



## JOB DEMANDS ANALYSIS

**Company:** City of Vancouver

**Location:** Various street locations

**Job Title:** Labourer - Construction

**Classification:** Regular Duty

### Purpose of Activities

The purpose of the duties of the Labourer - Construction is to assist other members of the construction crew in repairing and maintaining asphalt and concrete road/sidewalk area in Vancouver.

### Tools and Equipment

The labourer will use the following tools and equipment to perform their duties:

- Gloves.
- Safety Hat
- Safety Boots.
- Safety Vest.
- Shovels, rakes, broom, tar brush, pick, straight-bar and other hand tools.
- Wheelbarrow.
- 90 pound jackhammer.
- Tamper.

### Usual Methods – Asphalt Removal

As the backhoe removes the roadtop, the labourers will carry out light shoveling to finish breaking up the ground. They will also engage in push-broom work around the cut to keep the roadway clean. They may also use a straight-bar or a pick to clean up the edges of the cut.

### Usual Methods – Asphalt Replacement

As the truck backs up with its load of asphalt, the labourers drive their spades into the asphalt so that the packing becomes loosened. Once the asphalt has been dumped, it is shoveled off the road and into the cut (up to 15-kg per shovel full). They also shovel dry mix in advance of the asphalt and use the motorized hand roller to tamp the dry mix and the asphalt.

### Usual Methods – Concrete

This primarily involves work to break old concrete with a 90-lb jackhammer, pick and straight bar and then hand load the pieces into the back of the flatbed truck. New concrete work involves regular use of the wheelbarrow full of gravel over uneven surfaces. They also use



a tamper and move steel forms on and off of the trucks and into place. They will also hose down the site regularly. Shovel and rake work can be nearly constant.

### Administrative Issues

The labourer works on crews composed of two or three people. They work out of the Manitoba yard or out of a work wagon. They travel by truck. They must work in all environmental conditions.

The labourers are involved in pothole filling, concrete filleting, sidewalk construction, concrete curb construction and asphalt repair. They also occasionally clear snow from bus stops in the winter.

The normal shift is from 0700 to 1530, Monday through Friday, with a 30 minute lunch break and two ten minute coffee breaks.

The environmental conditions can change this job appreciably. It is possible to be exposed to extreme hot conditions that have implications for hydration, sunburn and heatstroke. Wet weather is common and can make footing less reliable even treacherous. Cold is also a possibility as is snow (regularly the case during the winter months since the watersheds are at elevation), although this is less likely than wet conditions.

### 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.

- Work in outdoor urban environment.
- Walk over uneven ground, on steep slopes.
- Lift, carry, grip and handle awkward loads.
- Carry out tasks under unpredictable outdoor conditions that often include steady rainfall.
- Exposure to asphalt, concrete and dust.

### 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.

- Choose postures for carrying out duties (e.g. lifting using hips and maintaining neutral spine, creative energy saving techniques).
- Planning of lifts and routes for carrying (limited).

### Accommodative Considerations

1. People with injuries to the spine in any region may have difficulty with constant movement of loads from near ground level.
2. People with shoulder injuries such as rotator cuff tendinitis, bursitis and instability may have difficulty with the frequent and often challenging .
3. People with any upper extremity problems may have difficulty with this position because of regular gripping and carrying of loads.



4. Individuals with knee, hip or ankle difficulties may find they have difficulty with this job because of constant walking over unpredictable ground while carrying load.
5. A very high level of general fitness is preferred for this job and individuals who do not present with this feature are likely to be at higher risk for mechanical injury.
6. Individuals recovering from systemic illness should be carefully screened before entering this activity.
7. Individuals who do not cope well in outdoor work environments would have difficulty with this position.
8. There is no significant learning curve associated with the tasks.

Prepared By:           Greg Hart, Kinesiologist                           August 4, 1999



## Summary of Stresses

### **Metabolic Stresses**

The aerobic energy system supplies the vast majority of energy required to complete the tasks in this position since the work is ongoing in nature. It is a paradox that using good mechanical form in lifting and carrying actually increases energy consumption. Individuals with low aerobic power will take increasing mechanical risks with their bodies as a result of mounting fatigue. There is also a high anaerobic power requirement associated with heavy lifts which can be frequent.

### **Structural Stresses**

**Spine** – there are a number of issues impacting the spine. It is possible that during prolonged low level work (e.g., working under tarps), the spine becomes flexed and the muscles do not act to support it. There is also increasing laxity of the rear ligaments and the outer ring of the disc with increased pressure on the disc nucleus. This time of prolonged flexion is followed by a period of intense, repetitive exertion that requires significant stabilizing of the spine. There is a profound emphasis on the strength and endurance of the torso stabilizers. If there is bending involved in the lifting, it exacerbates the problems brought on by sitting. If there are asymmetrical lifts and twisting motions while carrying load, the risk of damage to the structures in the spine increases dramatically. Many of these postures are possible in this job.

**Shoulders and Neck** – due to the considerable load being carried by the upper extremities and the frequent positioning of the arms away from the body, this activity places individuals at increased risk for rotator cuff tendinitis, sub-acromial bursitis and damage to the labral surfaces of the joint. The shoulder is mechanically ineffective when the arms are away from the body, especially under load. This also contributes to significant tension through the muscles of the neck and upper back. When the arm is held above the shoulder (sometimes with force as in jarring asphalt free from truck box), it is in an impingement position which can lead to a number of the conditions stated above.

**Arms and Hands** – frequent heavy gripping increased the risk of injuries to the elbows and wrist tendinitis which can lead to nerve entrapment scenarios. The gripping is made worse by the wearing of gloves (obviously necessary) and wet materials. As muscles in the shoulder, trunk and legs fatigue, more work often comes from the arms which will also increase loads at the elbow and forearm and could lead to epicondylitis type conditions (i.e., tennis or golfer's elbow).



## **INTERVENTIONS**

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

1. Encourage the workers to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, anaerobic power, muscular strength, muscular endurance and flexibility. Especially cardiovascular endurance. This is the type of work where the most impactful intervention is always going to be with the person doing the work due to the variability of the presentation of tasks.
2. Provide regular education in effective use of the body and neutral joint positions for this type of work. This cannot be standard bend your knees and lift information, but creative work aimed at the precise issues of the job in these very challenging environments.
3. Explore different possibilities for loosening asphalt without having to use the spades to jam into the mix.
4. Avoid asymmetrical lifts wherever possible.
5. Avoid twisting with a load to avoid damage to discs in the spine.
6. Keep arms and loads close to the body at all times.
7. Test a load before it is lifted.
8. Plan the route when manually handling materials.
9. Take a moment to extend the spine and warm up the body when switching from driving to strenuous activities.
10. Be careful to not increase grip forces unnecessarily.
11. Review footwear to insure that safety wear also is as light as possible with excellent heel and forefoot support.
12. Consider a program of pre-employment physical testing to ensure that candidates are able to safely carry out the essential job demands.

PJDC-Construction Labourer

Referral: Debbie Craig		Organization: City of Vancouver				Title: Construction Labourer				
Dept.: Streets		Division:				Contact:				
						Date: August 4, 1999				
PHYSICAL DEMANDS		R E Q U I R E D	S I D E	FREQUENCY*				Max. Weight (kg)	Usual Weight (kg)	COMMENTS
				Sel 1	Low 2	Mod 3	High 4			
S T R E E T G R O U P	Lifting - Floor to Knuckle		B				X	50	5	Lift shovel/material, forms, sand bag, jackhammer
	Lifting - Knuckle to Waist		B				X	50	5	Lift shovel/material, forms, sand bag, jackhammer
	Lifting - Waist to Shoulder		B				X	20	5	Shovel/material (hand break)
	Lifting - Over Head		B			X		5	5	Shovel/material
	Carrying - With Handles		B			X		20	8	Pail of oil for asphalt (< 100 metres)
	Carrying - Without Handles		B		X			35	5	Broken concrete, end of forms/jackhammer
	Pushing - Upper Extremity		B				X	15	5	Shovel to loosen asphalt, rake
	Pushing - Hip/Leg Assist		B				X	30	20	Wheelbarrow, rake
	Pulling - Upper Extremity		B		X			15	5	Wheelbarrow, shovel, rake
	Pulling - Hip/Leg Assist		B				X	30	20	Wheelbarrow, rake
	Reach - Shoulder or Above		B			X		5	5	Shovel to loosen asphalt
	Reach - Sho. or Above extnd		B			X		5	5	Shovel to loosen asphalt
	Reach - Below Shoulder		B				X	10	low	Rake, shovel
	Reach - Bel. Shoulder extnd		B				X	20	mod.	Rake, shovel, wheelbarrow
Handling		B				X	high	mod.	Equipment, tools, pieces of concrete	
Gripping		B				X	high	mod.	Steering wheel, tools, equipment	
Fine Finger Movements		D				X	low	low	Operate controls of equipment	
E N E R G Y	Aerobic (percent)						80	Walking, standing, light to moderate tasks		
	Anaerobic (percent)				20			During heavy short term exertion (lifting, pushing, etc.)		
	High Energy Expenditure						X	Break and load, asphalt application		
	Low Energy Expenditure			X				Walking, standing some tasks		
P O S T U R E S + M O V E M E N T S	Neck - Static Flexion						X	All labor tasks		
	Neck - Static Neutral									
	Neck - Static Extension									
	Neck - Rotation		B				X	Watch for vehicles		
	Throwing						X	Material from shovel, pieces of concrete into truck bed		
	Sitting				X			When driving		
	Standing						X	Most of the day		
	Walking					X		Around the jobsite (short distances)		
	Running/Jumping									
	Climbing - Arms and Legs				X			In and out of the trucks/equipment		
	Climbing - Legs Only									
	Bending/Stooping						X	Shovel, position forms, work under tarp during rain		
	Crouching				X			Working under tarp or setting forms		
	Kneeling			X				Position forms		
T W I S T I N G	Crawling									
	Twisting		B					Working around obstacles and confined spaces		
	Balancing					X		Working near the edges of excavations		
	Traveling				X			To the worksite within the City of Vancouver		
G E N E R A L	Work Alone							Always in a crew		
	Interact with Public					X		Always working in areas of pedestrian and vehicle traffic		
	Operate Equip/Machinery					X		Roller, wheelbarrow, jackhammer		
	Irregular/Extended Hours			X				Night & weekend shifts may be utilized		

\* 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.

Referral:		Organization:				Title: see 1st page header			
Dept.:		Division:				Contact:			
PHYSICAL DEMANDS		R E Q U I R E 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		B				X	On site with crew, radio	
	Hearing - Other Sounds		B				X	Motor, traffic, equipment	
	Vision - Far		B				X	Most activities	
	Vision - Near		B	X				Checking fine detail	
	Vision - Colour								
	Vision - Depth		B				X	Judging distance in excavations and piles of material	
	Perception - Spatial		B				X	Working around objects, stepping over uneven scenes	
	Perception - Form								
	Feeling (Tactile)		B				X	Gauging grip pressure	
	Reading								
W O R K E N V I R O N M E N T	Writing								
	Speech						X	On site to crew, members of the public	
	Inside Work				X			Driving to and from the site	
	Outside Work						X	Most of the day	
	Hot Conditions >25 deg. C			X				Occasional in summer	
	Cold Conditions <10 deg.C			X				Occasional in winter	
	Humid					X		Wet weather is common especially in fall and winter	
	Dust						X	Always present except during rain or snow	
	Vapor Fumes						X	Exhaust of vehicles in traffic, asphalt and tar	
	Hazardous Machines						X	Roller, trucks, backhoes, jackhammers, tampers	
	Proximity to Moving Object						X	On sidewalk and in ditches/roadsides	
	Noise						X	Jackhammer, traffic, other equipment	
	Electrical Hazard								
	Sharp Tools								
	Radiant/Thermal Energy						X	Heat off of asphalt (340 degreesF)	
	Slippery Conditions				X			Wet and mud in open excavations	
	Vibration and Related					X		Vibration of Jackhammer/tamper	
	Chemical Irritants						X	Tar, oil, concrete	
	Organic Substances								
	Medical Waste								
	Blood Products								
	Congested Worksite				X			Some locations have limited space for movement	
	Lighting - Direct						X	Daylight	
	Lighting - Indirect								
	Lighting - Adjustable								
	Lighting - Fluorescent								
Lighting - Incandescent									
Lighting - Shadows etc.						X	Depending on location		

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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