



## JOB DEMANDS ANALYSIS

**Company:** City of Burnaby

**Location:** Carpenter Shop

**Job Title:** Carpenter

**Classification:** Regular Duty

### Purpose of Activities

The Carpenter is responsible for rough and finish carpentry and new construction within the City of Burnaby buildings, parks and rental properties. The Carpenter can be expected to hang doors and ceiling tile; build cabinets, shelves, picnic tables, bleachers, frames and forms; install siding and soffits on buildings, insulation, drywall; and repair and maintain 160 rental properties (houses).

### Tools and Equipment

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

- Shop Equipment – table saw X 2, sander X 2, drill press, band saw, planer, mitre/cut-off saw, belt sander, edge band sander, shaper
- Hand tools – clamps, planer, brushes, masking tape, linoleum roller (53-kg), hand saws, sledge hammers, caulking guns, extension cords, shovels, bars, chisels, tape measures, punches, pliers, hand drill, drill bits, ropes, step and extension ladders, tool box, carpenter's apron
- Power/Air tools – nailers, spikers, impact gun, drills, jackhammer, circular saw, belt sander, router, drills, jig saw, electric planes, skill saw, vacuum, hammer drill, compressor
- Carts (20 to 100 cm high) for moving lumber and material around the shop
- Work benches in shop range from 68 to 99 cm tall
- Dodge cargo van with tool and equipment storage along the interior walls of the van; extension/step ladder storage on top of van roof (2.5 m from ground, 2.0 m from bumper of van)
- Scaffolding – staging (1.5 m tall X 1.5 m long), (0.80 m wide X 1.5 m tall X 1.8 m long); ladder jacks (6.1 m long planking for ladder jacks)
- One-ton van with a nine meter bucket extension (occasional use only)
- Steel toe boots, safety vest, hard hat, safety glasses, face shield, hearing protection, dust mask/Fit-Test mask for asbestos
- Lumber – (2X4, 2X6, 2X8, 2X10, 2X12); plywood sheets (4X8, 4X4, 4X6, 4X 12 - 1/4 to 3/4 inch thick), drywall sheets (4X8, 4X10, 4X12)
- Screws, nails, nuts, bolts, washers, glue



## Usual Methods

### Shop

1. Receive work order from Foreman.
2. Drive to location of repair or construction.
3. Determine exact requirements of work (measurements, material, supplies, tools and equipment, number of carpenters required, etc.).
4. Drive to vendor to pick up materials. Drive back to shop.\*\*
5. Unload materials in shop.\*\*
6. Build project in the shop. Use hand, air and power tools and equipment that are available.
7. Dry lumber; measure lumber; cut lumber; send to paint shop if required; fasten project together – glue, nails, etc.; sand project; attach all parts, components and accessories.
8. Load the finished project into van, truck or trailer (by hand or forklift).\*\*
9. Drive to location of installation.\*\*
10. Unload project (by hand or forklift) and take it into the building or work site.\*\*
11. Install project in work site. Perform any finish carpentry as required.
12. Clean up work area.\*\*
13. Complete paperwork related to job.\*\*
14. Move on to the next project. Note: A Carpenter may be working on more than one project at a time as he waits for materials, painting, etc.

### Field Work

1. Receive work order from Foreman.
2. Drive to location of repair or construction.
3. Determine exact requirements of work (measurements, material, supplies, tools and equipment, number of carpenters required, etc.).
4. Drive to vendor to pick up materials. Drive back to work location.\*\*
5. Unload supplies, materials, tool and equipment at job site.\*\*
6. Make the repair or build the new project using the tools and equipment available in the van. Complete all carpentry requirements that will range from rough to finish carpentry.
7. Clean up work area.\*\*
8. Load tools and equipment back into the van.\*\*
9. Complete paperwork related to job.\*\*
10. Drive to next job or to shop at the end of the day.\*\*
11. Repeat steps 1-9.

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

## Administrative Issues

The Carpenter 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. Overtime and on-call are not required of this position. The Carpenter works in all weather conditions. Eight full-time and one part-time Carpenter are employed by the City of Burnaby. Each Carpenter has his own van and usually will work on a project alone unless



the project requires more than one Carpenter. Power tools are supplied by the City of Burnaby, while the Tradesman – Carpenter is required to supply his own hand tools.

### 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.

- Lift and carry tools, equipment, supplies and materials (<1-53-kg) from the van to the work site or shop (<5 to 200 metres)
- Lift, carry, hold and operate hand, air and power tools (<1 to 53-kg) from below grade to above shoulders
- Walk up to 200 metres between the van and work area.
- Stand at work site on grass, dirt, rock, asphalt, concrete, carpet linoleum, wood, etc.
- Bend, stoop, kneel, crawl to perform carpentry tasks for construction, renovation and repair
- Bend and stoop to perform work on shop equipment and work benches
- Work from below feet to above shoulder height to make repair, renovation or build new construction
- Work in all weather conditions including prolonged periods of rain or heat
- Sit in van to drive between work locations
- Work benches and shop equipment at fixed heights (68-99 cm)
- Push/pull lumber and material, finished product on hand carts
- Drive van and forklift
- Climb step and extension ladders, scaffolding, bucket truck

### 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.

- Lifting technique to some extent
- Body position in tool use to some extent
- Task organization

### Accommodative Considerations

1. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required in this position.
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 in this position.
3. 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.
4. 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.
5. People with injuries to the hand and fingers will have difficulty with the fine motor manipulation tasks required to perform the activities of this position.



6. People with lower extremity injuries to the hips, knees and ankles may have difficulty with standing on concrete asphalt, grass, dirt and kneeling for extended periods.

Prepared By: Jeffrey J. McGinn, Kinesiologist

May 26, 1999



## Summary of Stresses

### Metabolic Stresses

The aerobic energy system will supply the major source of energy while performing the duties and responsibilities of the Carpenter. This energy system will be utilized during rough, finish and new construction and during the repair and maintenance tasks required in this position. The anaerobic energy system may be required to supply energy for brief intense periods of work. This works may include heavy lifting, carrying or holding tools, materials and equipment; 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 Carpenter is handling a load (hand, air or power tools, debris, 1 to 53-kg). Forward flexed postures during hand, air and power tool use 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 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.

**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, 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. Air Nailers, Spikers, drills, circular saws, impact gun 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 some work.

Almost all of the Carpenter'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** – will be taxed in the many dynamic movements associated with walking, standing, climbing, lifting and carrying on stable and unstable surfaces (concrete, asphalt, grass, dirt, ladders, van, 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.



**Slivers, Cuts and Amputations** – working with lumber and hand, air and power tools expose the Carpenter to these types of injuries that can range from very minor cuts to total amputations of fingers and hands.

**Insect Stings** – field work in parks, rental properties or outside will expose the Carpenter to insect stings that may range from localized swelling of the affected area to anaphylactic shock and death.

**Hearing Loss** – prolonged use of air and power tools and equipment expose the Carpenter to high noise levels. Ear protection is required when working with this type of tool or equipment.

## **INTERVENTIONS**

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

1. Encourage the Carpenter to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.
2. Provide the Carpenter with postural awareness training that will focus on the importance of proper body posture and how it relates to their ultimate physical comfort and reducing fatigue level.
3. Investigate the use of a kneepad that will slide across the knee when the Carpenter moves on his knees. The kneepads in use now, grab the kneecap and hold it in position, while the rest of the knee moves.
4. Investigate an alternate storage area for step and extension ladders on van. The present storage site (roof) does not allow for easy access and in-fact will increase the risk of injury to the Carpenter because of this roof top location. The Carpenter must balance on the end of the cargo area at the back of the van and pull the required ladder off the roof. Often more than one ladder will be pulled off the roof as they are stacked on top of one another.
5. Investigate purchasing a height adjustable permanent and portable workbenches for the Carpenter Shop and work vans.

PJDC-Carpenter

Referral: Lana Ho		Organization: City of Burnaby							Title: Carpenter	
Dept.: Engineering		Division:							Contact: Don Smith	
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	<1-10	tools, lumber, parts, equipment, material
	Lifting - Knuckle to Waist	X	B				X	50	<1-10	tools, lumber, parts, equipment, material
	Lifting - Waist to Shoulder	X	B			X		50	<1-10	tools, lumber, parts, equipment, material
	Lifting - Over Head	X	B		X			50	<1-10	tools, lumber, parts, equipment, material
	Carrying - With Handles	X	D			X		50	<1-10	tools
	Carrying - Without Handles	X	B				X	50	<1-10	tools, lumber, parts, equipment, material
	Pushing - Upper Extremity	X	B				X	50	<1-10	tools, lumber, parts, equipment, material
	Pushing - Hip/Leg Assist	X	B				X	50	<1-10	tools, lumber, parts, equipment, material
	Pulling - Upper Extremity	X	B			X		50	<1-10	tools, lumber, parts, equipment, material
	Pulling - Hip/Leg Assist	X	B				X	50	<1-10	tools, lumber, parts, equipment, material
	Reach - Shoulder or Above	X	B		X			50	<1-10	tools
	Reach - Sho. or Above extnd	X	D		X			50	<1-10	tools, lumber, parts, equipment, material
	Reach - Below Shoulder	X	B				X	50	<1-10	tools, lumber, parts, equipment, material
	Reach - Bel. Shoulder extnd	X	B			X		50	<1-10	tools, lumber, parts, equipment, material
	Handling	X	E				X	50	<1-10	tools, lumber, parts, equipment, material
Gripping	X	E				X	50	<1-10	tools, lumber, parts, equipment, material	
Fine Finger Movements	X	D				X	max.	low	grasp/handle fasteners, tool use	
E N R G	Aerobic (percent)	X					95	repair and build in the shop or field, on site		
	Anaerobic (percent)	X		neg.				possibly during a heavy or prolonged lift, hold		
	High Energy Expenditure									
	Low Energy Expenditure	X				X		repair or build in shop, field or on site		
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 or build in shop, field on site		
	Neck - Static Neutral	X						stand, walk, sit, drive		
	Neck - Static Extension	X					X	work above shoulders from bend, stoop, crouch, kneel		
	Neck - Rotation	X	E				X	drive van, repair or build in shop or field		
	Throwing	X	E	X				rope, garbage to bin, off buildings		
	Sitting	X			X			in van to drive from site to site		
	Standing	X					X	at work site in field, shop, concrete, asphalt, grass, carpet		
	Walking	X					X	between van and work site, in shop ( 1-50 m)		
	Running/Jumping									
	Climbing - Arms and Legs	X		X				ladders, scaffolding		
	Climbing - Legs Only	X		X				step ladders, stairs in buildings		
	Bending/Stooping	X					X	build, repair work with hand and power tools		
	Crouching	X				X		build, repair work with hand and power tools		
	Kneeling	X			X			build, repair work with hand and power tools		
	Crawling	X		X				build, repair work with hand and power tools		
Twisting	X	E				X	build, repair work with hand and power tools			
G E N	Balancing	X		X				on ladders, stairs, scaffolding, roof of building		
	Traveling	X			X			drive to work site in city with van		
	Work Alone	X				X		in shop, field work, help available upon request		
	Interact with Public	X				X		at work site in field, drive van		
	Operate Equip/Machinery	X				X		hand, power, air tools, fork lift, van		
	Irregular/Extended Hours						0700 - 1530, Monday to Friday, OT occasionally			

\* 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			co-workers, supervisors, city employees, tenants	
	Hearing - Other Sounds	X					X	power tool use, pager	
	Vision - Far	X					X	build, repair	
	Vision - Near								
	Vision - Colour	X			X			type of wood	
	Vision - Depth	X					X	drive van, use hand/power tools/equipment, measure, build	
	Perception - Spatial	X					X	drive van, use hand/power tools/equipment, measure, build	
	Perception - Form	X				X		tool selection, wood selection	
	Feeling (Tactile)	X					X	hand and power tool use, equipment use, hold materials together	
	Reading	X			X			drawings, plans, blueprints, street signs, work orders	
	Writing	X			X			paper work on completed work, plans, drawings	
	Speech	X			X			co-workers, supervisor, city employees, tenants	
	W O R K E N V I R O N M E N T	Inside Work	X					X	in shop, buildings, Burnaby rental properties, drive in van
Outside Work		X					X	in field, parks, under awning at shop	
Hot Conditions >25 deg. C		x		X				spring, summer fall, possibly some work locations like a pool	
Cold Conditions <10 deg.C		X		X				fall, winter, spring, some work location like an arena	
Humid		X		X				wet weather, working in a pool	
Dust		X					X	saw dust, saw dust is collected by mechanical fans in shop	
Vapor Fumes		X			X			glues, thinners, paints, cleaners	
Hazardous Machines		X					X	hand/ power tools and equipment	
Proximity to Moving Object		X					X	hands near hand and power tool blades, belts, bits, etc.	
Noise		X					X	hand and power tools, hearing protection required	
Electrical Hazard		X				X		electric tool use, in walls	
Sharp Tools		X					X	hand and power tools and equipment	
Radiant/Thermal Energy		X		X				sun, heat guns, hot air guns	
Slippery Conditions	X		X				wet weather conditions, water on floor, work on the ice at an arena		
Vibration and Related	X					X	hand and power tools use		
Chemical Irritants	X			X			glues, thinners, paints, cleaners, strippers		
Organic Substances									
Medical Waste	X		X				possibly discarded needles		
Blood Products									
Congested Worksite	X		X				houses, buildings, mostly hard to reach places		
Lighting - Direct	X					X	overhead fluorescent lights, sun light, day light		
Lighting - Indirect	X					X	sun light, day light		
Lighting - Adjustable	X			X			task lighting		
Lighting - Fluorescent	X					X	overhead fluorescent lights in buildings, shop		
Lighting - Incandescent	X				X		in rental properties		
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