



JOB DEMANDS ANALYSIS

Company: City of Burnaby

Location: Works Yard

Job Title: Sidewalks – Labourer

Classification: Regular Duty

Purpose of Activities

The Labourer on the Sidewalk's Crew assists the Form Setter as he builds wood and metal forms for the replacement of concrete sidewalk, curb and gutter, stairs and driveways. The Labourer is also responsible for stripping the concrete forms once the concrete has set.

Tools and Equipment

The Labourer will use the following tools and equipment to perform his duties:

- Clothing – Steel Toe boots, ear protection, safety vest, hard hat, leather or lined rubber gloves
- Single Axle Five-Ton Truck with a dump box, Electric Crane (one truck only)
- Small hand tools (hammer, shovel, saw, bars, brooms, etc.)
- Jack hammer (42 kg), Tamper (two man lift –30 kg/man), Cut Off Saw (39 kg)
- Wheel Barrow (23 kg) empty
- Traffic Control – signs, traffic cones, barricades
- Forms (wood and metal); Wood Forms – cut lumber to fit 2 X 4, 2 X 8, 2 X 12 up to 10 feet long; Metal forms – 2 X 4, 2 X 8, 2 X 10 all 10 feet long, weigh up to 36 kg, metal and wood stakes

Usual Methods

1. Load tools and equipment required for the day (forms, wheelbarrow, jackhammer, tamper, signs, barricades, stakes, etc) in the dump box of the Five-Ton Truck. Where a jackhammer is required, the Labourer will assist the Form Setter while he backs the truck to the compressor trailer. This compressor supplies the air pressure for the jackhammer.**
2. Drive to work location.**
3. Set up signs and barricades to protect the work crew from vehicle and pedestrian traffic.**
4. Unload tools and equipment from the dump box.



Usual Methods (Continued)

Break and Load

1. Take jackhammer off the back of the dump box, uncoil the air hose from the compressor.**
2. The Crew (Form Setter and Labourer) alternate breaking the concrete out with the jackhammer. The concrete can be anywhere from 2.5 to 36 cm (one to fourteen inches) thick.**
3. After the concrete has been broken into relatively small pieces (2-50 kg), the crew will load the pieces by hand into the dump box. The dump box sides may or may not fold down. In any event, the concrete must be lifted 1.5 to 1.8 metres high to be placed into the dump box.**
4. Repeat step 4 until all of the broken concrete has been removed and loaded into the dump box.**
5. Use a shovel and broom to clear small debris away from the excavation and throw this material into the dump box.**

Build Form

1. After the concrete debris has been cleared from the work area, the crew will layout the forms around the site.
2. The Labourer will assist the Form Setter as he builds the concrete forms. Sidewalk forms may range from less than one to up to 60 metres in length and may be up to 36 cm deep. The forms are made of wood or metal. The forms may be built around Catch Basins, water valves or other obstacles. Some obstacles are left in place while others are wrestled into position around the form.
3. A hand or power saw is used to cut the forms to length. The forms are held together with nails, stakes or clamps.
4. Fill the completed form with gravel. The gravel is dumped into the excavation either with a Five-Ton Truck or by wheelbarrow.
5. Spread the gravel (by shovel) around the inside of the form to bring the form to the required elevation.
6. Lift the tamper off the back of a truck (Five or half ton) and place it on the inside of the form. Two people are required to lift the tamper.
7. Compact the fill material with the tamper to bring the form to the required grade.
8. Lift the tamper out of the form and back to the truck.
9. Clean work site of any tools, equipment and debris.
10. Place barricades around excavation to protect the public from the open area.
11. Proceed to the next work site.

Form Stripping

1. Drive to work site location.**
2. Set up traffic barricades and cones around the work site to protect the crew from vehicle and pedestrian traffic.**
3. Use a sledge hammer to loosen the stakes holding the concrete forms in position.
4. Pull up all of the stakes by hand. Throw the stakes into a pile and collect later.
5. Use a pry bar to break the concrete form free of the concrete. Repeat until all of the Concrete forms have been freed.



6. Lift, carry and place the concrete forms onto the dump box of the Five-Ton Truck. Repeat until all the concrete forms have been placed on the truck.
7. Clear remaining debris from the work site.
8. Drive to next location to strip the concrete forms from the set concrete

The presence of ** indicates non-value added tasks. These are tasks that do not contribute to the stated purpose of the work.

Administrative Issues

The Labourer works an eight-hour day, Monday to Friday from 0700 to 1530 with a ten-minute rest period in the morning, a 30-minute lunch break and a ten-minute rest period in the afternoon. The Labourer is not required to work overtime. The Labourer is also required to perform snow removal and flood control duties as the weather demands.

Activity Demand Variables

These variables are tasks that must be carried out by the employee and are implicitly or explicitly required as objectives of the job.

- Lift, carry and load tools to the dump box of the truck
- Use jackhammer to break concrete up to 36 cm (14 inches) thick, 60 metres long and three metres wide
- Load broken concrete pieces by hand from the ground to the back of the Five-Ton Truck Dump Box (1.5 to 1.8 metres from the ground). Some trucks have a dump box where the sides fold down to allow for easier access.
- Crouch, kneel, bend and stoop to build wood and metal concrete forms
- Crouch, kneel, bend and stoop to grease and perform pre-trip Inspection on Truck every morning
- Reach below and above shoulder height to break and load concrete and build concrete forms

Worker Decision Variables

These variables are the sub-routines and cognitive/physical decisions made by the worker in carrying out the objectives of the job.

1. Lifting technique when lifting, carrying or placing tools, equipment or concrete in or out of the dump box
2. Choose body posture when building/stripping forms
3. The Sidewalk Crew can take turns breaking the concrete with a jackhammer and loading the concrete into the back of the dump box

Accommodative Considerations

1. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required during the labouring duties associated with form setting and stripping.
2. People with shoulder injuries such as rotator cuff tendonitis, bursitis and instability may have difficulty with dynamic and static loading and reaching when setting and stripping forms.



3. People with forearm and elbow injuries such as tennis elbow may have difficulty with the repeated jarring from air tool use as well as the static grip forces required during any power or hand tool use.
4. People with nerve compression injuries in the upper extremities may have difficulty with the repeated and prolonged use of the jackhammer and tamper (compression and vibration).
5. People with lower extremity injuries may have difficulty with the constant change of position from standing, to bending, to stooping, to crouching and to kneeling.

Prepared By: Jeffrey J. McGinn, Kinesiologist

February 15, 1999



Summary of Stresses

Metabolic Stresses

The aerobic energy systems will provide the major source of energy for the Labourer. This position requires a moderate to high level of aerobic function specifically when building or stripping the wood or metal form. A considerable amount of labouring is required to load or unload tools, equipment and broken concrete to or from the Five-Ton Truck Dump Box. The anaerobic energy system will be required during the heavy labouring tasks of this position (breaking concrete with a jackhammer and loading the broken concrete pieces into the dump box). This energy system will also take over as the primary energy source later in the day as an unfit Labourer becomes fatigued and the aerobic energy system can no longer supply the required energy.

Structural Stresses

Spine – There are two main risks to the spine from this position. The first deals with the prolonged forward flexed postures encountered as the Labourer assist the Form Setter as he builds the concrete forms. These forward flexed postures will occur in flexion, extension, lateral flexion and rotation and most likely while the Labourer is handling a load (< 1-50 kg). This posture requires no activity from the torso musculature, but increases asymmetrical disc compression and passive stretch on the posterior spinal ligaments and disc fibres. This can contribute to disc integrity problems as well as contributing to deconditioning of the torso support musculature. Lateral flexion and/or rotation with or without forward flexion (loaded or unloaded) will significantly increase the shear forces encountered by the discs, fibres and spinal ligaments.

The second risk to the spine will occur during the non-value-added and high risk movements encountered during the breaking and loading of concrete to the Five-Ton Truck Dump Box. Again, the spine will be loaded (<1-50 kg) and moving through all of the above ranges of motion. Loading concrete to the five ton truck dump box will likely require excessive lumbar/thoracic extension to lift the concrete block high enough to clear the edge of the dump box (approximately 1.5-2 metres from the ground). Significant, unnecessary loading of the spine occurs during this task. Use of the jackhammer will also increase the compression forces on the discs.

Shoulders and Upper Extremity– The Labourer handles extreme static (grip forces) and dynamic (build/strip forms, break and load concrete) loads to perform the tasks required in this position. Compression injuries to the carpal tunnel and overuse injuries to the tendons of the elbow (hammer, jackhammer use) are likely. The static grip required during some tool use will also decrease the blood flow in the upper extremities.

Hips and Lower Extremities – The Labourer is required to work at many levels as he builds or strips a concrete form. Bending, stopping, crouching and kneeling are all required movements. The ground may be uneven and wet which will decrease the stability of the Labourer as he works in the above positions. It is likely that the Labourer will be handling a load (<1-50 kg) from these positions as well. Standing on concrete, asphalt and other hard surfaces will increase the compressive forces up through the ankle, knee, and hip and into the spine.



INTERVENTIONS

Recommendations that could be implemented to increase productivity and lessen the risk of injury are listed below:

1. Encourage the Labourer to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.
2. Risk of injury can be decreased (soft tissue, nerve compression, disc, pinch or crush injuries) and productivity increased by eliminating the breaking and loading of concrete by hand. A Bobcat with a jackhammer and front bucket loader can both break the concrete and load it into the dump box more quickly and safely. This is a non-value added task that slows production and increases the risk of injury to the Labourer.
3. Encourage the Labourer to ask for assistance when handling heavy metal or wooden forms.
4. Store the wooden forms out of the rain to decrease their weight.
5. Install a Sidewinder on the back of the Sidewalk Crews Five-Ton Trucks. The Sidewinder will place gravel into the concrete form in a more effective and efficient manner. Presently, the gravel is either dumped (truck or wheelbarrow) into the concrete form and moved by shovel to where it is required.
6. A two-trailer system could be used to decrease the manual handling of the concrete forms. The first trailer is loaded with the concrete forms and is used by the Form Setter. The second trailer is used to strip the forms after the concrete has set. This empty trailer is then loaded with concrete forms until it is full. The Form Setter and the Labourer then switch trailers. Presently, the concrete forms are loaded and unloaded each day at the Works Yard, as they are required.
7. Provide regular education in effective use of the body and neutral joint positions for this type of work.
8. Provide kneepads for the Labourer for the times he will spend in a kneeling position when setting forms.

PJDC-Labourer Sidewalks

Referral: Lana Ho			Organization: City of Burnaby							Title: Labourer - Sidewalks	
Dept.: Public Works			Division: Concrete - Sidewalks							Contact:	
PHYSICAL DEMANDS			R E Q D E	S I D E	FREQUENCY*				Max. Weight (kg)	Usual Weight (kg)	Date: February 10, 1999
					Sel 1	Low 2	Mod 3	High 4			
S T R E N G T H	Lifting - Floor to Knuckle	X	D				X	50	<1-50	forms, jackhammer, tools, concrete	
	Lifting - Knuckle to Waist	X	D				X	50	<1-50	forms, jackhammer, tools, concrete	
	Lifting - Waist to Shoulder	X	D				X	50	<1-50	forms, jackhammer, tools, concrete	
	Lifting - Over Head	X	D			X		50	<1-50	forms, tools, concrete	
	Carrying - With Handles	X	D			X		50	<1-50	wheel barrow, tamper	
	Carrying - Without Handles	X	D				X	50	<1-50	forms, tools, jackhammer, concrete	
	Pushing - Upper Extremity	X	D				X	36	<1-36	forms, some tool use	
	Pushing - Hip/Leg Assist	X	D				X	50	<1-50	forms, concrete, jackhammer, tamper	
	Pulling - Upper Extremity	X	D				X	36	<1-36	forms, some tool use	
	Pulling - Hip/Leg Assist	X	D				X	50	<1-50	forms, concrete, jackhammer, tamper	
	Reach - Shoulder or Above	X	D			X		50	<1-50	load/unload forms/tools/concrete	
	Reach - Sho. or Above extnd										
	Reach - Below Shoulder	X	D				X	50	<1-50	break/load concrete,tool use,build form	
	Reach - Bel. Shoulder extnd	X	D				X	50	<1-50	forms, tools, jackhammer, concrete	
	Handling	X	D				X	50	<1-50	forms, tools, jackhammer, concrete	
E N R G Y	Gripping	X	D				X	50	<1-50	forms, tools, jackhammer, concrete	
	Fine Finger Movements	X	D			X		mod.	low	build forms, some tool use	
	Aerobic (percent)	X					75	jack hammer, break/load concrete, build form, strip form			
	Anaerobic (percent)	X				25	jack hammer, break/load concrete				
	High Energy Expenditure	X				X	jack hammer, break/load concrete				
	Low Energy Expenditure	X					X	jack hammer, break/load concrete, build form, strip form			
	Neck - Static Flexion	X					X	jack hammer, break/load concrete, build form, strip form			
	Neck - Static Neutral	X				X	sit in truck, stand, walk at work site				
	Neck - Static Extension	X					X	above shoulders from bend/stoop,crouch,lift to truck			
	Neck - Rotation	X	E			X	build/strip forms				
	Throwing	X				X	concrete up to truck, debris from shovel, forms to truck				
	Sitting	X			X		drive in truck to work site				
	Standing	X					X	at work site, on concrete, asphalt, grass, gravel, uneven			
	Walking	X					X	at work site, on concrete, asphalt, grass, gravel, uneven			
	Running/Jumping				X		possibly jump down from truck box (1.5m)				
M O B I L I T Y G E N E R A L	Climbing - Arms and Legs	X			X			to truck box to/from ground (1.5m), in/out of truck			
	Climbing - Legs Only	X			X			in/out of open sidewalk excavation			
	Bending/Stooping	X					X	break/load concrete,jackhammer,build/strip form,tamper			
	Crouching	X				X	build/strip form, load concrete to truck from ground				
	Kneeling	X				X	build/strip form, load concrete to truck from ground				
	Crawling										
	Twisting	X	E				X	build/strip form, load concrete, shovel			
	Balancing	X			X			climbing in/out of truck box			
	Traveling	X			X			in city to work site			
	Work Alone										
	Interact with Public	X			X			possibly at work site, in front of homes, in traffic			
	Operate Equip/Machinery	X				X		jackhammer, tamper, saw, truck dump box			
	Irregular/Extended Hours							8 hour day,Monday-Friday,2X10 min.break,30 min.lunch			

* Frequency Legend 1 = Seldom; Not Daily 2 = Low Daily Activity; < 1hr
 3 = Moderate Demand; Repetition 1 - 3 hrs daily 4 = High Frequency Demand; Repetition > 3 hrs daily
 The following shading denotes a HIGH RISK TASK: Modifications should be considered

REQD is marked with an X if the particular demand or category is relevant to the purpose of the job.

SIDE refers to the side or limb required to execute a task. If it is marked **E**, it indicates either side, the most common choice is listed first. **D** refers to dominant and **B** to both sides.

PJDC-Labourer Sidewalks

Referral:		Organization:				Title: see 1st page header			
Dept.:		Division:				Contact:			
PHYSICAL DEMANDS		R E Q D	S I D E	FREQUENCY*				COMMENTS	
				Sel. 1	Low 2	Mod. 3	High 4		
P E R C E P T I O N	Hearing - Conversations	X				X		Form Setter, other Labourers, Foreman, public	
	Hearing - Other Sounds	X				X		vehicles in traffic, jackhammer, truck, tamper	
	Vision - Far	X					X	jack hammer, break/load concrete, build form, strip form	
	Vision - Near								
	Vision - Colour								
	Vision - Depth	X					X	build/strip forms, jackhammer, level fill in form	
	Perception - Spatial	X					X	move about at work site, in traffic, tools/equipment	
	Perception - Form	X				X		types/sizes of lumber, wood/metal forms	
	Feeling (Tactile)	X					X	jackhammer/tamper use, build/strip forms	
	Reading								
W O R K E N V I R O N M E N T	Writing								
	Speech	X				X		Form Setter, other Labourers, Foreman, public	
	Inside Work	X			X			drive to work site in cab of truck	
	Outside Work	X					X	build/strip/labourer at form in all weather conditions	
	Hot Conditions >25 deg. C	X		X				spring, summer, fall	
	Cold Conditions <10 deg.C	X		X				fall, winter, spring	
	Humid	X		X				wet, rainy weather conditions	
	Dust	X				X		concrete dust, gravel fill for sidewalk	
	Vapor Fumes	X					X	traffic fumes, diesel fumes from compressor	
	Hazardous Machines	X				X		jackhammer, tamper, trucks	
	Proximity to Moving Object	X		X				vehicles in traffic	
	Noise	X					X	jackhammer, tamper, trucks, ear protection required	
	Electrical Hazard								
	Sharp Tools	X					X	saw, nails, edges of wood/metal forms, broken concrete	
	Radiant/Thermal Energy	X		X				sun burn during hot weather	
	Slippery Conditions	X		X				ground conditions during wet weather	
	Vibration and Related	X				X		jackhammer, tamper use	
	Chemical Irritants								
	Organic Substances	X		X				possibly dog feces at work site	
	Medical Waste	X		X				possibly needles at work site	
	Blood Products								
	Congested Worksite	X		X				depends on location of work site	
	Lighting - Direct	X					X	sun light, day light	
	Lighting - Indirect	X		X				day light	
	Lighting - Adjustable								
	Lighting - Fluorescent								
Lighting - Incandescent									
Lighting - Shadows etc.	X		X				depends on time of day and location or work site		

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For detailed descriptions of each of the different categories, please refer to the reference guide or inquire with Human Effort at 1-888-4EFFORT