







Industrial Commercial Institutional (ICI) - Task Analysis

Job Description	Brief Task Analysis	Photo of Task
<p>Reading & Drawing Blueprints</p> <ul style="list-style-type: none"> - Get blueprints from supervisor - At the worksite: From blueprints, mark where plugs, switches, fire alarms & other fixtures will be with a grease pencil 	<ul style="list-style-type: none"> - During slab work, only natural lighting is available for this task. CCOHS recommends a lighting value of at least 100 lux. (This will prevent squinting). Flashlight use on overcast days would be helpful [4] - During rough in and finishing tasks, lighting is available in main hallways and thoroughfares - Task requires thought, but minimal physical exertion 	
<p>Slab Work – ground</p> <ul style="list-style-type: none"> - Gather materials from materials pile - Place box (plug or switch) on the grease pencil marks - Screw, drill or hammer the box to the construction forms on the ground - Roll large bundle of conduit to the working site - Cut a length of conduit - Punch out the conduit holes in the installed fixture box - Insert conduit into hole & run it to another box - Tie conduit to rebar with wire 	<ul style="list-style-type: none"> - Over 90% of task is completed with a flexed spine. A flexed spine has a decreased ability to withstand shear and compressive forces, increasing the risk of a spinal injury [5] - Approx. 1500+ ties per day with tying occurring in 1-2 hour periods; this task is considered repetitive and places the worker at risk for muscle fatigue & injury [2] - Rebar is approx. 18” apart and 1-2” above the flooring presenting a risk for trips & falls - Electricians must be aware of the overhead crane and be constantly vigilant to hear the alarm indicating there is material overhead. The crane alarm should be different from all other auditory warning sounds [2] - The conduit cutter tool has a sharp blade that falls completely open, exposing a sharp blade. The cutter also lends itself to pinching the hand when closing, as it does not have a stop. Recommended handle length is 13 cm. A stop on the two-handed cutter would reduce pinches [2] - When tying conduit to rebar, the fingers of each hand are continuously gripping pliers for 1-2 hours and twisting each piece of wire 4 times. Each tie takes 4 ½ sec. A repetitive task. A task that continues for 2 hours is considered repetitive and increases the risk of musculoskeletal injuries. Approx. 3-14 sec between each repetition minimizing fatigue build up [2] - Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2] 	 
<p>Slab Work – wall</p> <ul style="list-style-type: none"> - Gather materials from 	<ul style="list-style-type: none"> - Approx. 70-80 fixture boxes are installed per day 	



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<p>materials pile</p> <ul style="list-style-type: none"> - Place box (plug or switch) on the grease pencil marks - Screw, drill or hammer the box to the construction forms on the ground - Roll large bundle of conduit to the working site - Cut a length of conduit - Punch out the conduit holes in the installed fixture box - Insert conduit & run it to another box - Hammer nails into the upright construction forms - Tie conduit to the nails 	<ul style="list-style-type: none"> - Work is completed at various heights. The maximum height installation of a fixture box is 7'6". A ladder is not used during wall work - Approx. 25% of the task is completed above the shoulder. - Overhead work places increased force on the shoulder, cervical and thoracic spine increasing the risk for ligament and muscular damage [1 1] - Awkward postures due to rebar installed by construction labourers - Electricians must be aware of the overhead crane and be constantly vigilant to hear the alarm indicating there is material overhead. The crane alarm should be different from all other auditory warning sounds [2] - The conduit cutter tool has a sharp blade that falls completely open, exposing a sharp blade. The cutter also lends itself to pinching the hand when closing, as it does not have a stop. Recommended handle length is 13 cm. A stop on the two-handed cutter would reduce pinches [2] - When tying conduit to nails, the fingers of each hand are continuously gripping pliers and twisting each piece of wire 4 times. Each tie takes 4 ½ sec. A repetitive task. A task that continues for 2 hours is considered repetitive and increases the risk of musculoskeletal injuries. Approx. 3-14 sec between each repetition minimizing fatigue build up [2] - Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2] - Worker must ascend/descend a 4' ladder. Potential for falls. Also, the worker may experience muscular fatigue from continuously bracing & balancing themselves while on the ladder increasing injury potential [9] 	 


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<p>Conduit Preparation</p> <ul style="list-style-type: none"> - Gather needed materials - Measure & mark the length of conduit to be cut - Cut the conduit with a heavy duty bandsaw - Place the cut conduit onto the table & clamp it into place - Ream both ends of the conduit - Remove the conduit from the clamp & place it into the threading machine - Thread the conduit 	<ul style="list-style-type: none"> - Items lifted individually are usually 5 Kg in weight. Materials above 23 Kg are to be lifted by 2 workers as per NIOSH standards [1] - A cluttered worksite & wet weather increase the potential for falls when materials handling [3] - Reaming & threading require high force production and static contraction particularly of the shoulder, forearm and back musculature. Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2] - CCOHS recommends reducing continuous vibration to the body as much as possible through rest, anti-vibration gloves & tool re-design to reduce potential hand-arm vibration injuries [7] 	
<p>Pipe Bending</p> <ul style="list-style-type: none"> - Place the conduit into the appropriate sized track on Chicago Bender or chose an appropriate sized hickey (manual pipe bender) - On the Chicago Bender, dial in the needed offset - Hold onto the Chicago Bender's handle and press down until the desired offset is reached 	<ul style="list-style-type: none"> - Pipe bending requires high force production particularly of the shoulder, forearm and back musculature. Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2] - Over 75% of task is completed with a flexed spine. A flexed spine has a decreased ability to withstand shear and compressive forces, increasing the risk of a spinal injury [5] 	 




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<p>Unistrut Installation</p> <ul style="list-style-type: none"> - Gather needed materials - Mark & layout unistrut according to blueprints - Measure & cut unistrut to the needed length - Slide the conduit into place - Insert clamps into the unistrut - Ensure the unistrut is straight 	<ul style="list-style-type: none"> - Overhead work – Shoulders, cervical & thoracic spine experience increased compressive and shear forces from static contraction. Prolonged static contraction can cause muscle fatigue & injury as blood flow is restricted. Overhead work also fatigues musculature faster than work below shoulder level, increasing the potential for injury [2] - Worker must ascend/descend a 5-step ladder to the elevated lift platform. Potential for falls. Also, the worker may experience muscular fatigue from balancing themselves while working on the platform increasing injury potential [9] - During unistrut installation, only natural lighting is available for this task. CCOHS recommends a lighting value of at least 100 lux. (This will prevent squinting). Flashlight use on overcast days would be helpful [4] - Using the electric hand saw requires static contraction particularly of the shoulder, forearm and back musculature. Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2] - CCOHS recommends reducing continuous vibration to the body as much as possible through rest, anti-vibration gloves & tool re-design to reduce potential of hand-arm vibration injuries [7] 	 <p>The first photo shows two workers on a blue lift platform (labeled 'Genie GS-2124') installing unistrut beams in a large industrial building. The second photo shows a worker in a blue shirt and white hard hat using a yellow hand saw to cut a unistrut beam on the floor. The third photo shows two workers on a blue lift platform (labeled 'Genie GS-3268 RT') installing unistrut beams.</p>
<p>Conduit Installation</p> <ul style="list-style-type: none"> - Gather needed materials - Measure & cut conduit to the needed length - Select the appropriate sized hickey (manual pipe bender) - Bend the conduit until the needed offset is reached - Slide the conduit into place - Attach a connector to the conduit - Punch out the 	<ul style="list-style-type: none"> - Overhead work – Shoulders, cervical & thoracic spine experience increased compressive and shear forces from static contraction. Prolonged static contraction can cause muscle fatigue & injury as blood flow is restricted. Overhead work also fatigues musculature faster than work below shoulder level, increasing the potential for injury [2] - Worker must ascend/descend a 5-step ladder to the elevated lift platform. Potential for falls. Also, 	 <p>The photo shows a worker in a blue shirt and yellow hard hat carrying a long, silver metal conduit pipe horizontally across a concrete floor. A red 'X' is marked on the wall behind him.</p>



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<p>appropriate hole in the fixture box & attach it to the connector</p> <ul style="list-style-type: none">- Bolt the connector to the unistrut clamp- Ensure the conduit is straight- Attach additional conduit with a coupling	<p>the worker may experience muscular fatigue from balancing themselves while working on the platform increasing injury potential [9]</p> <ul style="list-style-type: none">- Screwdriver – Repetitive supination / pronation of the wrist increasing potential for a wrist / forearm injury [2]- Pipe bending requires high force production particularly of the shoulder, forearm and back musculature. Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2]	   




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<p>Wire Pulling</p> <ul style="list-style-type: none"> - Gather needed materials - Run twine through the conduit - Tie the twine to the end of the wire to be pulled - Communicate with the worker at the other end - One worker pushes the wire into the conduit, while the other pulls on the twine to draw the wire through the conduit - Once the wire is in place, cut the twine 	<ul style="list-style-type: none"> - Wire pulling occurs at various heights - Assistive devices, such as wire carriers, reduce injury risk from lifting and carrying - Pushing wire through the conduit requires repetitive contraction of the forearm and shoulder musculature. For every 1 second of moderate muscular effort, a worker requires 1 second of rest [6,7] - Some awkward postures due to construction place workers at risk for injury - High forces applied to pull the wire through the conduit occasionally cause the twine to snap, causing an electrician to impact the floor with force. High impact forces on the spine can potentially cause severe injuries [7] 	
<p>Rough in – wire pulling (1)</p> <ul style="list-style-type: none"> - Bring wire cart to working area - Gather appropriate wire from the electrical wire cart - Cut the ends of the wire - Tape the wire together with electrical tape - Coat the taped end of the wires with soap - Insert the wire into the conduit and push it until it comes out the appropriate switch, plug, light or panel - Return to the opposite end and cut the wire 	<ul style="list-style-type: none"> - Wire pulling occurs at various heights – usually at approx. 46” - Assistive devices, such as wire carriers, reduce injury risk from lifting and carrying - Pushing wire through the conduit requires repetitive contraction of the forearm and shoulder musculature. For every 1 second of moderate muscular effort, a worker requires 1 second of rest [6,7] - Some awkward postures due to metals studs and pre-existing construction place workers at risk for injury 	
<p>Rough in – wire pulling (2)</p> <ul style="list-style-type: none"> - Attach a small plastic ball to twine - Thread twine into the conduit - Use a vacuum on the opposite end of conduit to draw the twine through the conduit - Bring wire cart to working area - Gather appropriate wire from the electrical wire cart - Cut the ends of the wire - Tape the wire together with 	<ul style="list-style-type: none"> - Wire pulling occurs at various heights – usually at approx. 46” - Assistive devices, such as wire carriers, reduce injury risk from lifting and carrying - Pushing wire through the conduit requires repetitive contraction of the forearm and shoulder musculature. For every 1 second of moderate muscular effort, a worker requires 1 second of rest [6,7] - Some awkward postures due to metal studs and pre-existing construction place workers at risk for injury 	




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<p>electrical tape</p> <ul style="list-style-type: none"> - Tie the twine to the taped end of the wires - Coat the taped end of the wires with soap - Go to the other end of the twine & pull on the twine until the wire emerges - Return to the opposite end and cut the wire 		
<p>Rough in – boxing in</p> <ul style="list-style-type: none"> - Gather required materials - Clip the fixture box to the metal stud - Slide the box into place - Screw or drill the box into place - Cut the box with clippers if necessary 	<ul style="list-style-type: none"> - Task involves nailing 720-900 nails into 240-300 boxes per day. - Boxing in is an all day task. A task that continues for over 2 hours is considered repetitive and increases the risk of musculoskeletal injuries [2] - Over 60% of drilling (installing plugs) is completed with a flexed spine. A flexed spine has a decreased ability to withstand shear and compressive forces, increasing the risk of a spinal injury [5] - Plug installation occurred at approx. 35-40" from floor 	

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<p>Rough in – conduit installation</p> <ul style="list-style-type: none"> - Roll bundle of conduit to the working site - Cut a length of conduit - Insert conduit into clip on fixture box - Run the conduit to another box - Use a stud puncher to create openings for the conduit when needed 	<ul style="list-style-type: none"> - Pre-existing holes for conduit are at 11”, 35”, 58” & 80” from the floor - Awkward postures due to metals studs and pre-existing construction place workers at risk for injury - Worker ascends/descends a 4’ ladder. Potential for falls. Also, the worker may experience muscular fatigue from continuously bracing & balancing themselves while on the ladder increasing injury potential [9] - Worker must also be aware of the potential for the conduit to get stuck on the opening going through the metal stud 	
<p>Rough in – chipping</p> <ul style="list-style-type: none"> - Read updated blueprints - Get jackhammer - Chip away at concrete until an adequate opening has been made 	<ul style="list-style-type: none"> - Chipping occurs occasionally and is usually below shoulder level - Chipping requires high force production and static contraction particularly of the shoulder, forearm and back musculature. Prolonged static contraction can cause muscle fatigue & injury as blood flow is constricted [2] - CCOHS recommends reducing continuous vibration to the body as much as possible through rest, anti-vibration gloves & tool re-design to reduce potential of hand-arm vibration injuries [7] - Noise levels above 80 dBA constitute a risk for hearing loss. Ear protection is recommended while chipping [2] 	
<p>Rough in – Cutting in</p> <ul style="list-style-type: none"> - Bend and twist BX armoured sheath cable - Snip and strip the cable - Pull out and expose the wires 	<ul style="list-style-type: none"> - Approx. 15-30 sec to complete one “cut in” with each cut in including 3 bends of the BX armoured cable - The task of cutting in is not performed for prolonged periods of time - Overhead work –fatigues musculature faster than work below shoulder level, increasing the potential for injury [2] 	

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<p>Rough in – breaker panel</p> <ul style="list-style-type: none"> - Gather breaker panel and required materials - Clip the breaker panel to the metal studs - Slide the breaker panel into place - Screw or drill the breaker panel into place - Cut the breaker panel with clippers if necessary - Strip wires and insert wires into breaker panel - Tighten breaker screws - Fold & tie up loose wire 	<ul style="list-style-type: none"> - Work is at chest level - Stripping wire: Wrist in ulnar deviation; firm hand grasp with quick extension of wrist – A repetitive task. - Approx. 2 – 2 ½ min between each repetition minimizing fatigue build up, however, the wrist is in ulnar deviation, which is an unwanted posture [2, 8] - Electricians mostly use a drill for securing screws - Drilling –potential for a vibration injury if there is not enough rest between drilling; for every 3 sec of drilling, a worker requires 2 sec of rest [6,7] 	
<p>Finishing – switch & plug install</p> <ul style="list-style-type: none"> - Bring switch/plug to the unfinished fixture - Cut drywall to reveal fixture box and its screw holes - Pull wire out of fixture - Strip approx. ½” of wire - Use drill to unscrew screws of plug/switch - Insert stripped wires; screw in the screws until they are tight - Cut two spacers - Place switch/plug into the fixture hole - Hold spacers in place - Screw the switch/plug into place - Screw on the plate 	<ul style="list-style-type: none"> - Approx. 1 ½ - 2 min to complete one switch/plug installation - Approx. 150 switches/plugs installed per day - Stripping wire: Wrist in ulnar deviation; firm hand grasp with quick extension of wrist - Approx. 2 – 2 ½ min between each repetition minimizing fatigue build up, however, the wrist is in ulnar deviation, which is an unwanted posture [2, 8] - Electricians mostly use a drill for securing screws - Drilling –potential for a vibration injury if there is not enough rest between drilling; for every 3 sec of drilling, a worker requires 2 sec of rest [6,7] - Over 50% of task (installing plugs) is completed with a flexed spine (lumbar & cervical). A flexed spine has a decreased ability to withstand shear and compressive forces, increasing the risk of a spinal injury [5] 	
<p>Finishing – light fixture install</p> <ul style="list-style-type: none"> - Bring light to the unfinished fixture - Climb ladder to the fixture - Cut drywall to reveal light fixture screw holes - Pull wire out of the fixture 	<ul style="list-style-type: none"> - Approx. 2 – 2 ½ minutes to complete a light installation - Overhead work – Shoulders, cervical & thoracic spine experience increased compressive and shear forces from static contraction. Prolonged static contraction can cause muscle fatigue & injury as 	

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<ul style="list-style-type: none"> - Strip approx. ½” of wire - Screw in bracket - Unscrew screws of light fixture - Insert stripped wires; screw in the screws until they are tight - Screw the light holder into place - Install bulb and attach globe 	<p>blood flow is restricted. Overhead work also fatigues musculature faster than work below shoulder level, increasing the potential for injury [2]</p> <ul style="list-style-type: none"> - Worker must ascend/descend a 4’ ladder. Potential for falls. Also, the worker may experience muscular fatigue from continuously bracing & balancing themselves while on the ladder increasing injury potential [9] - Stripping wire: Wrist in ulnar deviation; firm hand grasp with quick extension of wrist - Approx. 2 – 2 ½ min between each repetition minimizing fatigue build up, however, the wrist is in ulnar deviation, which is an unwanted posture [2, 8] - Electricians mostly use a drill for securing screws - Drilling –potential for a vibration injury if there is not enough rest between drilling; for every 3 sec of drilling, a worker requires 2 sec of rest [6,7] 	

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<p>Preventative Maintenance</p> <ul style="list-style-type: none"> - Open the control panel - Using a screwdriver, tighten all control panel connections - Dust the inside and outside of the control panel - Close the control panel 	<ul style="list-style-type: none"> - The electrician must check approx. 100 screws - 75% of the task is completed at or below shoulder level. - Preventative maintenance on one boiler takes approx. 25 min. There are 13 boilers that must be checked once a year. A task that continues for over 2 hours is considered repetitive and increases the risk of musculoskeletal injuries [2] - Screwdriver – Repetitive supination / pronation of the wrist increasing potential for a wrist / forearm injury [2] - If dusting the machinery is problematic, inhalation can be minimized through use of a mask 	
<p>Replace High Temp Wires</p> <ul style="list-style-type: none"> - Gather all necessary materials - Unscrew the cap covering the high temp wires - Pull out the excess wire - Unscrew the wire connector with a nut driver - Cut and strip the new wire - Connect the new wire to the preexisting wire - Wrap tape around the connection - Pull on the old wire to thread the new wire through the conduit - Pinch a wire attachment to the end of the wire - Attach the wire to the connector - Tighten the wire connector - Twist on a plastic wire protector 	<ul style="list-style-type: none"> - Almost all of the task is completed at or below shoulder level - High temperature wires must be replaced on 13 boilers at least once a year - Stripping wire: Wrist in ulnar deviation; firm hand grasp with quick extension of wrist - Approx. 2 – 2 ½ minutes between each repetition minimizing fatigue build up, however, the wrist is in ulnar deviation, which is an unwanted posture [2, 8] 	

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