



## JOB DEMANDS ANALYSIS

**Company:** City of Burnaby

**Location:** Automotive Shop

**Job Title:** Tradesman – Mechanic –  
Parks Equipment/Mower Shop

**Classification:** Regular Duty

### Purpose of Activities

The Parks Equipment/Mower Mechanic is responsible for the repair and maintenance of the Parks equipment and lawn mower fleet of the City of Burnaby. The parks equipment and mowers include: turf cutters; weed eaters; bush blades; push mowers; 3, 5 and 7 gang reel mowers; rotary riding mowers; greens mowers; trucksters; aerator, turf sweeper; fertilizer spreaders; wood chipper; John Deere tractor with front end loader; small farm tractor; snow plows; sander/salters; Zamboni or Olympia Ice Resurfacers; reciprocators; chain saws; backpack blowers; turf vacuum; compressors; flails; etc.

### Tools and Equipment

The Parks Equipment/Mower Mechanic will use the following tools and equipment to perform his duties:

- Automotive shop bay (three bays)
- Hoist – 2 X 2727 kg (6000 lbs.) floor hoist, 2 X 454 kg (1000 lbs.) overhead hoists
- Parks equipment/mower exhaust hoses vented to outside, ceiling fans, window fan
- Hand tools (wrenches, screw drivers, sockets, chisels, punches, hammers, task light, cheaters, hammers, sledge hammer, needle nose pliers, hack saw, tapping tools, putty knife, pipe wrenches, levels, files, rasps, brushes, etc.)
- Air tools (1/2 and 3/4 inch impact gun, pistol and in-line grip)
- Recycled oil/fluid drum with extension, funnels
- Parts washer, solvent
- Oxyacetylene torch,
- Grinders, Bed Knife Sharpener
- Work bench with vise, step ladder, extension ladder
- Forklift, cherry picker lift, floor jack, jack stand, creeper
- Parts room

### Usual Methods

The Parks Equipment/Mower Mechanics perform four different types of service, repair or regular maintenance on the parks equipment and mowers. They are: regular maintenance which include an oil change, grease and lube and mower blade/gang sharpening; an emergency repair or service call; a major overhaul to the parks equipment and mowers; or a



running repair. There is some fieldwork where the Parks Equipment/Mower Mechanic will travel to a park, golf course or ice arena to make the repair or perform regular maintenance. Mower blades and gang reels are sharpened on a regular basis during the summer, while major equipment/mower overhauls are performed in the winter or off months.

#### Regular Maintenance, Overhaul, Emergency Repair, Overhaul

1. Receive work order for parks equipment/mower.
2. Locate the Parks equipment/mower in front of Mower Shop or drive to parks equipment/mower in the field.\*\*
3. Drive, pull, push or carry the parks equipment/mower into the shop bay.\*\*
4. Determine how to work on the parks equipment/mower based on the work order or suspected problem. Does the parks equipment/mower need to be raised on the hoist, can it be jacked off the floor with floor jacks, placed on the work bench or as it sits in the field. Bend, stoop, crouch or crawl under the parks equipment/mower to set the hoist supports, floor jacks and/or jack stands in the proper location under the parks equipment/mower.
5. Raise the parks equipment/mower off the floor by raising the hoist or hand pumping the floor jack.
6. Gather tools and equipment to perform the required repair.\*\*
7. Dismantle the Parks equipment/mower parts and components to gain access to the defective part. The Parks Equipment/Mower Mechanic will use hand, power and air tools to dismantle the parts. Parts size and weight will range from light to extremely heavy. Some parts are handled by hand quite easily while other parts will require the use of a mechanical lifting device (forklift, portable cherry picker). Note: Due to space limitations, a mechanical lifting device can not always be used, as it can not be positioned appropriately. In this instance, which happens regularly, one or more Parks Equipment/Mower Mechanics will remove or install the part by hand.\*\*
8. Several times during step 7, the Parks Equipment/Mower Mechanic will search the shop for specific shared tools that he must use (1/2 or 3/4-inch impact gun, creeper, snipe or cheater, etc.). \*\*
9. Walk to the Parts room to order or pick up the required part.\*\*
10. Walk back to the shop bay. At this time, if the part is not available, the Parks Equipment/Mower Mechanic will start repairing another parks equipment/mower. Steps 1-9 are repeated on the new Parks equipment/mower.
11. Once the parts arrive, the first repair can be completed. Parts are cleaned in the parts washer and reinstalled with the new parts.
12. The parks equipment/mower is reassembled.
13. Several times during step number 12, the Parks Equipment/Mower Mechanic will search the shop for specific shared tools that he must use (1/2 or 3/4-inch impact gun, creeper, snipe or cheater, etc.). \*\*
14. Test the parks equipment/mower to ensure the repair has been completed satisfactorily.
15. Complete repair report.
16. Repeat steps with the next parks equipment/mower.

#### Running Repair

1. The parks equipment or mower operator comes to the Mower Shop and describes the mechanical problem to the Parks Equipment/Mower Mechanic.



2. The Parks Equipment/Mower Mechanic makes the repair on the spot. This repair may include disassembling and reassembling the parks equipment or mower or making minor adjustments so it runs better.
3. The parks equipment or mower operator then returns to the field to complete his work.

#### Rotary Blade Sharpening

1. The Parks Equipment/Mower Mechanic removes the blade from a rotary mower. Hand mowers are tipped up to gain access to the blades, while the deck on larger riding mowers are jacked up or raised with an automatic switch on the mower.
2. The blade(s) are taken into the grinding room where they are sharpened on a grinder. Hand, face and ear protection are worn during this task.
3. The blades are then returned to the mower, tightened and the mower is placed back in service.

#### Bed Knife Sharpening (Gang Reels)

1. Remove the gang reel from the mower, disconnect all hoses. Hand or air tools are used for this task. Some gang reels have wheels while others do not.
2. Push, lift or carry the gang reels one at a time into the Grinding Room.
3. Place a gang reel on the mechanical lift on the Bed Knife Sharpener.
4. Raise the lift by depressing a button on the control box.
5. Push the gang reel to the drive motor, lift the front edge of the gang reel over the support bar (5 cm), then secure the gang reel to the drive motor with hand clamps.
6. Adjust Bed Knife Sharpener to gang reel.
7. Turn Bed Knife Sharpener on and monitor the machine as it sharpens the gang reel blades. A three to five gang reel mower requires one and a half-hours to sharpen all of the gang reels. A seven gang reel mower takes a little longer.
8. Remove gang reel from the drive motor.
9. Lower mechanical lift to the floor.
10. Push, lift or carry the gang reel back to the mower. Note: If the gang reel is to be lifted and carried, it is picked up from the Bed Knife Sharpener, which is at knuckle height, rather than from the floor.
11. Repeat steps 1-10 with the next gang reel.

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

#### Administrative Issues

Five Parks Equipment/Mower Mechanics work an eight-hour day, Monday to Friday from 0700 to 1530 or 0830 to 1700. They receive a ten-minute rest period in the morning, a 30-minute lunch break and a ten-minute rest period in the afternoon. The Parks Equipment/Mower Mechanic rarely works overtime. Current parts manuals are not always purchased and the Parks Equipment/Mower Mechanic will often make the repair by trial and error. Some manuals and diagrams are difficult to read.

There are several safety issues in the Mower Shop. These issues can increase the risk of injury and/or decrease the productivity of the Parks Equipment/Mower Mechanic. These safety issues centre on the lack of adequate workspace for each Parks Equipment/Mower Mechanic to work within. There are often several pieces of parks equipment or mowers



placed in one bay at the same time. When all five Parks Equipment/Mower Mechanics are working, there is a significant lack of access and egress within the Mower Shop during normal daily work or in the event of an emergency. One floor hoist, when in use, completely blocks an aisle. In some instances, where it would be prudent to use a mechanical lifting device, the mechanical lifting device can not get near the parks equipment or mower. When this happens, the Parks Equipment/Mower Mechanic(s) will remove or install the part by hand.

The Mower Shop's air exchange system is weak as diesel, gasoline and other fumes hang in the air when the shop doors are closed. Lighting in the third bay is dull. The first two bays have been recently equipped with a brighter mercury vapor light that has considerably more candle power than the fluorescent lights that remain in the third bay.

The lack of adequate workspace, adequate ventilation and lighting are all factors that will negatively affect productivity. Of the three shop bays, two are loosely connected, while the third bay can only be accessed by exiting the main Mower Shop and walking up to ten metres to this bay. The five Parks Equipment/Mower Mechanics share some specialty tools and equipment. When he has to look for these tools or equipment, it takes time away from the purpose of the job, which decreases productivity.

#### 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.

- Walk, stand on concrete floor, asphalt works yard
- Bend, stoop, crouch, kneel and crawl to repair parks equipment/mowers
- Reach below, at and above shoulder height to repair parks equipment/mowers
- Insert hand(s) into confined areas to repair parks equipment/mowers
- Hand, power and air tool use is required
- Climb, stand and balance on ladders or the parks equipment/mowers to perform repair
- Work above shoulders in cervical extension from a stand, bend, stoop, crouch, kneel
- Work under parks equipment/mowers while they are on the hoist or the shop floor

#### 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 parks equipment/mower on the floor or on the hoist
- Some body postures can be selected by the Parks Equipment/Mower Mechanic, but most body postures are the result of how the parks equipment/mower has been engineered

#### Accommodative Considerations

1. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required during the maintenance and repair of vehicles and equipment.



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 access parts to make repairs.
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 air tools (compression and vibration).
5. Post-whiplash and other neck problems may have difficulty with this position.
6. Individuals who do not cope in open low-autonomy work environments would have difficulty with this position.
7. Must hold a Tradesman Ticket (Automotive or Heavy Duty Mechanic) valid for the province of British Columbia.

Prepared By: Jeffrey J. McGinn, Kinesiologist

February 17, 1999



## Summary of Stresses

### Metabolic Stresses

The aerobic energy systems will provide the major source of energy for the Parks Equipment/Mower Mechanic. This position requires a low to moderate level of aerobic activity to perform parks equipment/mower repair. The anaerobic energy system may be used in high intensity repair tasks, such as lifting tires to and from the wheel lugs, lifting parts to and from their proper location or using cheater to loosen or tighten nuts and bolts.

### Structural Stresses

**Spine** –Significant loading of the spinal structures are likely in this position. Prolonged loaded and unloaded forward flexion, extension, lateral flexion and rotation of the spine are all movements required by the Parks Equipment/Mower Mechanic. Forward flexed postures require no activity from the torso musculature, but increase 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.

Due to the equipment engineering and the space limitations found in the shop, it is almost impossible for the Parks Equipment/Mower Mechanic to use proper postural control and body positioning for most of the work they perform. With this in mind, the goal should be to minimize the time spent in these undesirable, high-risk postures and make good postural and movement choices whenever the situation presents itself.

**Neck, Shoulders and Upper Extremity**– Parks equipment/mower repair requires prolonged and repeated static and dynamic movements. The static and dynamic movements through the shoulder and upper extremity often require the rotator cuff muscle groups, upper trapezius and scalene muscles of the neck to maintain a significant load. Hand, air and power tool use (predominately dominant hand) will increase the static and dynamic loading of the forearm flexors, extensors, supinator, pronator teres and the pronator quadratus. Power and air tool use will also increase the vibration, jarring and compressive forces from the grip to the elbow and shoulder that may lead to over use tendon or nerve compression injuries.

**Hips and Lower Extremities** – Standing and walking on concrete and asphalt for the entire shift increase the compressive forces through the ankles, knee, hips and spine. The awkward positions required to access some parts and components do not allow the Parks Equipment/Mower Mechanic to perform the required work from a stable base of support. This in turn will increase the risk of injury for all of the other structures.



## **INTERVENTIONS**

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

1. The present Parks Equipment/Mower Shop is inadequate for the type and volume of work that the Parks Equipment/Mower Mechanic performs. A larger, space that is more modern is required. This space should be equipped with a proper ventilation system, an effective lighting system and be equipped with the proper number and type of tools and equipment required in a diverse mechanic shop. Floor and overhead hoists require adequate space around them to allow for access and egress. A pit to service Parks/mower equipment will decrease the time required to hoist or jack up these pieces for servicing. A stakeholder needs assessment should be conducted to determine the actual requirements of the Parks Equipment/Mower Shop. Consult industry to determine space requirements based on the number of mechanics on staff and the footprint of various tools and equipment, etc.
2. Encourage the Parks Equipment/Mower Mechanic to be active away from work focusing on cardiovascular endurance, muscular strength, muscular endurance and flexibility.
3. Provide regular education in effective use of the body and neutral joint positions for this type of work.
4. Encourage the Parks Equipment/Mower Mechanic to ask for assistance when handling heavy and/or oversized parts or pieces of equipment
5. Provide kneepads for the Parks Equipment/Mower Mechanic for the times he will spend in a kneeling position when servicing a vehicle. Replace the kneepads as they become worn.
6. Purchase current equipment/mower manuals with easy to read fonts and diagrams.
7. Investigate a padded handle for the pistol grip air tools. Each Parks Equipment/Mower Mechanic may require their own impact gun or changeable grip so that the pistol grip can be matched to the user's handgrip. Investigate the use of a variable speed impact gun to reduce the jarring force at the end of the cycle.

PJDC-Parks Equip/Mower

Referral: Lana Ho			Organization: City of Burnaby						Title: Mechanic - Parks Equip/Mower Shop		
Dept.: Engineering			Division:						Contact:		
			FREQUENCY*						Date: February 17, 1999		
PHYSICAL DEMANDS			R E Q D	S I D E	Sel 1	Low 2	Mod 3	High 4	Max. Weight (kg)	Usual Weight (kg)	COMMENTS
S T R E N G T H	Lifting - Floor to Knuckle	X	D			X			45	<1-7	tools, parts, equipment, tires
	Lifting - Knuckle to Waist	X	D				X		45	<1-7	tools, parts, equipment, tires
	Lifting - Waist to Shoulder	X	D			X			20	<1-7	tools, parts, equipment, tires
	Lifting - Over Head	X	D		X				10	<1-7	tools, parts, equipment, tires
	Carrying - With Handles	X	D			X			45	<1-7	tools, parts, equipment, tires
	Carrying - Without Handles	X	D				X		45	<1-7	tools, parts, equipment, tires
	Pushing - Upper Extremity	X	D				X		40	<1-7	wrenches, equip., tools, parts on bench
	Pushing - Hip/Leg Assist	X	D			X			40	<1-7	equip. on floor, parts, tools
	Pulling - Upper Extremity	X	D				X		40	<1-7	wrenches, equip., tools, parts on bench
	Pulling - Hip/Leg Assist	X	D			X			40	<1-7	equip. on floor, parts, tools
	Reach - Shoulder or Above	X	D	X					10	<1-7	work above shoulder equip. on hoist
	Reach - Sho. or Above extnd	X	D	X					10	<1-7	work above shoulder equip. on hoist
	Reach - Below Shoulder	X	D				X		45	<1-7	repair /maintenance of parks equip.
	Reach - Bel. Shoulder extnd	X	D		X				45	<1-7	lift, carry equip., tools, parts
	Handling	X	D				X		45	<1-7	equip., tools, parts
Gripping	X	D				X		45	<1-7	equip., tools, parts	
Fine Finger Movements	X	D				X		max.	low	tool use, handle small parts for repair	
E N R G	Aerobic (percent)	X					100				repair parks equip./mowers, lift, carry, shop/field work
	Anaerobic (percent)	X		X							heavy lift and carry
	High Energy Expenditure										
	Low Energy Expenditure	X					X				repair parks equip./mowers, lift, carry, shop/field work
P O S T U R E + M O B I L I T Y	Neck - Static Flexion	X					X				work below shoulders to repair parks equipment/mowers
	Neck - Static Neutral	X					X				stand, walk, in shop, work at shoulder level
	Neck - Static Extension	X				X					work from bend, stoop, crouch, kneel to repair equip.
	Neck - Rotation	X	L/R				X				view equip./mowers for repair on bench, floor, ground
	Throwing										
	Sitting				X						ride or drive some parks equipment/mowers
	Standing	X					X				on concrete floor, asphalt in works yard
	Walking	X					X				in shop and works yard on concrete and asphalt
	Running/Jumping	X		X							jump down from parks equipment /mowers
	Climbing - Arms and Legs	X		X							on parks equipment/mowers
	Climbing - Legs Only										
	Bending/Stooping	X					X				repair parks equip./mowers, lift, carry, shop/field work
	Crouching	X				X					repair parks equip./mowers, lift, carry, shop/field work
	Kneeling	X			X						repair parks equip./mowers, lift, carry, shop/field work
	Crawling	X		X							possible under a mower or parks equipment
Twisting	X	L/R				X				repair parks equip./mowers, lift, carry, shop/field work	
G E N E R A L	Balancing	X		X							on parks equipment/mowers
	Traveling	X		X							to repair parks equipment/mowers in the field
	Work Alone	X					X				work independently, in building with others
	Interact with Public	X		X							only when driving to field work
	Operate Equip/Machinery	X					X				power and air tools, parks equipment/mowers
	Irregular/Extended Hours										8 hour day, Mon-Fri, 7:00am-3:30pm, 8:30 -5:00 no OT
* 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-Parks Equip/Mower

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			co-workers, Foreman, parks equip/mower operator	
	Hearing - Other Sounds	X				X		parks equipment/mower motors	
	Vision - Far	X					X	repair parks equipment/mowers	
	Vision - Near								
	Vision - Colour	X				X		oil, fluid quality	
	Vision - Depth	X					X	repair parks equip./mowers, move about in shop	
	Perception - Spatial	X					X	repair parks equip./mowers, move about in shop	
	Perception - Form	X					X	equipment/mower parts, tools, equipment	
	Feeling (Tactile)	X					X	force application to loosen/tighten parts, repair equip.	
	Reading	X			X			service/repair reports	
W O R K E N V I R O N M E N T	Writing	X			X			service repair reports	
	Speech	X			X			co-workers, Foreman, parks equipment/mower operator	
	Inside Work	X					X	in shop	
	Outside Work	X		X				door way of shop bay, field work	
	Hot Conditions >25 deg. C	X		X				spring, summer, fall, shop doors open	
	Cold Conditions <10 deg.C	X		X				fall, winter spring, shop doors open	
	Humid	X		X				wet weather conditions	
	Dust	X			X			possibly when repairing parks equipment/mowers	
	Vapor Fumes	X					X	oil/gas mix, gasoline, solvent in parts washer	
	Hazardous Machines	X					X	parks equipment/mowers, tools, equipment	
	Proximity to Moving Object	X				X		moving parts on parks equipment/mowers	
	Noise	X					X	power/air tools, running motors on parks equip./mowers	
	Electrical Hazard								
	Sharp Tools	X				X		hand/air tools, mower blades, Zamboni blades	
	Radiant/Thermal Energy	X			X			hot motor or parts on equipment, hot oil, fluid	
	Slippery Conditions	X					X	oil, fluid, water on shop floor	
	Vibration and Related	X				X		power and air tool use	
	Chemical Irritants	X				X		oil/gas mix, gas, oil, chain saw oil, etc.	
	Organic Substances	X		X				decaying grass, weeds on parks equipment/mowers	
	Medical Waste								
	Blood Products								
	Congested Worksite	X					X	in minor parks equipment/mower shop	
	Lighting - Direct	X					X	overhead fluorescent, some mercury vapor lighting	
	Lighting - Indirect	X					X	daylight from open shop doors	
	Lighting - Adjustable	X					X	trouble lights	
	Lighting - Fluorescent	X					X	overhead fluorescent lights	
	Lighting - Incandescent								
Lighting - Shadows etc.	X					X	in shop and field work		

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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