



JOB DEMANDS ANALYSIS

Company: Greater Vancouver Regional District **Location:** Capilano Watershed

Job Title: Water Crew **Classification:** Regular Duty

Purpose of Activities

The purpose of the duties of the Water Crew is to maintain to the condition of the watersheds in the GVRD.

Tools and Equipment

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

- Pick-up Truck (4x4 extended cab) or panel van.
- Gloves.
- Safety Boots.
- Safety Vest.
- Shovels, spades and other hand tools.
- Pressure washer.
- Leaf blower.
- Power broom.
- Chainsaws.
- Handheld radio.
- Boat.

Usual Methods – Rounds

There are no “usual” methods to this job since there is a wide variety of activities that members of the Water Crew may be required to participate in. There are routine rounds of the watershed area that are carried out by driving from place to place (keeping track of the conditions of drainage, checking hydrants, measuring rainfall, checking the function of valves and other elements in the dam) and then carrying out the inspection duties on foot. This can involve climbing many stairs, walking through tunnels inside the dam and underground (often in wet conditions) to check valves, chambers and change light bulbs. It can also include some manual work (turinging valves, setting clamps, etc.).

There are also lake-checks that are carried out from the boat and can involve extensive surveys of the shoreline to check for instability of the bank and contamination of the water.

There are a number of special construction and maintenance projects that can include work with tools as well as heavy lifting and other forms of heavy labour. These duties may require transportation by helicopter to some heavy log work or the building of a helicopter pad. There are also duties associated with repair work inside the dam or in the workshop



(e.g., pressure washing screens for the dam intake). Snow removal is another task that may be infrequently required in the winter months.

Administrative Issues

The Water Crew is composed of four crews of seven or eight people. They work out of the watersheds and are responsible for a number of duties. They may travel by truck, van, boat or even helicopter depending on the duties. They must work in all environmental conditions and are regularly on the water. They may work inside a dam, a workshop or out in the bush depending on the requirements of the particular set of tasks.

The Water Crew is often involved in complex repair tasks that require interaction with outside contractors as well as engineers.

The normal shift is from 0700 to 1530, Monday through Friday.

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.

- Drive a vehicle through a variety of different road surfaces.
- Walk over uneven ground, on steep slopes.
- Lift, carry, grip and handle unpredictable and awkward loads.
- Carry out tasks under unpredictable outdoor conditions that often include steady rainfall.
- Work in confined spaces.
- Regular exposure to water.
- Regular exposure to heights.

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).
- Frequency and timing of switching duties.



Accommodative Considerations

- People with injuries to the spine in any region may have difficulty with constant movement of loads from near ground level to the back of the truck.
- People with shoulder injuries such as rotator cuff tendinitis, bursitis and instability may have difficulty with the frequent and often challenging loads and the frequent elevated arm postures.
- People with any upper extremity problems may have difficulty with this position because of regular gripping and carrying of loads.
- 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. This includes steep slopes and loose rock.
- 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.
- Individuals recovering from systemic illness should be carefully screened before entering this activity.
- Individuals who do not cope well in outdoor work environments would have difficulty with this position.
- Individuals who have a fear of heights, confined spaces or water would not be suitable for this position.
- There is a slight learning curve associated with the tasks.

Prepared By:

Greg Hart, Kinesiologist

March 19, 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 high anaerobic power requirements associated with climbing a steep slope or maneuvering a heavy object (e.g., timber) into place.

Structural Stresses

Spine – there are a number of issues impacting the spine. While the individual is driving, 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 inactivity 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, 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). frequent tool use in awkward and confined spaces is an issue for the arms and hands as well.

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. Avoid asymmetrical lifts wherever possible.
4. Avoid twisting with a load to avoid damage to discs in the spine.
5. Keep arms and loads close to the body at all times.
6. Test a load before it is lifted.
7. Plan the route when manually handling materials.
8. Take a moment to extend the spine and warm up the body when switching from driving to strenuous activities.
9. Be careful to not increase grip forces unnecessarily.
10. Review footwear to insure that safety wear also is as light as possible with excellent heel and forefoot support.
11. Consider a program of pre-employment physical testing to ensure that candidates are able to safely carry out the essential job demands.
12. Insure that a crane or helicopter or other heavy equipment is utilized wherever safe and possible to decrease manual loads on workers.

PJDC-Water Crew

Referral: Keith Arkell		Organization: GVRD							Title: Water Crew - Lake Maintenance		
Dept.: Waterworks		Division:							Contact:		
PHYSICAL DEMANDS		REQD	SIDE	FREQUENCY*				Max. Weight (kg)	Usual Weight (kg)	Date: March 19, 1999	
				Sel 1	Low 2	Mod 3	High 4				
S T R E N G T H	Lifting - Floor to Knuckle		B			X		55	10	Varies - lifting screens, logs, power tools	
	Lifting - Knuckle to Waist		B			X		55	10	Varies - lifting screens, logs, power tools	
	Lifting - Waist to Shoulder		B		X			55	10	Logs, tools, equipment	
	Lifting - Over Head		B		X			55	10	Logs, tools, equipment	
	Carrying - With Handles		B		X			10	3	Tools for short distances	
	Carrying - Without Handles		B			X		10	4	Parts for short distances	
	Pushing - Upper Extremity		B			X		30	5	Wrenches, valves	
	Pushing - Hip/Leg Assist		D			X		40	10	Saws, wrenches, valve wheels	
	Pulling - Upper Extremity		B			X		30	5	Wrenches, valves	
	Pulling - Hip/Leg Assist		D			X		40	10	Saws, wrenches, valve wheels	
	Reach - Shoulder or Above		D		X			30	3%BW	Installl ne light bulbs in dam, climb ladder	
	Reach - Sho. or Above extnd										
	Reach - Below Shoulder		D			X		10	4	Repairs, working in awkward locations	
	Reach - Bel. Shoulder extnd		D		X			10	4	Repairs, working in awkward locations	
	Handling		B				X	max.	min.	Tools, levers, valve wheels, logs, brush	
Gripping		B				X	max.	min.	Tools, levers, valve wheels, logs, brush		
Fine Finger Movements		B		X			mod.	min.	Checking rain gauge, repair work, writing		
E	Aerobic (percent)						80	Riding in vehicle, light walking & climbing, standing			
N	Anaerobic (percent)				20			Heavy lifting, extended stair or climbing, other forceful short exertion			
R	High Energy Expenditure				X			Working in rough terrain, heavy exertion work (lifting, climbing)			
G	Low Energy Expenditure							Not likely to be much sedentary work			
P O S T U R E +	Neck - Static Flexion					X		Working on tasks below waist level			
	Neck - Static Neutral										
	Neck - Static Extension				X			looking up during prolonged repair			
	Neck - Rotation		B				X	Survey different areas			
	Throwing										
	Sitting				X			In vehicle, boat or shop for up to 15 minutes at a time			
	Standing						X	On a variety of surfaces from concrete to sloping bush			
	Walking						X	Varying distances over a variety of terrain (concrete to forest)			
	Running/Jumping				X			Jump out/in boat, down off of a step or log/felled tree			
	M	Climbing - Arms and Legs				X			Ladders in the dam, into helicopter		
	O	Climbing - Legs Only					X		Up stairs in the dam, up/down hillsides		
	B	Bending/Stooping					X		Low level work in dam or in construction/maintenance work		
	I	Crouching				X			Low level work in dam or in construction/maintenance work		
	L	Kneeling			X				Low level work in dam or in construction/maintenance work		
	I	Crawling									
T	Twisting		B	X				Possible in awkward locations and confined spaces			
Y	Balancing					X		On ladders and near the edges of cliffs and dam			
G E N	Traveling					X		Around the watershed area and occasionally around Vancouver			
	Work Alone				X			Sometimes on dam inspections and other tasks			
	Interact with Public						X	Watershed areas are popular public areas			
	Operate Equip/Machinery						X	Drive vans, operate chainsaws, valves, boat			
	Irregular/Extended Hours										

* 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 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	Communication with co-workers and members of the public
	Hearing - Other Sounds		B				X	Machinery, water flow, alarms
	Vision - Far		B				X	Most activities
	Vision - Near		B		X			Fine repair work, examining controls or fittings
	Vision - Colour				X			Determine condition of water
	Vision - Depth		B				X	Working where distances are to be judged (heights esp.)
	Perception - Spatial		B				X	Working around obstacles and reaching to specific points
	Perception - Form							
	Feeling (Tactile)				X			Feel for leaks, sense grip pressure
	Reading					X		Signs, directions, work requests, manuals
W O R K E N V I R O N M E N T	Writing				X			Short notes and reports
	Speech						X	Talk to co-workers and members of the public
	Inside Work						X	While working in the shop or inside the dam
	Outside Work						X	In variety of conditions close by the dam or in wilderness spots
	Hot Conditions >25 deg. C			X				In summer
	Cold Conditions <10 deg.C			X				Can be frequent in winter because of elevation at watershed
	Humid					X		Considerable rainfall, especially fall/winter
	Dust						X	Inside and outside exposure to dust
	Vapor Fumes						X	From equipment and vehicles (could include Chlorine)
	Hazardous Machines						X	Valves, chainsaws, vehicles
	Proximity to Moving Object				X			Vehicles
	Noise					X		Background machine/water noise, pumps (req. protection)
	Electrical Hazard				X			Replace light bulbs in dam, operate machines near water
	Sharp Tools					X		Saws, chainsaws
	Radiant/Thermal Energy					X		Reflected off of water, concrete and through windshield
	Slippery Conditions						X	Possible inside and outside since water is everywhere
	Vibration and Related				X			Some jarring while riding in the van or helicopter
	Chemical Irritants					X		Potential for exposure to chlorine and sulphur dioxide
	Organic Substances					X		Dead animals, rotting plant material
	Medical Waste							
Blood Products								
Congested Worksite					X		Inside dam, limited head room	
T	Lighting - Direct						X	Sunlight
	Lighting - Indirect							
	Lighting - Adjustable				X			Flashlight
	Lighting - Fluorescent						X	In some shop and dam areas
	Lighting - Incandescent						X	In dam
Lighting - Shadows etc.							Obstructed light in dam, variety of possibilities outside	

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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