



## JOB DEMANDS ANALYSIS

**Company:** City of Burnaby

**Location:** Piper Nursery

**Job Title:** Parks Equipment Operator 1

**Classification:** Regular Duty

### Purpose of Activities

The Parks Equipment Operator 1 drives and operates a small farm tractor (4630 or 540) with the following attachments: three or five gang reel mower, flail, fertilizer spreader, seeder and aerator. The purpose of this position is to cut, plant, fertilize and aerate parks, sports fields and boulevards.

### Tools and Equipment

The Parks Equipment Operator 1 will use the following tools and equipment to perform his duties:

- Clothing – Steel Toe boots, ear protection, safety vest
- Small 4630 or 540 (enclosed cab) farm tractor
- Three or five gang reel mower, seeder, fertilizer spreader, aerator, flail
- Small hand tools (wrenches, screw drivers, hammer, grease gun, etc.)
- Pogo and 20-litre bucket for litter pick up – a Pogo is a long handled aluminum stick with jaws on one end and a pistol grip handle on the other. The Pogo is operated by squeezing and releasing the handle to open and close the jaws.

### Usual Methods

1. Perform a pre-trip vehicle inspection every morning. This will include greasing the tractor and attachments, checking and topping up fluid levels, checking brakes, tire pressure and ensuring all lights are in working order.
2. Hook up required attachment to the tractor and PTO. This may be done in the morning before leaving Piper Nursery or at any other time during the day.
3. Drive to work location (park, sports field, boulevard, etc.). \*\*
4. Open gate if required.\*\*
5. Perform litter pick up if required. Generally, a Parks Maintenance Crew will have performed this task before the arrival of the Parks Equipment Operator 1.\*\*
6. Lower attachment to the ground by hydraulic controls and engage PTO.
7. Cut, seed, fertilize or aerate park, sports field or boulevard.
8. Lift attachment by hydraulic controls and disengage PTO.
9. Close and lock park or sports field gate.\*\*
10. Drive to next work area.
11. Repeat steps 1-10.



**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 Parks Equipment Operator 1 works an eight-hour day, Monday to Friday from 0630 to 1500 with a ten-minute rest period in the morning, a 30-minute lunch break and a ten-minute rest period in the afternoon. There are no overtime or on call requirements in this position. The tractors are equipped with power steering, a hand and foot throttle, clutch, hand operated Power Take Off (PTO), unadjustable spring suspension seat and some tractors have a soft cover enclosed cab while others do not. This position operates from April to November as the weather allows. The Parks Equipment Operator 1 is reassigned in the winter or laid off.

### 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.

- Sit to drive and operate the tractor, gang reel mower, flail, fertilizer spreader, seeder, aerator
- Climb one step approximately 60 centimetres high to get in and out of the tractor cab
- Crouch, kneel, bend and stoop to grease and perform Pre-trip Inspection and change attachments every morning or as they are used
- Twist in the seat (right or left) to monitor attachment operation behind the tractor
- Reach below right shoulder (flexion and extension) to operate hand throttle, gear shift, PTO control; reach below left shoulder (flexion to operate turn signals)
- Use both right and left lower extremities (pushing from seated position) to operate foot throttle, clutch and brake
- Litter pick up (garbage, rocks, tree branches, etc.) by hand or Pogo and bucket

### 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.

- Sitting posture (neutral spine, shoulders, elbows slightly open, hips above knees are the desired postures)

### Accommodative Considerations

1. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required to drive and operate the tractor and attachments.
2. People with shoulder injuries such as rotator cuff tendonitis, bursitis and instability may have difficulty with dynamic and static loading and reaching activities required to drive and operate the tractor and attachments.
3. People with nerve compression or structural injuries in the upper extremities (fingers, hands, wrist and elbows) may have difficulty with steering the tractor and operating the hand controls as well as using the Pogo and bucket for litter pick up.
4. Post-whiplash and other neck problems may have difficulty with this position.



5. People with hip and lower extremity injuries may have difficulty climbing in and out of the tractor cab (one step approximately 60 centimetres from the ground) or performing the Pre-trip Inspection or changing the attachments.

Prepared By: Jeffrey J. McGinn, Kinesiologist

May 14, 1999



## Summary of Stresses

### Metabolic Stresses

The aerobic energy system will provide the major source of energy for the Parks Equipment Operator 1. This position is primarily sedentary with low level energy expenditure while driving and operating the tractor and attachments and performing litter pick up around the park, sports field, boulevard, etc. It is not likely that the anaerobic energy system will be required to provide energy for the Parks Equipment Operator 1.

### Structural Stresses

**Spine** – the sedentary nature of this work can place significant passive loads on the spinal structures. Prolonged sitting increases disc compression forces alone. It is not unusual to have people adopt a flexed spine posture while sitting. This sitting posture requires no activity from the torso musculature, but increases asymmetrical disc compression, passive stretch on the posterior ligaments and disc fibres. This forward flexed posture can also contribute to disc integrity problems over time as well as decondition the torso support musculature. Constant and static and dynamic lumbar/thoracic rotation, to the left and right, is required to monitor the operation of the attachment. This requirement will significantly increase the static tension through the torso musculature, asymmetrical compressive forces in the discs and stretch in the ligaments and disc fibres. The bouncing, jarring and vibration forces encountered when driving and operating the tractor are significant and will increase the asymmetrical compressive forces to the discs.

**Shoulders and Neck** – due to the static positions required and the frequent reaching for the steering wheel, hand controls and PTO; the muscles in the rotator cuff (especially right) and the upper trapezius and scalene muscles of the neck, maintain significant and often constant static load. Also, if the Parks Equipment Operator 1 is too low in his seat with respect to the steering wheel and hand controls, the load on the neck and shoulders is increased as the arms must be lifted and held in a static position to operate the tractor and attachments. Constant cervical rotation (left or right) to monitor the attachment will increase the static tension in the upper trapezius and scalene muscles as well.

**Shoulders and Upper Extremity**– Serious risk of injury to the shoulders, elbows and hands will result from poor sitting posture and an improperly adjusted seat. The Upper Extremities are primarily used in a static concentric movement pattern and impingement and inflammatory injuries to the are likely.

**Hips and Lower Extremities** – prolonged sitting is likely to shorten the hamstring muscle group of both legs. This in turn will pull the pelvis under the body, preventing the Parks Equipment Operator 1 from sitting on the sit bones (Ischeal Tuberosity), and promote the undesirable forward flexed spinal posture. Slip and fall injuries while getting in or out (one step to 60 centimetres) of the tractor cab are increased during wet weather of wet working conditions.

**Insect Stings** - the Parks Equipment Operator 1 is at risk for injury because of stinging insects. Injuries can range from localized swelling of the sting site 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 Parks Equipment Operator 1 to stand and walk at the work site. This will reduce the static forces encountered from sitting for long periods.
2. Install an adjustable seat (air ride suspension, seat pan depth, height adjustment and forward seat pan tilt) in all of the Parks tractors. This will allow the Parks Equipment Operator 1 to adopt a neutral sitting posture (hip angle, spine, shoulders, elbows and wrists) which will decrease the risk of injury to the spine and upper extremities.
3. Teach the Parks Equipment Operator 1 how to set up the seat to achieve a neutral sitting posture.
4. Encourage the Parks Equipment Operator 1 to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.

PJDC-Parks Equip Op 1

Referral: Lana Ho			Organization: City of Burnaby						Title: Parks Equipment Operator 1		
Dept.: Engineering			Division: Parks						Contact: Mel Booth		
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	D		X			15	<1-3	pogo use to pick garbage, pick rocks, branches	
	Lifting - Knuckle to Waist	X	D		X			15	<1-3	pogo use to pick garbage, pick rocks, branches	
	Lifting - Waist to Shoulder										
	Lifting - Over Head										
	Carrying - With Handles	X	D		X			15	<1-3	pogo, bucket	
	Carrying - Without Handles	X	D		X			15	<1-3	garbage, rocks, grease gun	
	Pushing - Upper Extremity	X	E				X	10	<1-3	steering wheel, tractor, PTO controls	
	Pushing - Hip/Leg Assist	X	E				X	15	<1-3	accelerator, clutch, brake	
	Pulling - Upper Extremity	X	E				X	10	<1-3	steering wheel, tractor , PTO controls	
	Pulling - Hip/Leg Assist	X	E	X				15	<1-3	possibly drag garbage, branches	
	Reach - Shoulder or Above	X	D		X			<10	<1-3	per-trip inspection, connect attachments	
	Reach - Sho. or Above extnd										
	Reach - Below Shoulder	X	E				X	15	<1-3	drive/operate tractor, pick garbage, adjust reels	
	Reach - Bel. Shoulder extnd	X	E		X			15	<1-3	lift, carry garbage, rocks, branches, bucket	
E N E R G Y  P O S T U R E + M O B I L I T Y	Handling	X	E				X	15	<1-3	steering wheel, garbage, pogo, bucket	
	Gripping	X	B				X	15	<1-3	steering wheel, garbage, pogo, bucket	
	Fine Finger Movements	X	E		X			max.	low	adjust reels, controls	
	Aerobic (percent)	X					100	low activity, sit to drive/operate tractor/attachments, pick garbage			
	Anaerobic (percent)										
	High Energy Expenditure										
	Low Energy Expenditure	X					X	low activity, sit to drive/operate tractor/attachments, pick garbage			
	Neck - Static Flexion	X					X	view in front/behind of tractor/attachments, pick garbage			
	Neck - Static Neutral	X					X	drive/operate tractor, walk, stand at work site			
	Neck - Static Extension	X			X			sit with flexed spine, pre-trip inspection			
	Neck - Rotation	X	E				X	drive/operate tractor/attachments			
	Throwing										
	Sitting	X					X	sedentary activity to drive/operate tractor/attachments			
	Standing	X			X			pre-trip inspection, pick garbage, adjust attachments			
	Walking	X			X			pick garbage, pre-trip inspection, adjust attachments			
G E N E R A L	Running/Jumping										
	Climbing - Arms and Legs	X			X			in/out or tractor cab 1 metre from ground			
	Climbing - Legs Only	X		X				pick garbage on hills in parks, etc.			
	Bending/Stooping	X			X			pre-trip inspection, pick garbage			
	Crouching	X			X			pre-trip inspection, adjust/connect attachments			
	Kneeling	X			X			pre-trip inspection, adjust/connect attachments			
	Crawling	X		X				possibly for pre-trip inspection			
	Twisting	X	E				X	drive/operate tractor and attachments			
	Balancing										
	Traveling	X				X		to/from job site in tractor on urban roadways			
	Work Alone	X				X		drive/operate small tractor and attachments			
	Interact with Public	X				X		driving on urban streets, possibly in parks, on boulevards			
	Operate Equip/Machinery	X				X		small tractor, reel mower, flail, fertilizer, aerator			
	Irregular/Extended Hours							Mon-Fri, 0630-1430, no OT, April - November			
* 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	X			X			trim crew, supervisor, public	
	Hearing - Other Sounds	X					X	tractor, attachment operation	
	Vision - Far	X					X	drive and operate tractor and attachments	
	Vision - Near								
	Vision - Colour	X			X			traffic lights	
	Vision - Depth	X					X	drive /operate tractor/attachments in traffic and work site	
	Perception - Spatial	X					X	drive /operate tractor/attachments in traffic and work site	
	Perception - Form								
	Feeling (Tactile)	X					X	brake, clutch, accelerator, tractor/attachment controls	
	Reading								
W O R K E N V I R O N M E N T	Writing								
	Speech	X			X			trim crew, supervisor, public	
	Inside Work								
	Outside Work	X					X	operate tractor/attachments from April to November	
	Hot Conditions >25 deg. C	X		X				spring, summer, fall	
	Cold Conditions <10 deg.C	X		X				cold, rainy days	
	Humid								
	Dust	X		X				possibly at some work sites	
	Vapor Fumes	X					X	diesel fumes from tractor	
	Hazardous Machines	X			X			tractor, mower reels, flail, fertilizer, PTO	
	Proximity to Moving Object	X			X			moving parts on tractor, mower reels, flail, fertilizer, PTO	
	Noise	X					X	noise from tractor, hearing protection recommended	
	Electrical Hazard								
	Sharp Tools	X			X			mower reels	
	Radiant/Thermal Energy	X					X	heat from engine, exhaust, sun burn	
	Slippery Conditions	X		X				in wet conditions on tractor and ground	
	Vibration and Related	X					X	spinal compression from bouncing/vibration, no give in seat	
	Chemical Irritants	X		X				fertilizer, diesel	
	Organic Substances	X						decaying grass, dog feces	
	Medical Waste	X		X				needles, condoms	
	Blood Products								
	Congested Worksite	X			X			drive in traffic	
	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 and 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