket to top of scaffold and removes items and lowers bucket</li> <li>• Lift and carry individual solar panels from trailer to base of scaffold and attach hook to panel frame</li> <li>• Installer at top of scaffold lifts panel to top of scaffold, stacks panel against scaffold frame and lowers hook</li> <li>• Repeat process approximately five times (or the equivalent number of panels to complete one row on a roof)</li> <li>• Attach mid clamps and end clamps to rails</li> <li>• Attach solar panel to clamps</li> <li>• Plug solar panels into inverters</li> </ul> <p><i>Note: This task is typically done on a separate day after the rails and cables have been installed.</i></p>	<p><b>Up to 80% of shift – on separate day</b></p>
	<p><b>11. Install rodent guard</b></p> <ul style="list-style-type: none"> <li>• Refer to work plan to determine outer circumference of installation</li> <li>• Determine number of rolls of rodent guard and fasteners required</li> <li>• Lift and carry rolls and fasteners to ladder or scaffold and climb to roof</li> <li>• Apply rodent guard and fasteners</li> </ul>	<p><b>6% - 12% of shift</b></p>
	<p><b>12. Take down ladders or staging</b></p> <ul style="list-style-type: none"> <li>• Remove ratchet straps</li> <li>• If removing ladders: <ul style="list-style-type: none"> <li>– Collapse ladder and lift and carry to trailer</li> <li>– Lean on edge of trailer roof and climb to trailer roof</li> <li>– Pull ladder up roof and slide across attachment points and secure with ratchet straps</li> </ul> </li> <li>• If removing scaffolding: <ul style="list-style-type: none"> <li>– Remove platform, cross braces and frame members and lift and carry to trailer</li> <li>– Stabilize and secure in place in trailer with ratchet straps</li> </ul> </li> </ul>	<p><b>Up to 4% of shift</b></p>
	<p><b>13. Clean-up site</b></p> <ul style="list-style-type: none"> <li>• Set up separate garbage bags in containers by type of waste as per local disposal bylaws</li> <li>• As work progresses, place waste material in appropriate container</li> <li>• Remove garbage bags from site at end of day and dispose of appropriately</li> </ul>	<p><b>Up to 2% of shift</b></p>
	<p><b>14. Return (drive) to warehouse from installation site</b></p>	<p><b>Up to 12% of shift</b></p>
<b>Work Load</b>	<p>PV Installers typically complete their tasks at one site at a time that, for residential installations, require between two-to-five days to complete. Commercial installations may require longer than five days to complete and the duration of time on-site depends on the square footage of the installation and the roof features.</p>	
<b>Work Schedule</b>	<p>Typical hours: Mon-Fri 9-hour shifts; up to ½ hour for lunch with an AM and PM break for 15 minutes. When breaks and lunch are taken is at the discretion of the work crew. Overtime is often required to make up for weather delays.</p>	

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### Work Environment

**Description:** Pre-installation site visits take place for pricing and planning purposes or digital investigation of site using Google Maps assists in understanding quantity of materials required from the warehouse to price out the job and to prepare a quote and plan for materials required to complete an installation.

PV Installers retrieve and load tools, materials, truck, and work trailer at central warehouse. All hand tools and tool belts are typically kept in the work trailer while batteries are charged regularly in the warehouse. Bulk boxes of some materials are replenished and maintained in the work trailer and may not get topped up until several jobs are complete while other, larger materials are manually handled in the warehouse.

Most of the work is completed outdoors although entry into garages, crawlspaces, and attic spaces for extended periods of time (i.e., up to one hour) may be necessary depending on structure of the roof.

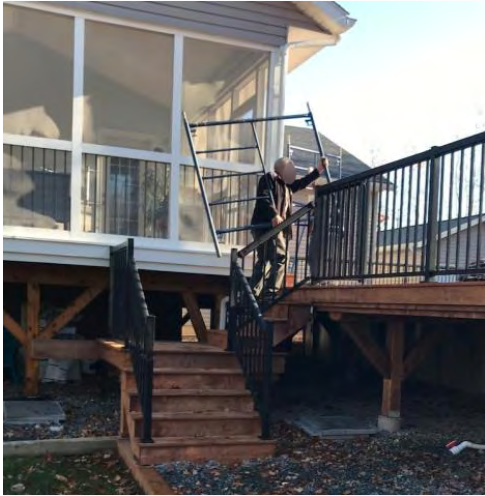
**Working Heights:** Work is done on the roofs of houses. Roof heights and pitches vary by job site. Ladders & scaffolding are used. When on the roof, PV Installers constantly work between ankle and knee height.

**Working Reaches:** Full bilateral range of motion at the shoulder is necessary to complete many job tasks. Approximately 33% of the work requires reaching in primary reach zones with a further 33% in secondary and 33% in tertiary reach zones while standing, stooping, squatting, kneeling and sitting.

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## Pictures of Main Job Tasks



Carrying scaffold frame member



Lifting scaffold platform and positioning into place across frame members



Lifting scaffold platform and positioning into place across frame members



Measuring portion of roof



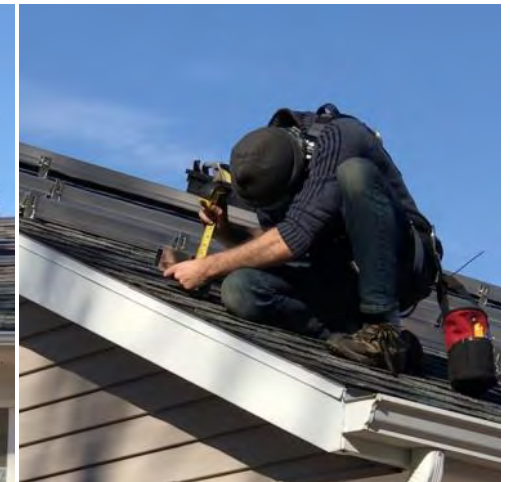
Measuring portion of roof



Installing roof mounts (foreground) and sounding with hammer (background)



Lifting a rail that will be attached to a series of L-brackets protruding from roof



Leveling a rail



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## Pictures of Main Job Tasks



Lifting a solar panel to top of scaffolding



Stacking groups of solar panels and securing to scaffolding for eventual placement



Using circular saw to cut a length of rail in the fabrication of a rail extension



Using driver to a self-tapping screw into a splice block that attaches to the pre-cut rail section in the fabrication of a rail extension



Leveling a section of rail



Carrying a solar panel on roof



Carrying solar panel from trailer



Carrying a solar panel to scaffold

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## Summary of Major Essential Demands

*For further details refer to the tables on the following pages*

To be completed by Health Care Provider — Please check one:

	Able to Perform	Modification Required (Explain)	Unable to Perform
Occasional <b>one-</b> and <b>two-handed lifting</b> (typical 5 lbs, max. 41 lbs) of tools, equipment, fasteners, parts, ladders, scaffolding, solar panels and related components.			
Occasional <b>one-</b> and <b>two-handed carrying</b> (typical 5 lbs, max. 41 lbs) of tools, equipment, fasteners, parts, ladders, scaffolding, solar panels and related components.			
Rare-to-occasional <b>two-handed horizontal &amp; vertical pushing/pulling</b> (typical 40 lbs , 10-30 ft); to move mounting rails & solar panels.			
Occasional to <b>sitting</b> on roof for up to 60 seconds; on truck seat or forklift for typically 30 min – 60 minutes to drive to and from job site; if operating forklift, seated duration is typically less than 5 mins.			
Frequent <b>standing</b> on the ground around the site, in the trailer, on the roof (with a pitch of up to 45 degrees), on scaffold and ladders; typically, 30-90 seconds at a time.			
Occasional <b>walking</b> on the ground around the site, in the trailer, on the roof (with a pitch of up to 45 degrees and often over obstructions); max. ~150 ft.			
Frequent <b>crouching, stooping and squatting</b> to work with hand tools, fasteners, and parts at floor (roof) level; 60-90x/hour, 0.5-1 minutes at a time throughout most of the shift.			
Frequent <b>kneeling</b> to work with hand tools, fasteners, and parts at floor (roof) level; 60-90x/hour, 0.5-1 minutes at a time throughout most of the shift.			
Rare to occasional <b>climbing</b> and <b>balancing</b> to climb ladders and scaffold 10-20x/shift and when carrying mounting rails, solar panels and generally walking on the roof while avoiding and stepping over obstructions.			
Frequent <b>gripping/handling</b> with one/both hands 200-300 x/shift. Intermittently to handle cordless power tools, equipment, and parts; typically to hold and handle various hand and power tools (5 lbs per hand); max to bilaterally lift and carry solar panels, ladders and scaffolding, 41 lbs (20.5 per hand).			
Frequent <b>pinching/fingering</b> with one/both hands (Pinch grips strength between 3 lbs – 17 lbs) 800- 1000 x/shift to handle and manipulate hand tools, clips, parts, and fasteners.			
Moderate <b>neck repetition</b> (all directions) with extensive <b>static neck postures</b> (forward bending and backwards bending).			
Moderate <b>back repetition</b> (all directions) with extensive <b>static back postures</b> (forward bending).			
Moderate <b>bilateral shoulder repetition</b> (all directions) with extensive <b>static shoulder postures</b> (forwards reaching while crouching, stooping, squatting and kneeling).			
High <b>bilateral elbow repetition</b> (all directions) with some <b>static elbow postures</b> to manipulate fasteners, parts, tools & equipment.			
High <b>bilateral wrist repetition</b> (all directions) with some <b>static wrist postures</b> to manipulate fasteners, parts, tools & equipment.			
Good <b>visual acuity</b> , as well as good <b>hearing</b> , and <b>tactile / feel</b> capabilities required.			
High <b>attention to detail</b> and <b>communication skills</b> required.			

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Demand / Action		Check if Performed	Description & Potential Accommodations <i>*Accommodation options noted in green</i>
Sensory	<b>Hearing / Speech:</b>		Phone and in person, with co-workers, head office, and the public. Many tasks require coordination and teamwork.
	• Conversation	✓	Emergency alarms in the office. Reversing vehicles and horns on construction sites. When 'sounding' a roof using a hammer to find trusses to drill into, the PV Installer listens for specific sound beneath the roofing shingles to find the truss.
	• Signals	✓	
	<b>Vision:</b>		Close vision required for securing and unsecuring loads to trailer roof and to walls of trailer, hand & power tool use, measuring tapes, reading part labels, installing cables, installing cable ties, attaching fasteners, drilling holes, filling holes in roofing shingles with caulking, reading level, cleaning, and visual quality check.
	• 20 inches or less	✓	
	• 20 feet or more	✓	
	• Colour	✓	To drive, observe coworkers at a distance on a roof, monitor the work area, and to perform some visual inspections of aspects of the installation from the ground.
• Depth Perception	✓	See red, yellow and other chalk lines and colored marker lines on roofing shingles or metal roof. Far vision and depth perception are required for overall site safety, maintain awareness of surroundings, as well to drive and operate a forklift.	
	<b>Smelling</b>	✓	Smell fuel and smoke for safety.
	<b>Tactile / Feeling</b>	✓	To locate the threaded edges of some fasteners that may not be able to be seen; to test tightness; to feel the vibrations in a hammer and to be able to discriminate between a hollow space under roofing shingles and a solid roofing truss; feeling for fasteners in pockets of tool belt.
Environment	<b>Conditions of Work</b>		Seasonal work that is completed predominantly outdoors on roofs of various pitches and heights in mostly dry weather with exposure to sun and colder weather in the fall. Work stops with rain, high winds, ice and/or snow.
	<b>Temperature / Humidity</b>		Exposed to three seasonal temperature extremes, wind, sunlight, humidity (location dependent).
	<b>Noise</b>		>85dB when operating circular saw to cut rails. Earplugs and earmuffs are worn.
	<b>Vibration</b>		Mild to moderate whole-body vibration to drive over rough terrain. Mild to moderate hand-arm vibration & jarring when using hammer, drill and impact driver.
	<b>Walking / Working Surface</b>		Walk on uneven & rough terrain on residential and commercial properties; walking and standing on metal roofs and shingled roofs of various pitches up to 45 degrees; ladder rungs (to climb up to and down from roof on ladders and scaffolding); must walk over rails, cables, tools and related obstructions on roofs.
	<b>Lighting</b>		Work done during daylight hours.
	<b>Electrical</b>		None
	<b>Sharp Objects</b>		Edges of rails after being cut with circular saw; blades of circular and reciprocating saw; drill bits; screws of various lengths; side cutters; utility knife; nail heads and screw heads that protrude from floor joists and roof trusses in attic spaces.
	<b>Hot / Cold Hazards</b>		None
<b>Chemical / Dust</b>		Minimal amount of chalk dust; if entering crawl space in attic of home to inspect roofing trusses.	
Tools	<b>Moving Machinery / Equipment</b>		Forklift in warehouse; circular saw blade; reciprocating saw blade.
	<b>Hand / Sharp Tools</b>		Cordless drill; cordless impact driver; caulking gun; hammer; 25' measuring tape; 100' measuring tape; side cutters; utility knife; clipboard; chalk line; chalk; ratchet straps; driver bits; drill bits; circular saw; reciprocating saw; and, socket set.
	<b>Personal Protective Equipment</b>		Steel toe boots; hearing protection; fall arrest harness with dorsal attachment & lanyard, gloves (task dependent: nitrile, nylon, leather, insulated), kneepads (task dependent).
	<b>Other Equipment / Supplies</b>		Caulking, discs, L-brackets, roof mounts, spliceblocks, inverters, ladders, trunk cables, solar panels, scaffolding frame members, cross braces and platforms, rails, toolbelt, rodent guard, rodent guard fasteners, zip ties, anti-chafing tubes.

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Demand		Rate Requirement	Description of Tasks that Demand is Required & Potential Accommodations <i>*Accommodation options noted in green</i>
<b>Legend: NE = Not Essential   ND = Not Daily but essential   5% or less = Rare Essential   6-33% = Minor Essential Demand   &gt;33% = Major Essential Demand</b>			
<b>Cognitive</b>	<b>Reading:</b>		
	• English	Rare	To read paper documents and recognize words, short phrases, and names. Includes work plans, bill of materials and part labels. Alphanumeric literacy. <i>*Note that depending on the province, French reading may be required instead of English.</i>
	• French	Varies by Province	
	• Other	No	
	<b>Writing:</b>		
	• English	Rare	Alphanumeric literacy required. Short entry hand-written notes on bill of materials and work plans. Informal writing, accurate grammatical construction and spelling is not essential. <i>*Note that depending on the province, French writing may be required instead of English.</i>
	• French	Varies by Province	
	• Other	No	
	<b>Verbal Communication:</b>		
	• English	Major	Communication through phone, and in-person, with crew members, other contractors and homeowners. Must speak clearly and be clearly understood. Hand signals are used where verbal communication is not possible. <i>*Note that depending on the province, verbal communication in French may be required instead of English.</i>
	• French	Varies by Province	
	• Other	No	
	<b>Supervising Others</b>	No or Major	Work crew has a Lead PV Installer. In addition to all other duties completed by the rest of the crew, the Lead is typically responsible for measuring the roof, creating a work plan on paper for the crew to follow and calculating the materials required and if/how materials will need to be cut in order to fit the plan. Otherwise, other crew members have no supervisory responsibility.
	<b>Working to Speed</b>	Major	Pressure to work within project time constraints. Each stage of an installation project takes has an expected completion time (pending weather), and workers need to stay within time constraints to ensure construction meets customer deadlines and projected labour cost.
	<b>Self-Supervision/ Working Alone</b>	No	Workers are supervised by a Lead PV Installer. While they may work on sub-tasks independently, they work near others within their crew.
	<b>Computer Usage</b>	No	Not required to use computers.
	<b>Math:</b>		
	• Simple	Minor	Required to carry out basic arithmetic operations such as addition, subtraction, division, and multiplication to determine amount of construction material required and to adjust materials accordingly. Use power tools, jigs, measuring tapes, and levels to ensure parts are aligned, installed, and secured correctly & evenly. Calculator can be used. Basic trigonometry required to measure some roofs & determine amount of construction materials required. <u>Calculator can be used.</u>
	• Complex	Minor	
	<b>Memory:</b>		
• Short Term	Minor	Basic memory ability is required to recall information that is applied to work tasks on a regular basis (e.g., procedural information). <u>Physical reference documents are available if needed. Lead PV Installer is nearby to answer questions.</u>	
• Long Term	Minor		
<b>Organization</b>	Major	Track daily and site installation progress through work plans.	
<b>Decision Making</b>	Major	Minor decisions for troubleshooting where an error in judgement could create an inconvenience. <u>Defer to Lead for most major decisions.</u>	
<b>Attention to Detail</b>	Major	Significant attention to detail is required for many tasks. Ensuring correct parts and correct number of parts are provided. Quality, cleanliness and safety checks for all parts and equipment, materials assembled, hoisted, and installed.	
<b>Problem Solving</b>	Minor	Select predefined alternatives according to standard practice. Recognizing an atypical situation and deferring to Lead for guidance.	
<b>Emergency Management</b>	Minor	Reviews hazards & emergency plans at the site daily, follows predetermined protocol to ensure safe work and emergency response.	

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Demand / Action		Check if Performed	Duration	Frequency	Description & Potential Accommodations <i>*Accommodation options noted in green</i>
Legend: NE = Not Essential   ND = Not Daily   Rare = 1-5%   Occasional = 6-33%   Frequent = 34-66%   Constant = 67-100%					
Strength	Lifting	Two Hands	✓	Occasional	<ul style="list-style-type: none"> <li>35-41 lbs: lifting and lowering extension ladders, scaffold parts, solar panels; 60x/shift</li> <li>1-5 lbs: repeatedly picking up cordless drill or driver while kneeling or crouching on roof; picking up dual and quad inverters; 60-120x/hour over ½ shift</li> <li>5-12 lbs: using cordless circular saw, or reciprocating saw; mounting rails; small boxes of fasteners; tool belt; overall up to 20x/shift</li> </ul>
		One Hand	✓		
	Carrying	Two Hands	✓	Occasional	<ul style="list-style-type: none"> <li>35-41 lbs: carrying extension ladders, scaffold parts, mounting rails and solar panels; 60x/shift</li> <li>1-5 lbs: walking with cordless drill or driver; carrying dual and quad inverters;</li> <li>5-12 lbs: carrying cordless circular saw, or reciprocating saw; carrying small boxes of fasteners; tool belt; overall up to 20x/shift</li> </ul>
		One Hand	✓		
	Pushing/Pulling	Two Hands	✓	Rare - Occasional	<ul style="list-style-type: none"> <li>Solar Panel Pull: 10 reps/panel x up to 40 panels at 40 lbs/panel for up to 30' typically done in groups of 5 panels spread out over a shift</li> <li>Pushing solar panel rails; pushing a solar panel rail off trailer roof to ground (10 lbs of effort over 12' up to 16 reps/shift typically done when rails are needed)</li> <li>Pulling a solar panel rail up to the roof (30 lbs of effort over 12')</li> </ul>
		One Hand	✓	Rare	
Mobility	Sitting	✓	Rare – Occasional	Up to 60 mins when driving; Typically 30-90 seconds around site.	In truck to and from job site; if operating forklift; rarely on a pitched roof as most of the work is angled away from the Installers or directly at their feet; more opportunity may exist on flat roofs.
	Standing	✓	Frequent	Intermittent with walking	On the ground around the site, in the trailer, on the roof, on scaffold.
	Walking	✓	Occasional	Intermittent with standing. Max ~150'	On the ground around the site, in the trailer, on the roof, on scaffold.
	Foot Activation	✓	None or Rare	Depress pedal intermittently -2-15 min at a time.	If operating truck or forklift.
	Crouching/Squatting	✓	Frequent	60-90x/hour, 0.5-1 minutes at a time	On the roof and in attics and crawlspaces.

Position: **PV Installer**

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Demand / Action		Check if Performed	Duration	Frequency	Description & Potential Accommodations <i>*Accommodation options noted in green</i>
Legend: NE = Not Essential   ND = Not Daily   Rare = 1-5%   Occasional = 6-33%   Frequent = 34-66%   Constant = 67-100%					
Mobility	<b>Kneeling</b>	✓	Frequent	60-90x/hour, 0.5-1 minutes at a time	On the roof and in attics and crawlspaces.
	<b>Climbing</b>	✓	Rare	Climb ladders and scaffold 10-20x/shift	Ladders and scaffolding.
	<b>Balancing</b>	✓	Occasional	Climb ladders and scaffold 10-20x/shift When carrying mounting rails, solar panels and generally walking on the roof while avoiding and stepping over obstructions.	On the roof, ladders and scaffolding.
	<b>Crawling</b>	✓	None or Rare	1-2x/hour, less than 1 minute duration	In attics and crawlspaces.
Dexterity	<b>Gripping/Handling (Gross motor)</b>				
	Right Hand	✓	Frequent	200-300 x/shift Intermittently to handle cordless power tools, equipment and parts	<b>Objects:</b> 24', 28', and 35' extension ladders; scaffold frame member (40.8 lbs); scaffold platform (35 lbs); scaffold cross braces (10 lbs); solar panels (40 lbs); boxes of inverters (33-39.6 lbs); various cordless hand tools (4.8-14.3 lbs); full tool belt (8-10 lbs); various boxes of fasteners, 5-35.5 lbs (e.g., discs, L-brackets, roof mounts, splice blocks, lugs); mounting rails (20' lengths at 12 lbs each) <b>Weight Max:</b> 40.8 lbs   <b>Weight Typical:</b> 5 lbs
	Left Hand	✓			
	Either	✓			
	<b>Pinching/Fine Finger Movement</b>				
	Right Hand	✓	Frequent	800- 1000 x/shift to handle and manipulate hand tools, clips, parts, and fasteners	<b>Objects:</b> Fall arrest harness and harness clips, ratchet straps for load securement, torque dial on cordless drill and driver, unwrapping and cutting open component packaging, using marker or pen, using tape measure, leveling rails, attaching discs to roof mounts, attaching L-brackets to roof mounts, installing mid clamps and end clamps to mounting rails, attaching solar panels to clamps, attaching rodent guard to panels <b>Weight:</b> Pinch grips strength between 3 lbs – 17 lbs
	Left Hand	✓			
	Either	✓			
<b>Hand/Eye Coordination</b>	✓	Constant	Align components and fasteners, use measuring tapes, levels, jigs; operating circular saw, reciprocating saw, cordless drill and driver	Align components during assembly for correct construction and safety.	

Position: **PV Installer**

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Demand / Action	Check if Performed	Typical Posture Range of Motion (°)	Typical Repetition Rate/Hour	Description & Potential Accommodations <i>*Accommodation options noted in green</i>
<b>Neck Movement</b>				
• Flexion (bent forward)	✓	<input checked="" type="checkbox"/> <20° <input type="checkbox"/> 20-45° <input type="checkbox"/> >45°	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	Flex and extend neck to look onto roof from ground, avoid obstacles on the roof, communicate with coworkers who are higher up on the roof, to measure roof and mark out roof, sound for studs, drill holes, apply caulking, install discs on roof mounts, install roof mount/disc combo into holes in roof, attach L-brackets, rails, cables, inverters, mid clamps, end clamps, solar panels, rodent guard.  Static postures are common and are held from 30-60 sec.
• Extension (bent backwards)	✓	<input type="checkbox"/> <5° <input checked="" type="checkbox"/> >5°		
• Rotation (twist)	✓	<input checked="" type="checkbox"/> <45° <input type="checkbox"/> >45°	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	
• Lateral Flexion (bent to side)	✓	<input checked="" type="checkbox"/> <5° <input type="checkbox"/> >5°	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	
<b>Back Movement</b>				
• Flexion (bent forward)	✓	<input type="checkbox"/> <20° <input type="checkbox"/> 20-45° <input checked="" type="checkbox"/> >45°	<input type="checkbox"/> <12 <input checked="" type="checkbox"/> 12-120 <input type="checkbox"/> >120 <input checked="" type="checkbox"/> STATIC	Flex to access attics and crawl spaces; to measure roof and mark out roof, sound for studs, drill holes, apply caulking, install roof mount/disc combo into holes in roof, attach L-brackets, rails, cables, inverters, mid clamps, end clamps, solar panels, rodent guard.  Static postures are common and are held from 30-60 sec.
• Extension (bent backwards)	✓	<input checked="" type="checkbox"/> <5° <input type="checkbox"/> >5°		
• Rotation (twist)	✓	<input type="checkbox"/> <15° <input checked="" type="checkbox"/> 15-30° <input type="checkbox"/> >30°	<input type="checkbox"/> <12 <input checked="" type="checkbox"/> 12-120 <input type="checkbox"/> >120 <input checked="" type="checkbox"/> STATIC	
• Lateral Flexion (bent sideways)	✓	<input checked="" type="checkbox"/> <20° <input type="checkbox"/> 20-45° <input type="checkbox"/> >45°	<input type="checkbox"/> <12 <input checked="" type="checkbox"/> 12-120 <input type="checkbox"/> >120 <input checked="" type="checkbox"/> STATIC	
<b>Shoulder Movement (Dominant)</b>				
• Flexion (raised in front of body)	✓	<input type="checkbox"/> <45° <input checked="" type="checkbox"/> 45-90° <input type="checkbox"/> >90°	<input checked="" type="checkbox"/> <90 <input type="checkbox"/> 90-150 <input type="checkbox"/> >150 <input checked="" type="checkbox"/> STATIC	Flex to climb ladder and scaffold: >90°, <20/hour required, 10-15 x/day; to measure roof and mark out roof, sound for studs, drill holes, apply caulking, install discs on roof mounts, install roof mount/disc combo into holes in roof, attach L-brackets, rails, cables, inverters, mid clamps, end clamps, solar panels, rodent guard.
• Extension (raised behind body)	✓	<input checked="" type="checkbox"/> <5° <input type="checkbox"/> >5°		
• Abduction (raised to side)	✓	<input checked="" type="checkbox"/> <45° <input checked="" type="checkbox"/> 45-90° <input type="checkbox"/> >90°		Typical <45° abduction. Approaches 90° abduction when lifting and carrying solar panels and scaffolding parts.  Adduct to midline of body to measure roof and mark out roof, sound for studs, drill holes, apply caulking, install discs on roof mounts, install roof mount/disc combo into holes in roof, attach L-brackets, rails, cables, inverters, mid clamps, end clamps, solar panels, and rodent guard.
• Adduction (across body)	✓	<input checked="" type="checkbox"/> <45° <input type="checkbox"/> 45-90° <input type="checkbox"/> >90°	<input checked="" type="checkbox"/> <90 <input type="checkbox"/> 90-150 <input type="checkbox"/> >150 <input checked="" type="checkbox"/> STATIC	
• Rotation (turned in/out)	✓	<input checked="" type="checkbox"/> <5° <input type="checkbox"/> >5°		

**Posture & Joint Position**

Position: **PV Installer**

Date of On-Site Assessment: **November 30, 2021**

Demand / Action	Check if Performed	Typical Posture Range of Motion (°)	Typical Repetition Rate/Hour	Description & Potential Accommodations <i>*Accommodation options noted in green</i>
<b>Shoulder Movement (Non-dominant)</b>				
• Flexion (raised in front of body)	✓	<input type="checkbox"/> <45° <input checked="" type="checkbox"/> 45-90° <input type="checkbox"/> >90°	<input checked="" type="checkbox"/> <90 <input type="checkbox"/> 90-150 <input type="checkbox"/> >150 <input checked="" type="checkbox"/> STATIC	As per dominant shoulder.
• Extension (raised behind body)	✓	<input checked="" type="checkbox"/> <5° <input type="checkbox"/> >5°		
• Abduction (raised to side)	✓	<input checked="" type="checkbox"/> <45° <input type="checkbox"/> 45-90° <input type="checkbox"/> >90°		
• Adduction (across body)	✓	<input checked="" type="checkbox"/> <45° <input type="checkbox"/> 45-90° <input type="checkbox"/> >90°		
• Rotation (turned in/out)	✓	<input checked="" type="checkbox"/> <5° <input type="checkbox"/> >5°		
<b>Elbow Movement (Dominant)</b>				
• Pronation/Supination (palm down/up)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> Full	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	Forearm rotation to manipulate fasteners, tools & equipment; rotation to install discs on roof mounts (45 reps/minute over 1 hour); Pronate to attach and manipulate fasteners and parts, tools & equipment; neutral posture to 'sound' roof using hammer; pronate to climb up/down ladder and scaffolding.  Supination to carry rails on roof, during a minimum amount of assembly, and to don harness/PPE.
• Flexion/Extension (bent/straight)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> Full	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input checked="" type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	Extension to apply fasteners, parts and to use hand tools & power tools; flexion and extension to 'sound' roof using hammer (300x/hour over ½ shift); flexion and extension to apply calking using gun; flexion and extension to climb up/down ladder and scaffolding.  Flexion and extension to complete most lifting and carrying tasks.
<b>Elbow Movement (Non-dominant)</b>				
• Pronation/Supination (palm down/up)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> Full	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	Forearm rotation to manipulate fasteners, tools & equipment; Pronate to attach and manipulate fasteners and parts, tools & equipment; pronate to climb up/down ladder and scaffolding.  Supination to carry rails on roof, during a minimum amount of assembly, and to don harness/PPE.
• Flexion/Extension (bent/straight)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> Full	<input checked="" type="checkbox"/> <120 <input type="checkbox"/> 120-180 <input type="checkbox"/> >180 <input checked="" type="checkbox"/> STATIC	Extension to apply fasteners, and parts; flexion and extension to climb up/down ladder and scaffolding.  Flexion and extension to complete most lifting and carrying tasks.
<b>Wrist Movement (Dominant)</b>				
• Flexion/Extension (bent up/down)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> >½ range	<input checked="" type="checkbox"/> <900 <input type="checkbox"/> 900-1800 <input type="checkbox"/> >1800 <input checked="" type="checkbox"/> STATIC	Flex/extend to attach and to manipulate fasteners, tools & equipment.
• Deviations (bent to side)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> >½ range	<input checked="" type="checkbox"/> <900 <input type="checkbox"/> 900-1800 <input type="checkbox"/> >1800 <input checked="" type="checkbox"/> STATIC	Deviate to attach and to manipulate fasteners, tools & equipment; deviate to 'sound' roof using hammer (300x/hour over ½ shift).
<b>Wrist Movement (Non-dominant)</b>				
• Flexion/Extension (bent up/down)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> >½ range	<input checked="" type="checkbox"/> <900 <input type="checkbox"/> 900-1800 <input type="checkbox"/> >1800 <input checked="" type="checkbox"/> STATIC	Flex/extend to attach and to manipulate fasteners, tools & equipment.
• Deviations (bent to side)	✓	<input type="checkbox"/> Neutral <input checked="" type="checkbox"/> Partial <input type="checkbox"/> >½ range	<input checked="" type="checkbox"/> <900 <input type="checkbox"/> 900-1800 <input type="checkbox"/> >1800 <input checked="" type="checkbox"/> STATIC	Deviate to attach and to manipulate fasteners, tools & equipment.

**Posture & Joint Position**



Position: **PV Installer**Date of On-Site Assessment: **November 30, 2021**

## Optional Form

Can be used for Accommodation and Return to Work. To be completed by employee's medical practitioner/ health care provider (do not include diagnosis).

**Employee's Name:** 

Are there any medical/health conditions that account for absence(s) from the workplace or would affect the employee's ability to perform his/her duties?

**Yes**  **No**

If yes, describe the employee's specific work-related limitations and/or restrictions.

Indicate duration of limitation(s) and/or restriction(s) identified above. **Permanent**  **Temporary**

If temporary, what is the expected duration?

Is employee involved in treatment and/or taking medication that may affect his or her ability to work, including regular attendance, and/or performing certain duties? **Yes**  **No**

If yes, describe the impact (i.e. medication may cause drowsiness, safety risk related to treatment, treatment requires intermittent absences from work.)

Are any further absences from work (e.g. surgery) anticipated at this time? **Yes**  **No**

If yes, please specify:

When is the date of your next assessment?

Name and address of medical practitioner/health care provider completing this form:

