



## **JOB DEMANDS ANALYSIS**

**Company:** City of Burnaby

**Location:** Works Yard

**Job Title:** Labourer – Ditching - Waterworks

**Classification:** Regular Duty

### Purpose of Activities

The purpose of the Labourer position is to clear debris and vegetation from ditches in the City of Burnaby back lanes and front streets. These ditches are a vital link to ensure that excess ground water is carried from the back lane and front street to the catch basins and out to the storm sewers to prevent flooding.

### Tools and Equipment

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

- Clothing – Steel Toe boots, safety vest, hard hat, leather gloves, safety glasses, face shield, chain saw pants, coveralls
- Hand tools - square and round mouth shovels, push brooms, rakes, loppers, pliers, grips, hammer, etc.
- Power tools - weed eater with two-stroke engine (10-kg), chain saw, hedge trimmers
- Wheel Barrow (23-kg) empty
- One-ton single axle crew cab truck with cut down dump box – dump box is 1.5 metres from the ground, step to truck cab is 0.60 metres from the ground

### Usual Methods

#### **Whole Ditching Crew**

1. Drive to work location.
2. Set up traffic control if required.
3. Unload required tools and equipment from back of truck box.
4. Load tools and equipment when moving to a new site or workday is over.

#### **Ditching (usually in winter)**

1. Using a shovel or rake, clear dirt and debris from ditch and culvert.
2. Continue clearing dirt and debris until a rest period, lunch or the end of the workday.

### Usual Methods (Continued)

#### **Clearing Vegetation from Ditch (usually in summer)**

1. Fuel weed eater with oil and gas mix.



2. Install or pull weed eater line on spool.
3. Wear protective clothing.
4. Pull start weed eater two-stroke engine.
5. Put weed eater shoulder harness on, adjust straps to fit.
6. Lift weed eater to waist height and secure to shoulder harness.
7. Clear overgrown vegetation from ditch with weed eater.
8. Continue clearing vegetation until a rest period, lunch or the end of the workday.
9. The Labourer will also use a chain saw, hedge trimmer or a lopper to clear overhanging vegetation (tree branches, trees, hedges, etc.) away from ditch.

### **Debris Removal**

1. Push or shovel debris into a condensed pile.
2. Drive one-ton truck beside debris pile.
3. Use a shovel or pitchfork to load debris into the back of the truck box. The Labourer is required to lift the loaded shovel or pitch fork at least 1.5 metres to clear the lowest point on the truck box.
4. Continue steps 1-3 until a rest period, lunch or the end of the workday.
5. Drive truck to dump, back into required location, and operate dump controls with right hand to raise dump box to clear debris from the truck box. In some instances, a half-ton truck (no dump box) is used and the debris is shoveled on and off the truck by hand.\*\*

**The presence of \*\* indicates non-value added tasks. These tasks 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. There is no overtime or on-call requirement in this position. There are three to six Labourers on a crew with a Foreman.

### 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.

- Dig dirt and debris from bottom of ditch and around culverts
- Shovel (pitch fork) dirt and debris to grade and then to truck box 1.5 metres from the ground – typically shoveling is from below grade to above shoulder height
- Operate weed eater, chain saw, hedge trimmers – wear protective clothing as required for each piece of equipment
- Unload tools and equipment from 1.5 metre truck box
- Load tools and equipment from ground to 1.5 metre high dump box
- Walk, stand in ditches filled with water
- Walk several kilometres per day operating weed eater in summer and clearing dirt and debris from ditches in the winter
- Climb in/out of truck cab – 0.60 metres from ground – one step
- Climb on/off truck box – 1.5 metres from ground – 3 ladder rungs on side of truck box



### 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.

- Set up shoulder harness for weed eater
- Choose body posture and shoveling technique when clearing debris from ditch and loading into truck 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 the Ditching Crew.
2. People with shoulder injuries such as rotator cuff tendonitis, bursitis and instability may have difficulty with dynamic and static loading and reaching when clearing debris from the ditch, loading debris on the truck and during weed eater, chain saw and hedge trimmer use.
3. People with forearm and elbow injuries such as tennis elbow may have difficulty with the static grip forces required to hold the shovel, rakes and pitch fork as well as the jarring and vibration encountered when using the weed eater, chain saw and hedge trimmer.
4. People with nerve compression injuries in the upper extremities may have difficulty with the repeated and prolonged use of the weed eater, chain saw and hedge trimmer (compression and vibration).
5. People with lower extremity injuries may have difficulty with the dynamic movements and forces required to clear debris from the ditch, load the debris to the truck and walk and stand for almost the whole day.

Prepared By: Jeffrey J. McGinn, Kinesiologist

May 18, 1999



## Summary of Stresses

### Metabolic Stresses

The aerobic energy system will provide the major source of energy for the Labourer. This position requires a moderate to high level of aerobic function, specifically when clearing debris from the ditches and culverts, loading the debris to the truck and when weed eating, operating the chain saw and hedge trimmers. The anaerobic energy system may 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** – Forward flexed postures will occur most likely while the Labourer is handling a load (shoveling dirt and debris, lifting/carrying tools and equipment, operating the weed eater, chain saw and hedge trimmer). 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 decondition 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 compression of the weed eater and shoulder harness will also add to the asymmetrical disc compression on the spine.

**Shoulders and Upper Extremity**– The Labourer handles moderate to high static (grip forces on shovels, rakes, pitch forks, weed eaters, chain saws, hedge trimmers.) and dynamic (clear dirt and debris from ditch, shovel dirt and debris to truck) loads to perform the tasks required in this position. Shoveling debris to the truck box requires a lift of at least 1.5 metres to reach the lowest point of the truck box. The static grip forces required to hold the hand and power tools will also decrease the blood flow in the upper extremities.

Almost all of the Labourer's work is carried out in front of his body with some type of tool or implement. This position will weaken the shoulder girdle support structure and increase the risk of injury to this area. Rotator cuff and biceps tendon tendonitis injuries are likely as the muscle of the upper back and shoulder weaken through prolonged use. As this happens, thoracic spine kyphosis will increase and the cervical spine will be pulled forward out of its neutral position.

**Hips and Lower Extremities** – The Labourer is required to work at many levels as he performs the tasks required in this position. Walking, standing, bending and stooping 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 (<1-23 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.

**Insect Bites** – stinging insects are likely to be prevalent in the ditches and vegetation. Injury to the Labourer can range from localized swelling of the bite area to death from anaphylactic shock.



## **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. Provide regular education in effective use of the body and neutral joint positions for this type of work.
3. Investigate the use of a shoulder harness for the weed eater that will take its weight and spread it between the Labourers shoulders (right and left) and the hips. It is important not to just transfer the load to the hips, as this will also negatively affect the function of the spine.
4. Carry a Sharps Container for discarded needles that are found by the Labourer.

PJDC-Labourer Ditching

Referral: Lana Ho			Organization: Burnaby							Title: Labourer - Ditching	
Dept.: Engineering			Division: Waterworks							Contact: Lorne Graham	
PHYSICAL DEMANDS			R E Q 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 N G T H	Lifting - Floor to Knuckle	X	B			X		23	<2-23	tools/equip. use, load debris, tools/equip. to truck	
	Lifting - Knuckle to Waist	X	B				X	23	<2-23	tools/equip. use, load debris, tools/equip. to truck	
	Lifting - Waist to Shoulder	X	B			X		23	<2-23	tools/equip. use, load debris, tools/equip. to truck	
	Lifting - Over Head	X	B		X			23	<2-23	tools/equip. use, load debris, tools/equip. to truck	
	Carrying - With Handles	X	B			X		23	<2-23	weed eater, chain saw	
	Carrying - Without Handles	X	B				X	23	<2-23	shovels, rakes, pitch fork, loppers, brooms	
	Pushing - Upper Extremity	X	B				X	23	<2-23	shovels, rakes, tools, on/off truck	
	Pushing - Hip/Leg Assist	X	B				X	23	<2-23	shovel,rake,pitch fork use,load material on truck	
	Pulling - Upper Extremity	X	B				X	23	<2-23	pull start on power equipment, shovels, rakes	
	Pulling - Hip/Leg Assist	X	B				X	23	<2-23	shovel,rake,pitch fork use,unload truck box	
	Reach - Shoulder or Above	X	B		X			23	<2-23	lift tools, equipment, debris to/from truck box	
	Reach - Sho. or Above extnd	X	B		X			23	<3-23	lift tools, equipment, debris to/from truck box	
	Reach - Below Shoulder	X	B				X	23	<2-23	clear debris from ditch by hand, power equip.	
	Reach - Bel. Shoulder extnd	X	B		X			23	<5-23	lift/carry tools and equipment to/from truck	
	Handling	X	B				X	23	<2-23	tools, equipment, debris, branches, etc.	
E N R G P O S T U R E + M O B I L I T Y G E N E R A L	Gripping	X	B				X	40	<4-20	shovels, weed eater, chain saw, pitch fork, broom	
	Fine Finger Movements	X	D			X		mod.	low	trigger on weed eater, chain saw, hedge trimmer	
	Aerobic (percent)	X					95	clear debris from drainage ditches, load into truck for disposal			
	Anaerobic (percent)			neg.				possibly from fatigue			
	High Energy Expenditure										
	Low Energy Expenditure	X					X	clear debris from drainage ditches, load into truck for disposal			
	Neck - Static Flexion	X					X	work below shoulders with hand and power tools equip.			
	Neck - Static Neutral	X					X	walks, stand at work site, usually in an alley			
	Neck - Static Extension	X			X			load/unload tools/equip. from truck, work from bend/stoop			
	Neck - Rotation	X	E				X	hand/power tool use, load/unload debris, tools, equip. from truck			
	Throwing	X				X		from shovel from ditch to grade, grade to truck box at 1.5 metres			
	Sitting	X			X			drive between job sites in city of Burnaby			
	Standing	X					X	on concrete, asphalt, grass covered ditches, in water in ditches			
	Walking	X					X	several km per day to clear ditches			
	Running/Jumping										
Climbing - Arms and Legs	X			X			up/down to/from truck box, 1.5 metres high, 3-4 steps				
Climbing - Legs Only	X		X				in/out of ditches, hills				
Bending/Stooping							hand/power tool/equip use to clear debris from ditches				
Crouching	X		X				possibly to clear debris from ditch or culvert				
Kneeling	X		X				possibly to clear debris from ditch or culvert				
Crawling											
Twisting	X	E				X	hand/power tool use to clear debris from ditch, load/unload truck				
Balancing	X			X			on truck, steps, truck box ladder, in truck box, in ditch				
Traveling	X			X			in City of Burnaby, less than 1 hour per day				
Work Alone							in a crew of 3-6 Labourers and truck driver				
Interact with Public	X			X			possibly when clearing debris from ditch				
Operate Equip/Machinery	X					X	weed eater, chain saw				
Irregular/Extended Hours							0700-1530, Monday - Friday, no overtime				

\* 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 Ditching

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			others in crew, truck driver, supervisor, public	
	Hearing - Other Sounds	X					X	weed eaters, chain saws, truck, public vehicle traffic, insects	
	Vision - Far	X					X	clear debris from ditch, load into truck for disposal	
	Vision - Near								
	Vision - Colour								
	Vision - Depth	X					X	clear debris from ditch, hand/power tools use	
	Perception - Spatial	X					X	clear debris from ditch, hand/power tools use	
	Perception - Form								
	Feeling (Tactile)	X				X		hand and power tools use, load debris into truck	
	Reading								
W O R K E N V I R O N M E N T	Writing								
	Speech	X			X			others in crew, supervisor, truck driver, public	
	Inside Work	X			X			in cab of truck driving to next location	
	Outside Work							clearing debris from ditches, load debris to truck for disposal	
	Hot Conditions >25 deg. C	X		X				spring, summer and fall	
	Cold Conditions <10 deg.C	X		X				fall, winter and spring	
	Humid	X		X				during rain and extended periods of wet weather	
	Dust	X		X				clearing debris from ditch, weed eating ditch	
	Vapor Fumes	X				X		oil/gas mix from weed eater and chain saw	
	Hazardous Machines							weed eater, chain saw	
	Proximity to Moving Object	X					X	spinning weed eater, moving chain, in lanes/streets near traffic	
	Noise	X				X		weed eaters, chin saws, hearing protection is worn	
	Electrical Hazard								
	Sharp Tools	X					X	weed eaters, chain saws, shovels, rakes	
	Radiant/Thermal Energy	X					X	hot equip. motors, sun	
	Slippery Conditions	X		X				in wet ditches, grass and mud	
	Vibration and Related	X					X	weed eater, chain saw use, shovel and pitch fork use	
	Chemical Irritants							fertilizers, insecticides sprayed on the grass in ditches	
	Organic Substances	X					X	dog feces, decaying vegetation in ditches	
	Medical Waste	X		X				discarded needles and condoms	
	Blood Products								
	Congested Worksite	X		X				possibly clearing debris from ditch	
	Lighting - Direct	X					X	day light, sun light	
Lighting - Indirect	X					X	day light		
Lighting - Adjustable									
Lighting - Fluorescent									
Lighting - Incandescent									
Lighting - Shadows etc.	X		X				depends on time of day. 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