

PHYSICAL DEMANDS EVALUATION FOR MINING APPRENTICESHIP PROGRAM

Job Title: Industrial Electrician Apprentice

A. JOB DEMANDS:

1. Hours worked: Regular: 12 hours
Overtime: maximum 3 of 4 days off
Tours/Sets: 4 on / 4 off – possibility of 2 day / 2 night shifts or 4 steady days
Breaks: Set to each sites collective agreement

2. Activities involved in this job:

- a. Stationary activities: Walking: 20 - 30 % of day
Standing: 70 – 80 % of day
Sitting: infrequent, at breaks
Laying on creepers
- b. Dynamic activities: - Gripping tools and parts; arm use overhead, behind forward motions
- Lifting varying weights from side, in front and overhead
- Pushing/pulling tools, carts, parts, hoses, etc. from side, from behind, in front and overhead
- Carrying tools, parts in front and at sides
- Climbing on concrete, steel and equipment
- Shoveling or sweeping and clean up

3. Required personal equipment: Steel toed boots; eye protection; hard hat, hearing protection, gloves,

B. PHYSICAL DEMANDS/ HAZARDS:

Following are tables to summarize:

1. Physical Task Demand
2. Equipment/ tools used
3. Job Hazards

Key to Tables : E = extensive use – greater than 60% of day ie. 7 or more hours
Mod. = moderate use – 30 to 60 % of day ie. 3.5 to 7 hours
Min.=Minimal use –less than 30% of day ie. Less than 3.5 hours
Wt. = weight

1. Physical Task Demands	Comments	Weight/Distance	Repetitive Use			Sustained Use (ie. Holding)			Physical Dangers/Cautions
			E	Mod	Min	E	Mod	Min	
Neck - forward bending - sideways - turning - bending back	Employee should try to keep hard hat level at all times	- weight of hard hat	✓	✓			✓		- if at extremes of neck motion - if employee has painful neck pre-employment suggest wearing soft collar in compromising spaces. - confined spaces; can hit head
				✓	✓			✓	
			✓				✓	✓	
				✓	✓			✓	
Mid Back/Lower Back - rounding forward - twisting	Learn to bow forward at hip and to body twist. Avoid spine bending /twisting when possible								- danger if back rounding when lifting >40 lbs
			✓			✓			
			✓	✓		✓			
Lifting - ground to waist - waist to overhead - at side	Needs to squat then lift Use of come-a-longs	0 -50 lbs up to 100 lbs		✓	✓				- anything greater than 1/2 body weight should require assistance - avoid extreme of arm reach - more than 50 lbs. danger to arm
		0 - 50 lbs	✓	✓					
		0 - 50 lbs							
Pushing/Pulling - in front - from side	Hoses, wrenches, cables	<50 lbs. short distance	✓	✓					- use two hands to start cart
	Tool carts	Width of shop, length of shop max.		✓	✓				
	Oil carts; should avoid twisting body	Up to 100 lbs; length of shop		✓	✓			✓	

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			E	Mod	Min	E	Mod	Min	
Carrying - in front - at side	- part/tools - parts/tools	- up to 15 lbs. going up ladder and equipment - up to 50 lbs		✓	✓			✓	- need to keep weight close to chest
Reaching - overhead - behind - single arm	- parts; wrenches	- up to 10 lbs	✓	✓ ✓ ✓			✓	✓	- beyond 10 lbs. use both hands
Wrist - bending	Wrists should be held in neutral position majority of activities when possible. Use large joints of the hands		✓			✓	✓		
Gripping	Wider grip tools minimize strain of finger joints		✓			✓	✓		
Squatting		- Bodyweight plus depending on amount of lifting		✓				✓	- existing knee conditions could put greater strain on knee and/or back. Treatment should be sought
Kneeling	If extensive use, knee pads should be used			✓	✓		✓	✓	

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			E	Mod	Min	E	Mod	Min	
Climbing - Stairs - Ladders - Equipment		- Weight of body plus tools/parts	✓	✓ ✓	✓				- care with slippery surfaces - when coming down avoid jumping down; risk of ankle sprains. Have high boots to protect ankles.
Crawling	If extensive, suggest wear knee pads			✓					

Suggestions: Sustained activities: a) If greater than minimum use, then every 5 minutes come out of that position and gently move in the opposite direction for 5 repetitions. Also do during breaks.
b) Try to keep joints in resting or neutral position 80% of the time during sustained activities.

Repetitive activities: Put joint in mid position which is the resting position during breaks
Alternate activities between joints so one joint is not used repeatedly. Means organizing job.

2. Types of equipment/tools Used	Frequency of use			Weight of item (approx)	Comments
	E	Mod	Min		
Small Hand tools	✓			Under 5 lbs	- located in personal tool kits or carts
Impact tools		✓		7 - 15 lbs	- 1/2 inch, 1 inch, 1 1/2 inch impact wrenches; vibrations
Sledge Hammers / hammers	✓	✓		1 to 5 lbs hammer 4,8,12,16 lbs sledges	- shock absorbing gloves are available when use of hammer is extensive; all employees should wear gloves.
Large tools – from tool crib		✓		5 to 25 lbs 25 - 100 lbs	- smaller tools - need assistance at 100 lbs
Torque Wrenches		✓	✓✓	3 foot long 5 to 25 ft. lbs 750-1400 ft. lbs	- up to 1 inch - Danger of whip action to wrists, shoulders and spine if slips
Jacks/Lifts (on wheels)		✓	✓	10 lbs	- pulling and maneuvering devices over uneven, and unclear surfaces
Carts - Tool		✓	✓	up to 100 lbs	- often required to get tools from cart at varying heights below waist level
- Oil			✓	up to 100 lbs if full	- pulling cart behind with one hand
Equipment parts	✓	✓		> 100 lbs	- this is the max one man should lift; safe guide is not more than 1/2 body weight
		✓		100 lbs plus	- use available hoists, lifts and come-alongs or another person to assist
Grinding tools		✓	✓	5-10 lbs	- suggest use of gloves; apparently frequent hand abrasions experienced
Creepers - wheeled			✓		- encourage use of ones with head supports
Wheelbarrows carts			✓		

2. Types of equipment/tools Used	Frequency of use			Comments
	E	Mod	Min	
Working - at heights - confined spaces (height, length, width) - below waist - near moving equipment	✓ ✓	✓ ✓	 ✓ ✓	 - especially on Cats and smaller equipment - during running checks of equipment
Exposure to - cold temperatures - hot temperatures - humidity - wind - dust - fumes/gases - battery acid - cleaning fluids - engine fluids Working Floor - hard surface - slippery surface - wet surface	 ✓	 ✓ ✓ ✓ ✓ ✓	 ✓ ✓ rare ✓ ✓	 - more when taking in or out the equipment - especially during running checks; must use fans to exhaust fumes - varsol, alcohol, gasoline - antifreeze, diesel, gasoline, oils, transmission fluids - concrete; impregnated steel * - fluid on floor; mud - water from vehicles after washing - the men clean between each job to reduce the risk due to wet, slippery floors.
Noise	✓	✓		- trucks running: tested at 85 decibels - noise with impact tools; Recommend wearing decidamps when doing running
			✓	checks - high pitched noise from air arcing, air chipping
Eye strain/irritation				- small metal pieces; fumes; * do wear eye protection
Whip action to the body	✓	✓		- on hand and arms due to impact tools toque wrenches, sledge hammers - to neck from hitting hard hats on objects

Comments / Safety considerations regarding:

a) Physical task:

- When performing kneeling activities greater than twenty minutes employees should put on the available knee pads. Another suggestion is to place foam drop down pads on all tool carts to use for short periods. (They can be purchased at any hardware store).
- It is recommended that employees should avoid lifting more than half their own body weight from ground to waist without assistance. Lifting beyond this increases the risk of injury to the spine.

b) Equipment:

- When using impact tools and sledge hammers, the employees should use shock absorbing gloves especially with greater than 3 hours of steady use.
- When using torque wrenches, impact tools and with repeated gripping, all employees should avoid having any joint of the upper body, in particular the arms, at the extreme of its motion.

c) Job hazards:

- Recommend use of surgical gloves when dealing with the various fluids used, especially if an employee has an open wound on the hand or if there is skin sensitivity/allergies.
- All electricians should have shock absorbing insoles in their work boots (full insoles) to minimize the effect of prolonged working on hard floor surfaces.

Summary

1. Strength Requirement:

Maximum a) Leg strength required (from a squat lift position): to safely lift 100 lbs plus body weight to a full stand with good spinal posture maintained.

b) Arm strength required is:

- Lifting 15 lbs. with one arm to a height of 16 – 20 inches about shoulder level.
- Lifting from arms length to shoulder level 75 lbs with both arms.

c) Grip strength: required 70 – 90 lbs. each hand

d) Back strength: requires strength of the back extensors abdominals, and mid back spinal rotators to a level that can counteract the

force

and leverage put on back by loads of 10 lbs to 100 lbs.

e) Neck strength to hold weight of head plus hard hat against gravity sustained for up to 3 minutes against gravity.

(All spinal muscles must be trained in a static ie. Holding function with the mid back rotators trained for movement of no greater than 20 – 30 degrees turning to one side.)

2. Flexibility requirements:

Good flexibility is required in the following muscles groups to minimize the compressive forces and loss of movement and should be done before and after work. Treat your job like your sport – **warm up and cool down.**

a) Lower body: in light of the standing and climbing and the heavy lifting which must be done with the legs:

- Hamstrings
- Calf muscles (gastrocnemium)
- Quadriceps
- Psoas muscle (front of the hip muscle)

b) Upper body: in light of the extensive arm and hand use:

- Pectoralis muscle
- External rotators and extensors of the shoulder
- Wrist flexors and extensors
- Finger and thumb flexors

c) Spinal muscles: all

3. Joint range required: full shoulder, neck and mid back knee and hip motion is a must to manage the awkward work places and the lifting required

4. Correct movement patterns should be implemented by all workers. There are to:

- Start and end all movements in good joint postures
- Avoid completely the extremes of your joint motions
- Big motions required must come from the large joints of your hips, knees, shoulders, and elbows.
- Brace the back by tensing all muscles around the spine then bow and/or twist the whole body together

Note: Exercise must be done correctly otherwise further strain or sprain can occur.