



## JOB DEMANDS ANALYSIS

**Company:** City of Burnaby Parks

**Location:** Piper Nursery

**Job Title:** Arborist Assistant

**Classification:** Regular Duty

### Purpose of Activities

The Arborist Assistant is responsible for carrying out or supervising the duties given him by the Arborist, which will include planting, pruning, falling, watering and fencing trees. The work of the Arborist Assistant is seasonal in nature with the above named tasks occurring primarily within a specific season (spring, summer, fall or winter). The Arborist Assistant supervises a crew of one to three Tree Pruners depending on the season and workload. The Arborist Assistant and his crew are also responsible for snow removal at Civic Square (approximately two to three times per year).

### Tools and Equipment

The Arborist and his crew will use the following tools and equipment to perform their duties:

- Ford one ton Super Duty Truck with power crane and dump box
- Hand tools – shovels, long handle scoop shovels, fan rakes, pick, axe, pitch fork, pole saw, pole pruner, two metre extension for poles, sledge hammer, push broom, long bar
- Power tools – chain saw, Bush King Weed eater with shoulder strap and shin guards, blower, air compressor, pump
- Rubber and leather gloves, chain saw pants, hard hat, face shield or safety glasses, ear protection or foam ear plugs,
- Climbing gear – harness, ropes, climbing spurs
- First aid kit
- Three quarter ton crew cab truck with 1600 litre water tank, calibrated motorized pump, tree spike, five centimetre hose, hydrant key
- Five ton diesel truck with chipper (trailer)
- Traffic cones, traffic signs (lane closure, men and equipment working)

### Usual Methods

#### Tree Planting (November to April)

The Arborist Assistant and his crew will plant trees as determined by the Arborist. The crew (typically four during this time of year) will plant approximately 300 - B & B (Ball and Burlap) trees, 300 – six centimetre trees, 50 - eight to twelve centimetre trees and 1000 to 1500 - one to five gallon potted trees. The crew may plant anywhere from five to fifteen



medium to large trees per day during planting season. They will plant more small trees (ball and burlap) and one to five gallon potted trees.

The Arborist Assistant and his crew will receive a work order from the Arborist. Drive to the tree nursery and select the required trees. The crew will load the trees onto the truck and/or trailer with the aid of a crane (some tree balls and cages weigh approximately 272 kilograms (600 lbs.)) or more or by hand (one to five gallon-potted trees). The trees are secured into the truck box or trailer with rope and a red flag is tied to a tree if it hangs over the back of the truck. The crew then drives the truck to the required location.

At the planting location, the crew will set up the work area with signs and traffic cones to warn people and vehicles of their presence. Some planting sites are on boulevards and can be in direct conflict with vehicle traffic. When the truck is parked on a street, a second truck is parked in such a way as to protect the crew from oncoming vehicle traffic. The crew will mark the location (spray paint) of each tree if it has not already been done. A tree bowl, slightly larger than the tree ball and cage, is then dug by hand (pick and shovel). The crew will spell each other off the pick and shovels to reduce fatigue. The digging conditions will vary from easy to hard. Hard clay and rocks are common in the Burnaby area. Once it has been determined the tree bowl has been dug to the appropriate depth (up to one metre deep), the crew will use chains to secure the tree cage to the crane. A crew member will then operate the crane controls (fine finger movements), to lift the tree cage off the truck and set it into the tree bowl. The crew will then wrestle the tree into position while it is attached to the crane. Once the tree is in position, the crew members will fill the tree bowl with dirt. They may tamp the dirt into the hole to keep the tree vertical. When the tree is vertical, the tree bowl is filled with the remaining dirt.

If the tree is large enough, the crew will stake it (usually two stakes per tree). They will use a long bar to make a pilot hole. A five centimetre round by one and a half metre long post is driven into the ground with a 3.6 kilogram sledgehammer. It is likely that a crew member will pound the post into the ground while he is standing on a ladder or in the back of the truck. A strap is then nailed to the post and wrapped around the tree. This procedure is repeated on the other side of the tree.

The site is cleaned of dirt and debris. Extra dirt that is removed from the tree bowl is thrown into the back of the truck (one to one and a half metres from the ground) for disposal. Signs and traffic cones are then returned to the truck and the crew will move to a new tree location or new task.

### Tree Pruning (Spring and Fall)

The City of Burnaby is divided in three sections, North, Central and South with 37 areas that require tree pruning. The Arborist Assistant and his crew prune trees following a specific pruning schedule for that section. The crew is responsible for pruning trees owned by the City of Burnaby. These trees can be in parks or along the boulevard between lanes of traffic or the boulevards separating city property from home owner's property. The crew will use the five ton diesel truck with the Chipper for this task.

The crew will load the appropriate tools and equipment that are required to prune trees into the truck. They will then drive to the location and set out traffic cones and signs to warn motorists or the public of their presence in the area. Each crew member will take a pole saw



and/or pole pruner with one or more extensions and pruning spray. The pruning spray prevents the disease transfer from one tree to another.

The crew will walk along the tree line and prune each tree as they go. All work is performed overhead. They will either use the pole saw to cut the limb from the trees or use the pole pruner based on their knowledge of how to most effectively remove the limb. On occasion, the crew will use a chain saw to remove a larger limb. Pruned limbs are left on the ground so that they do not block the sidewalk or roadway.

A crew member will follow the crew, picking up cut limbs, carry the limbs to the truck and then run them through the Chipper. The Chipper handles branches and limbs that range from the diameter of a finger to a persons leg or bigger. The truck is moved along the tree line as the crew moves forward.

The crew will clean the work site of all debris and remove the signs and traffic cones once the work has been completed.

The Crew will also remove underbrush from City of Burnaby Parks and Recreation land. This task is performed with a Bush King Weed Eater that is equipped with a special rotating saw blade. Each crew member is required to wear a hard hat, full face shield, chain saw pants or coveralls and specially designed metal shin guards. The Bush King Weed Eater is carried in a harness that fits over both shoulders and has a hip pad attachment that can be moved easily from the right to the left hip.

#### Tree Falling (all year as required)

Trees that have been identified by the Arborist for removal are taken down by the Arborist Assistant and his crew. The crew will drive (five ton truck with Chipper) to the required location, set up traffic cones and signs warning motorists or the public of their presence in the area. The crew will determine the direction they want the tree to fall and park the truck accordingly. A tag line is thrown up into the tree so that a rope can be secured to the trunk or limbs higher on the tree. This tag line is used to assist the crew to direct the fall of the tree. The crew will limb the low hanging branches from the tree with either a chain saw or the pole saw (with one to three extensions). At this point the other crew members will use hand held traffic signs to stop traffic. This ensures the area of the fall is kept clear and damage to the public or their vehicles is prevented. One crew member will then use the chain saw and an axe to set the fall of the tree. Once this is complete, the crew member will use the chain saw to make the cut. As the tree is cut, wedges are inserted to assist with falling the tree and to prevent the tree from falling back onto the chain saw.

Once the tree is on the ground, the limbs are taken off with the chain saw. If the tree trunk can be salvaged, it is left whole and sold to a local lumber company. The rest of the tree is then carried to the Chipper where it is ground up. The Chipper will chip almost any size of tree. Occasionally, blocks or rounds of tree are cut on site and loaded by hand into the back of the truck. The crew will use fan rakes, pitch forks and shovels to clean the entire area.

After the area is cleared of all debris, the crew will retrieve all traffic signs and cones to reopen vehicle and pedestrian traffic. The crew will then proceed to the next tree on the work order.



### Tree Fencing (all year as required)

Throughout the year, the Arborist, for many reasons will require that certain trees that are owned by the City of Burnaby be fenced (plastic snow fence) for their protection. The crew will drive to the location and set up traffic signs and cones to inform motorists and the public of their presence in the area. The crew will use a long bar to make pilot holes in the ground for the five centimetre posts. The posts are then taken from the back of the truck and inserted into the holes. One crew member will hold the post and then steady a ladder while the second crew member will climb the ladder, balance himself on the ladder steps and then pound the post into the ground with an 3.6 kilogram sledge hammer. This step is repeated until all posts have been secured in the ground. The fencing is then taken off the truck, where a hammer and fencing nails are used to secure one end of the fence to the post... The fence is then unrolled and wrapped around each post and secured with the fencing nails. The equipment is returned to the truck, the traffic cones and signs cleared and the crew moves on to the next job.

### Tree Watering (May through October)

The Arborist Assistant and crew are responsible for watering newly planted trees in the summer. The Arborist Assistant will map out the location of all the trees that require water for the upcoming growing season. Tree Watering is a task that is delegated to a Seasonal Tree Pruner (Temporary Position). See Tree Pruner Physical Job Demands Analysis for more information.

### Snow Removal (as required in the winter)

Two to three times per year during a snowfall, the snow will remain on the ground for extended periods. The Arborist Assistant and his crew are responsible for snow removal at Civic Square. They will clear snow from the steps of the building(s) and a walking path from the parking lot(s) to the building(s).

**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 Arborist Assistant works from Monday to Friday 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. The Arborist Assistant is usually responsible for supervising a crew of one to three Tree Pruners.

### 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 holes (pick and shovel) for trees up to one metre deep and one metre wide in clay and rock soil conditions
- Throw dirt, tree limbs, tree rounds and debris from a shovel or pitchfork from ground level to the truck (one to one and a half metres high) or Chipper (50 centimetres)



- Lift, carry, hold and operate hand and power tools (one to 15 kg) from below ground (tree bowl) to above shoulders (use chain saw, pole saw, pole pruner, sledge hammer, etc)
- Lift, carry and throw or place debris from the ground to the back of the truck (one to one and a half metres high)
- Balance on a ladder or edge of a truck while pounding posts into the ground
- Two ten minute rest periods (one in the morning and one in the afternoon) and a 30 minute lunch break
- Work in all weather conditions including prolonged periods of rain or heat

#### 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.

- Use crane to lift trees to back of truck or trailer
- Rotate tool (hand and power) use with other crew members to aid in recovery from prolonged activity (i.e. Pick and shovel while digging a tree bowl, clearing debris and pruning)

#### Accommodative Considerations

1. The Arborist Assistant is a supervisory position.
2. Advanced education in Forestry and/or Horticulture and knowledge of power tool use is necessary to maintain productivity levels in this position.
3. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required in this position.
4. People with shoulder injuries such as rotator cuff tendonitis, bursitis and instability may have difficulty with dynamic and static loading and reaching activities required in this position.
5. People with forearm and elbow injuries such as tennis elbow may have difficulty with the static grip forces required during any power or hand tool use.
6. People with nerve compression injuries in the upper extremities may have difficulty with the repeated and prolonged use of hand and power tools (compression and vibration) below, at and above shoulder height.
7. Post-whiplash and other neck problems may have difficulty with this position.
8. People with lower extremity injuries to the hips, knees and ankles will have difficulty maintaining the required pace and performing the heavy physical labour required in this position.

Prepared By: Jeffrey J. McGinn, Kinesiologist

February 8, 1999



## Summary of Stresses

### Metabolic Stresses

The aerobic energy systems will be the major source of energy requirement while performing the duties and responsibilities of the Arborist Assistant. This energy system will be utilized during tree planting, pruning, falling and fencing as well as snow removal. The anaerobic energy systems may be required to supply energy for brief intense periods of work, which may include heavy or sustained digging, picking, lifting or carrying; or towards the end of the day when the aerobic energy system has been depleted. In this last instance the anaerobic energy system becomes the primary energy source

### Structural Stresses

Spine – Typically, flexion, extension, lateral flexion and rotation movements will be performed while the Arborist Assistant is handling a load (hand or power tools, tree limbs/trunks or debris, 1-50 kg). Digging tree bowls below the Arborist Assistant's feet will increase the time spent in forward flexion of the thoracic/lumbar spine. 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.

**Neck, Shoulders and Upper Extremity**– This position requires prolonged and repeated static and dynamic movements from below to above shoulder height. 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 constant and significant load. Hand and power tool use (predominately both hands) will increase the static and dynamic loading of the forearm flexors, extensors, supinator, pronator teres and the pronator quadratus. Chain saw and other power tools will increase the vibration and compressive forces from the grip to the elbow and shoulder that may lead to over use tendon or nerve injuries. Impingement and inflammatory injuries to the shoulders are likely due to the prolonged static arm position (flexed and abducted shoulder and elbow) required during pruning and other overhead work.

Almost all of the Arborist Assistant'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 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 – will be taxed in the many dynamic movements associated with walking, standing, climbing, lifting and carrying on stable and unstable surfaces (grass, gravel, dirt, rock, concrete, asphalt, mud, ladders, truck boxes, etc.). These surfaces may be wet or dry. Twisting an ankle or knee or a slip and fall injury are the most likely to the lower extremities.



## **INTERVENTIONS**

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

1. Encourage the Arborist Assistant to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.
2. The crew plants a significant number of trees each year. Presently all tree bowls are dug by a pick and shovel. Where ever possible, mechanical digging equipment (Bobcat with attachments) should be used to decrease the risk of fatigued or overuse related injuries. On the other hand, as all trees are planted in the winter, a greater number of staff should perform this work during the planting season.
3. Provide the Arborist Assistant postural awareness training that focus on the importance of proper body posture and how it relates to their ultimate physical comfort and reducing fatigue level.
4. Heavy physical labour is required in this position. Allow the Arborist Assistant adequate time to complete high repetition physically demanding tasks. Frequent rest periods or crew rotation should be considered to reduce fatigue levels, which are likely to lead directly to injury.

PJDC-Arborist Assistant

Referral: Lana Ho		Organization: City of Burnaby							Title: Arborist Assistant	
Dept.: Engineering		Division: Parks/Forestry							Contact: Brent Robertson	
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 N G T H	Lifting - Floor to Knuckle	X	B				X	50	1 to 15	shovel dirt, lift tools/equipment, tree
	Lifting - Knuckle to Waist	X	B				X	50	1 to 15	shovel dirt, lift tools/equipment, tree
	Lifting - Waist to Shoulder	X	B				X	35	1 to 15	shovel dirt, lift tools/equipment, tree
	Lifting - Over Head	X	B				X	20	1 to 15	shovel dirt, lift tools/equipment, tree
	Carrying - With Handles	X	D				X	50	1 to 15	chain saw, signs, root balls, <10-1000m
	Carrying - Without Handles	X	B				X	50	1 to 15	hand tools, trees, branches, plants, <10-1000m
	Pushing - Upper Extremity	X	B				X	50	1 to 15	shovel dirt, prune tree with pole pruner
	Pushing - Hip/Leg Assist	X	B				X	50	1 to 15	shovel dirt, chain saw, pruner, saw
	Pulling - Upper Extremity	X	B				X	50	1 to 15	shovel dirt, chain saw, pruner, saw
	Pulling - Hip/Leg Assist	X	B				X	50	1 to 15	shovel dirt, chain saw, pruner, saw
	Reach - Shoulder or Above	X	B				X	20	1 to 15	prune/saw trees, shovel dirt to truck
	Reach - Sho. or Above extnd	X	B				X	50	1 to 15	prune/saw trees, shovel dirt to truck
	Reach - Below Shoulder	X	B				X	50	1 to 15	hand/power tool use, shovel, water trees
	Reach - Bel. Shoulder extnd	X	B				X	50	1 to 15	lift/carry trees, shovel dirt, tool use
G	Handling	X	B				X	50	1 to 15	hand/power tools, trees,
	Gripping	X	B				X	50	1 to 15	hand/power tools, trees,
E N R G	Fine Finger Movements	X	E				X	max.	1 to 15	crane use, spray pruner, tie ropes
	Aerobic (percent)	X					75			plant, prune and fall trees, water trees, fence trees
	Anaerobic (percent)	X				25				heavy lift and carry while planting or falling trees
	High Energy Expenditure	X				X				heavy lift and carry while planting or falling trees
P O S T U R E + M O B I L I T Y G E N	Low Energy Expenditure	X					X			plant, prune and fall trees, water trees, fence trees
	Neck - Static Flexion	X					X			work below shoulders planting, pruning, watering trees
	Neck - Static Neutral	X					X			stand, walk at work site, sit in truck driving to work site
	Neck - Static Extension	X					X			work above shoulders to plant, prune or fall trees
	Neck - Rotation	X	E				X			plant, prune, fall, water trees, drive truck(s)
	Throwing	X	B				X			dirt from shovel, debris to truck, limbs to chipper
	Sitting	X			X					while driving in truck, completing paperwork
	Standing	X					X			at work site, in shop
	Walking	X					X			at work site, along boulevard, <10-1000 m
	Running/Jumping									
	Climbing - Arms and Legs	X				X				up to back of truck, out of tree bowls, ladder
	Climbing - Legs Only	X				X				out of tree bowls, ladder
	Bending/Stooping	X					X			hand/power tool use, plant, prune, fall, water trees
	Crouching	X				X				hand/power tool use, plant, prune, fall, water trees
Kneeling	X			X					hand/power tool use, plant, prune, fall, water trees	
Crawling										
T W I S T I N G B A L A N C I N G T R A V E L I N G W O R K A L O N E I N T E R A C T W I T H P U B L I C O P E R A T E E Q U I P /M A C H I N E R Y I R R E G U L A R /E X T E N D E D H O U R S	Twisting	X	B				X			pick, shovel dirt, prune, fall tree, climb in/out of truck
	Balancing	X			X					prune tree, pound posts from ladder, back of truck
	Traveling	X			X					in city of Burnaby to/from shop and work site
	Work Alone									in a crew of 2 to 5
	Interact with Public	X			X					possibly at work site, in traffic
O P E R A T E E Q U I P /M A C H I N E R Y I R R E G U L A R /E X T E N D E D H O U R S	Operate Equip/Machinery	X					X			chain saw, chipper, truck(s), blower, pumps, weed eater
	Irregular/Extended Hours									8 hour shift, no OT, 2X10 min rest period, 30 min lunch

\* 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-Arborist Assistant

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	X					X	communication with crew and supervisor	
	Hearing - Other Sounds	X					X	power equipment, trucks, chipper, vehicle traffic	
	Vision - Far	X					X	plant, water, prune, fall trees	
	Vision - Near	X			X			inspect tree, leaves for disease	
	Vision - Colour	X					X	tree ID, inspect for tree disease, soil conditions	
	Vision - Depth	X					X	plant, water, prune, fall trees	
	Perception - Spatial	X					X	plant, water, prune, fall trees	
	Perception - Form	X					X	tree ID, inspect for tree disease, soil conditions	
	Feeling (Tactile)	X	D				X	hand/power tool use, prune, shovel, pick	
	Reading	X			X			work orders, paperwork	
N	Writing	X		X				work orders, paperwork	
	Speech	X					X	communication with crew and supervisor	
W O R K E N V I R O N M E N T	Inside Work	X		X				some work in shop/office, paper work in truck, drive	
	Outside Work	X					X	all weather conditions, plant, prune, fall, water trees	
	Hot Conditions >25 deg. C	X		X				possibly in spring, summer or fall	
	Cold Conditions <10 deg.C	X		X				possibly in fall, winter or spring	
	Humid	X		X				mostly during winter rainy season	
	Dust	X					X	tree pollens. Saw dust from falling trees	
	Vapor Fumes	X					X	diesel fumes, fumes from traffic	
	Hazardous Machines	X					X	power tools, chipper, truck(s), crane	
	Proximity to Moving Object	X					X	power tool moving parts, vehicles in traffic	
	Noise	X			X			power tools, hearing protection required	
E N V I R O N M E N T	Electrical Hazard	X					X	tool use while planting and pruning	
	Sharp Tools	X					X	hand/power tools, chipper	
	Radiant/Thermal Energy	X			X			hot power tools, sun	
	Slippery Conditions	X		X				water, mud at work site, more likely in winter during rain	
	Vibration and Related	X	B				X	hand and power tool use	
	Chemical Irritants	X		X				pruning spray	
	Organic Substances	X			X			fecal material in parks, tree bowls, beds, etc.	
	Medical Waste	X		X				needles in park	
	Blood Products								
	Congested Worksite	X				X		in tree bowl, around trees, in traffic,	
T	Lighting - Direct	X					X	sunlight, street lights	
	Lighting - Indirect	X				X		sunlight, street lights	
	Lighting - Adjustable								
	Lighting - Fluorescent	X						overhead lights in shop	
	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