

# Job Demands Analysis

**Worker's Occupation:** Concrete Finisher (CF)

**Prepared for:** City of Richmond

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## **OVERVIEW OF POSITION**

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This is a skilled manual labour position, which involves the construction, installation, finishing and maintenance of concrete structures such as sidewalks, walls, foundations, curbs, gutters, beams, plates, columns or other decorative forms of concrete.

## **WORK HOURS/WORK SCHEDULE**

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- Fulltime Hours: 8-9 hours/day
- Shift: 5 weekdays + 4 weekdays and one day off
- Breaks: two 10-minute coffee breaks and one 37-minute lunch break
- Overtime: as required
- Frequency of overtime: varies depending on need

## **PERSONAL PROTECTIVE EQUIPMENT**

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- Hard hat
- Steel Toed Boots
- Gloves
- Overalls
- Knee Pads (Optional)
- Safety Glasses
- Hearing Protection (Task-specific)
- Respiratory Protection Equipment (Where required)

## **TOOLS AND EQUIPMENT**

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A CF can use the following tools and equipment to perform their duties:

### Up to 20 lbs:

- |                         |                                  |
|-------------------------|----------------------------------|
| • Trowels               | • Grinder                        |
| • Powder-actuated tools | • Shovel                         |
| • Hammers               | • Broom                          |
| • Levels                | • Push hand hammer               |
| • Screwdrivers          | • Concrete rakes                 |
| • Wrenches              | • Tampers                        |
| • Saws (hand/electric)  | • Screed or 2x4x48 piece of wood |
| • Measuring tape        | • Long or hand held floats       |
| • Crowbar               | • Trowels                        |
| • Sledgehammer          | • Groover                        |

### 21-50 lbs:

- |                |                    |
|----------------|--------------------|
| • Chainsaw     | • Brick / tile saw |
| • Concrete saw |                    |

### 51-100 lbs:

- |                       |               |
|-----------------------|---------------|
| • Portable generators | • Jack hammer |
| • Compactor           |               |

### 100 lbs +:

- Concrete grinder

## **WORK ORGANIZATION**

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Workers tend to operate in small crews and/or individually. An onsite leader supervises each crew. A foreman supervises and organizes groups of crews.

## **REQUIRED EDUCATION & QUALIFICATIONS**

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- Red seal ticket tradesmen (bricklayer or mason)
- General orientation courses as prescribed by the City of Richmond eg) flagging
- Class 5 driver's license

## **ESSENTIAL - PHYSICAL DEMANDS**

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The essential tasks of a Concrete Finisher (CF) include the following:

1. Preparing and transporting materials from the City Works Yard to the work site
2. Preparing the work site including as necessary establishing chalk lines
3. Setting the steel or constructing the wooden concrete forms
4. Pouring, placing, and rough setting liquid concrete into the steel or wood forms
5. Fine finishing, edging and brushing concrete
6. Removing the steel or wooden concrete forms
7. Cleaning up the work site (sweeping, disposal of waste) and the work tools (washing)

The following tasks are physically repetitive:

4. Pouring, placing, and rough setting liquid concrete into the steel or wood forms
5. Fine finishing, edging and brushing concrete

In a typical day, a crew of CF can install up to 200 feet of new sidewalks.

A detailed description of each essential task follows in this next section.

### 1 - Preparing and Transporting

Concrete Finishers (CF) meet at the City Works Yard on Lynas Lane at the start of each shift. Work schedules for the day are reviewed. Supplies and tools are loaded into City vehicles. Wooden forms, if required, are constructed (Task 3). CFs drive to their designated work sites for the day.

### 2 - Preparing Worksite

Concrete Finishers (CF) prepare the worksite. This may include the following:

- Diverting traffic and setting up traffic cones
- Transporting equipment
- Laying chalk lines
- Compressing and levelling the ground to be covered
- Contacting and liaising with City (Roads) or 3<sup>rd</sup> party workers (Lafarge)

### 3 - Setting Concrete Forms

CF lay/set the wood/metal forms that hold the concrete in place. Wooden forms, if required, are constructed in advance at the City Work Yards. Alterations to any forms are completed on site. On average, metal forms weight 5 lbs per square foot<sup>1</sup>. Metal forms come in varying lengths.



### 4 - Pouring, Placing and Rough Setting Concrete Liquid

There are multiple steps in this process.

- i. A CF controls, and directs the flow of liquid concrete from a chute to the ground.
- ii. Another CF distributes the liquid concrete evenly over the ground.



Figure 1

- iii. One or two other CFs “screed” or level the top of the freshly placed concrete with a flat tool (screed or a 2x4x48 section of wood).



Figure 2

- iv. Another CF uses a “bull float” (a long handled trowel) to a) level the rough parts of the concrete b) compact and fill voids left by the screeding process c) smooth the surface of the concrete for fine finishing and edging



Figure 3

### 5 - Fine Finishing and Edging

There are multiple steps in this process.

- i. CF uses a “groover” to score the concrete into smaller sections.



Figure 4

- ii. CF uses a float/trowel to ensure the surface of the concrete is uniform and smooth. This is repeated as required. Floats/trowels can be of varying sizes/lengths. A long handled float or “fresno trowel” is used to create a smooth finish over a large area.



Figure 5

#### 6 - Removing Concrete Forms

CF return 24 hours later to remove the wood/metal forms. Forms are loaded into trucks and transported back to the City Works Yard or to the next work site.

#### 7 - Clean Up

CFs clean up the work site and their tools. Tools/equipment are loaded onto trucks.



Figure 6

### **PHYSICAL DEMANDS OF WORK TASKS**

The following guide/descriptors have been used to identify the frequency, and the load of the specific steps as outlined in the preceding pages (3-5) of this document.

<b>Table ST1 - Physical Demand Characteristics Of Work</b> (Dictionary of Occupational Titles - Volume II, Fourth Edition, Revised 1991)			
Physical Demand Level	OCCASIONAL	FREQUENT	CONSTANT
	0-33% of the workday	34-66% of the workday	67-100% of the workday
Sedentary	1 - 10 lbs.	Negligible	Negligible
Light	11 - 20 lbs.	1 - 10 lbs.	Negligible
Medium	21 - 50 lbs.	11 - 25 lbs.	1 - 10 lbs.
Heavy	51 - 100 lbs.	26 - 50 lbs.	11 - 20 lbs.
Very Heavy	Over 100 lbs.	Over 50 lbs.	Over 20 lbs.

Action	Weight / Force (Lb.)	Travel Distance	Frequency	Task Parameters (Essential/non-essential)
<b>Lifting</b>				
Floor to Waist	11-20 lbs	0-36 Inches	Frequent	Essential – trowels, screed, rakes. Light to medium demand. Steps 1-7. Figs 1-6.
	21-50 lbs	0-36 Inches	Occasional	Essential – various saws, forms. Medium demand.
	51-100 lbs	0-36 Inches	Occasional	Essential – Jackhammer. Heavy demand.
	100+ lbs	0-36 Inches	Occasional	Essential – concrete grinder. Very heavy demand.
Waist to Shoulder	11-20 lbs	0-36 Inches	Frequent	Essential – trowels, screeding, and raking. Medium to heavy demand. Steps 1-7. Figs 1-6.
	21-50 lbs	0-36 Inches	Occasional	Essential – medium demand.
	51-100 lbs	0-36 Inches	Occasional	Essential – heavy demand.
	100+ lbs	0-36 Inches	Occasional	Essential – very heavy demand.
Shoulder to Overhead	11-20 lbs	0-36 Inches	Occasional	Non-essential – light demand.

Action	Weight / Force (Lb.)	Travel Distance	Frequency	Task Parameters (Essential/non-essential)
<b>Carrying</b>				
Bilateral Carrying	11-20 lbs	0-36 Inches	Occasional	Essential – buckets, tools, screed. Light demand. Steps 1-7. Figs 1-6.
	21-50 lbs	0-36 Inches	Occasional	Essential – saws. Medium demand.
	51-100 lbs	0-36 Inches	Occasional	Essential – compactor, Jackhammer. Heavy demand.
Unilateral Carrying – Right / Left	11-20 lbs	0-36 Inches	Constant	Essential – tools (trowels, rakes, buckets). Heavy demand. Steps 1-7. Figs 1-6.
	21-50 lbs	0-36 Inches	Occasional	Essential – saws. Medium demand.



Action	Weight / Force (Lb.)	Travel Distance	Frequency	Task Parameters (Essential/non-essential)
<b>Push / Pull</b>				
Static / Dynamic Pushing & Pulling	11-20 lbs	0-36 Inches	Constant	Essential – push/pulling/lifting trowel/screed in Step 4 item iii and iv. Figs 2-5. Medium to heavy load.
	21-50 lbs	0-36 Inches	Constant	Essential – supporting/holding the concrete chute at 1/3 – ½ load. Step 4 item i. Fig 1. Medium to heavy load.
	51-100 lbs	0-36 Inches	Constant	Essential – supporting/holding the concrete chute at full load and over varying terrain and obstacles. Step 4 item i. Fig 1. Medium to heavy load.
	100+ lbs	0-36 Inches	Occasional	Essential – using the concrete grinder. Heavy load.

Action	Force Required	Frequency	Task Parameters (Essential/non-essential)
<b>Gripping</b>			
Right Hand & Left Hand	11-20 lbs	Constant	Essential – all hand tools / equipment. Steps 1 – 7 and particularly Steps 3,4,5,6 and 8. Figs 1,3,5,7. Medium to heavy load.
	21-50 lbs	Frequent	Essential – supporting the concrete chute. Step 4 item i. Fig 1. Heavy load.

The table in the subsequent page highlights the frequency of the most common movement patterns performed by the City of Richmond's Concrete Finishers as assessed on June 7, 2016. The numeral in the "Task #" column refers to these tasks:

1. Preparing and transporting materials from the City Works Yard to the work site
2. Preparing the work site including as necessary establishing chalk lines
3. Setting the steel or constructing the wooden concrete forms
4. Pouring, placing, and rough setting liquid concrete into the steel or wood forms
5. Fine finishing, edging and brushing concrete
6. Removing the steel or wooden concrete forms
7. Cleaning up the work site (sweeping, disposal of waste) and the work tools (washing)

The "Frequency" column is described as follows:

N = Not required, R = Rarely (<2%), O = Occasional (3-33%), F = Frequent (34-66%), C = Constant (67-100%)



PHYSICAL DEMAND	TASK #	FREQUENCY					DESCRIBE ACTIVITY Note distances, durations and surfaces
		N	R	O	F	C	
<b>MOBILITY</b>							
Walking	1-4 & 6,7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Walking ~ 70% of time - 250 metre area. Over paved and gravel/uneven terrain. Standing ~ 100% of time. Figs 1,3,5,6. - Obtaining/operating tools, conversing with peers, traffic - Depending on role/duty of worker. Crawling ~ 2% of time. Figs 4,5. - Limited to fine finishing with a hand trowel.
Standing	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Sitting	-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Crawl	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Driving (Forklift/Vehicle/Other)	-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
City vehicles/trucks	1 & 7	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>POSTURE - Back</b>							
Bending Forward	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Forwards ~ 80% of time. Figs 1,2,3,4,5. - Setting/removing concrete forms and prepping the worksite - Placing, pouring, rough/fine setting, and edging concrete - Movement combinations (walk/flex) while trowelling. - Varying positions ie) crawl/kneel and flex while finishing
Bending Backwards	-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Twisting	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>POSTURE - Reaching</b>						Note forward and/or side reach distances	
Above Shoulder Level	1,7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Either Above ~ 2% of time. Fig 5. - end range of shoulder to obtain tools Chest to shoulder ~ 66% of time. Fig 1-6. - mid and end range for tasks Below Chest ~ 66% of time. Figs 1-6. - mid and end range for tasks
Chest to Shoulder Level	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Below Chest Level	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Behind Body	1-7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>POSTURE - Elbow/Forearm/Wrist</b>							
Elbow Flexion/Extension	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Either Elbow ~ 90% of time. Figs 1-6. - mid to end range for tasks Chest to shoulder and below chest. - ~ 66% of time. Figs 1-6. - mid - end range for tasks
Wrist Flexion/Extension	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Wrist Rotation	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>POSTURE - Neck</b>							
Forward Bending/Flexion	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Forwards / back / twisting ~ 66 % of time. Figs 1-6. - neutral to end range - for task completion - survey/monitor environment (traffic, obstacles, peers)
Backward Bending/Ext.	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Twisting/Turning/Tilting	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>POSTURE - Hip/Knee/Ankle/Foot</b>							
Crouching/Squatting	1-7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Crouch/Squat ~ 66 % of time. Figs 2,4,5. - mid to end range for tasks (setting, finishing) Kneeling ~ 33% of time. Figs 4,5. - mid to end range for edging/fine finishing Climbing ~ 2% of time - into/out of trucks/vehicles Foot Pedal ~ 1% of time - only if operating City trucks/vehicles
Kneeling	4	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Climbing (Stairs/Other)	1 & 7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Jumping	-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Foot Pedal/Action	1 & 7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

N = Not required, R = Rarely (<2%), O = Occasional (3-33%), F = Frequent (34-66%), C = Constant (67-100%)

## **ESSENTIAL – NON-PHYSICAL DEMANDS**

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Concrete Finishers (CFs) are required to account for environmental variables. These variables (wind, warm or cool temperatures, and weather) can make the concrete warp or crack. CFs need to know how concrete responds to these variables. They need to anticipate problems and take preventative measures to prevent any problems.

CFs are also required to demonstrate their understanding of the following:

- Knowledge of the occupational hazards
- Knowledge of the safety precautions
- Maintaining records as required
- Converse, instruct, follow and direct work as required

These demands (environment, hazards, safety, administrative) require the following range of cognitive and sensory skills.

### Attention/concentration

- Sustained - attending to the chute, rough setting concrete, fine finishing, or cleaning
- Divided - conversing with crew and attending to the chute/rough setting or finishing
- Alternating - conversing with concrete truck driver/crew, attending to chute or other tasks

### Memory

- Procedural - knowledge of methods, materials, tools, equipment and use of same
- Immediate and delayed visual - written directions, blueprints, survey material, tools
- Immediate and delayed auditory - verbal directions, conversations with crew/leader
- Prospective - project timelines, schedules, meeting times

### Executive Functioning

- Initiation - beginning task/project
- Working memory - short term directions/changes, one off instructions
- Sequencing - identifying and/or following an order of activities/actions
- Problem solving - identifying and/or addressing unexpected issues
- Termination - completing a task/project

### Sensory

- Vision - observation of the immediate environment and task at hand
- Hearing - attending to sounds within the environment
- Touch - to hold and manipulate tools/equipment and concrete

The table in the subsequent page summarizes the key environmental conditions that may influence and impact a CFs ability to do their job.

**ENVIRONMENTAL/PSYCHOSOCIAL FACTORS:**

ENVIRONMENTAL & OTHER CONDITIONS	YES	NO	TASK DESCRIPTION
Inside Work Location		X	
Outside Work Location	X		
Electronic		X	
Mechanical	X		
Fumes, Gases or Odours		X	
Dust	X		
Toxic Conditions		X	
Explosives		X	
Wet/Humid	X		
Noise	X		Traffic, immediate environment, and various tools
Vibration	X		Compressor or jack hammer
Exposure to Changes in Temperature	X		
Confined and/or Awkward Spaces	X		Task dependent. See Figure 1
Talking	X		Interacting with co-workers, public, managers
Near Vision	X		Reading manuals or drawings. Identifying imperfections in the concrete/pavement.
Far Vision	X		Directing traffic. Driving City vehicles.
Depth Perception	X		Preparing, setting, finishing concrete.
Reading	X		Reading manuals or drawings. Identifying imperfections in the concrete/pavement.
Writing		X	Limited to crew lead / foremen.
Driving	X		City vehicles to and from worksites.
Operating Hand/Foot Controls	X		Driving City vehicles to and from worksites.
Travel	X		
Deadline Pressures	X		
Work Alone	X		Specific tasks/steps while laying concrete.
Work in Group	X		Within crews to complete the tasks.

**FOOTNOTE / REFERENCE**

1 - <http://www.advanceconcreteform.com/sitepage/faqs> - page 4. Task 3.