



## JOB DEMANDS ANALYSIS

**Company:** City of Burnaby

**Location:** Works Yard

**Job Title:** Sidewalks – Form Setter

**Classification:** Regular Duty

### Purpose of Activities

The Form Setter builds wood and metal forms for the replacement of concrete sidewalk, curb and gutter, stairs and driveways.

### Tools and Equipment

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

- Clothing – Steel Toe boots, ear protection, safety vest, hard hat, leather or lined rubber gloves
- Single Axle Five-Ton Truck with a dump box, Electric Crane (one truck only)
- Small hand tools (hammer, shovel, saw, bars, brooms, etc.)
- Jack hammer (42 kg), Tamper (two man lift –30 kg/man), Cut Off Saw (39 kg)
- Wheel Barrow (23 kg) empty
- Traffic Control – signs, traffic cones, barricades
- Forms (wood and metal); Wood Forms – cut lumber to fit 2 X 4, 2 X 8, 2 X 12 up to 10 feet long; Metal forms – 2 X 4, 2 X 8, 2 X 10 all 10 feet long, weigh up to 36 kg, metal and wood stakes

### Usual Methods

1. Perform the Pre-Trip Inspection of the Five-Ton Single Axle Truck. Grease, top up fluid levels and readjust breaks, check tire pressure, etc.\*\*
2. Load tools and equipment required for the day (forms, wheelbarrow, jackhammer, tamper, signs, barricades, stakes, etc) in the dump box. Where a jackhammer is required, the Form Setter will back his truck up to a compressor (trailer) and tow it around for the rest of the day. This compressor supplies the air pressure for the jackhammer.\*\*
3. Drive to work location.\*\*
4. Set up signs and barricades to protect the work crew from vehicle and pedestrian traffic.\*\*
5. Unload tools and equipment from the dump box.



## Usual Methods (Continued)

### Break and Load

1. Take jackhammer off the back of the dump box, uncoil the air hose from the compressor.\*\*
2. The Crew (Form Setter and Labourer) alternate breaking the concrete out with the jackhammer. The concrete can be anywhere from 2.5 to 36 cm (one to fourteen inches) thick.\*\*
3. After the concrete has been broken into relatively small pieces (2-50 kg), the crew will load the pieces by hand into the dump box. The dump box sides may or may not fold down. In any event, the concrete must be lifted 1.5 to 1.8 metres high to be placed into the dump box.\*\*
4. Repeat step 4 until all of the broken concrete has been removed and loaded into the dump box.\*\*
5. Use a shovel and broom to clear small debris away from the excavation and throw this material into the dump box.\*\*

### Build Form

1. After the concrete has been cleared from the work area, the crew will layout the forms around the site.
2. The Form Setter will then begin to build the form as required by the work order. Sidewalk forms may range from less than one to up to 60 metres in length and may be up to 36 cm deep. The forms are made of wood or metal. The forms may be built around Catch Basins, water valves or other obstacles. Some obstacles are left in place while others are wrestled into position around the form.
3. A hand or power saw is used to cut the forms to length. The forms are held together with nails, stakes or clamps.
4. Fill the completed form with gravel. The gravel is dumped into the excavation either with a Five-Ton Truck or by wheelbarrow.
5. Spread the gravel (by shovel) around the inside of the form to bring the form to the required elevation.
6. Lift the tamper off the back of a truck (Five or half ton) and place it on the inside of the form. Two people are required to lift the tamper.
7. Compact the fill material with the tamper to bring the form to the required grade.
8. Lift the tamper out of the form and back to the truck.
9. Clean work site of any tools, equipment and debris.
10. Place barricades around excavation to protect the public from the open area.
11. Proceed to the next work site.

**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 Form Setter works an eight-hour day, Monday to Friday from 0700 a.m. 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 Form Setter is not required to work overtime. The Five Ton Truck is equipped with either an air ride or spring suspension driver's seat, power steering, an automatic or five speed split shift gear box and air brakes. The Form Setter is likely the



most senior on the crew and will supervise one or two Labourers depending on the job. The Form Setter is also required to perform snow removal and flood control duties as the weather indicates.

### 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 Truck, sander and plow
- Drive the Truck in traffic between Works Yard and work site
- Lift, carry and load tools to the dump box of the truck
- Use jackhammer to break concrete up to 36 cm (14 inches) thick, 60 metres long and three metres wide
- Load by hand broken concrete pieces from the ground to the back of the Five-Ton Truck's Dump Box ((1.5 to 1.8 metres from the ground). Some trucks have a dump box where the sides fold down to allow for easier access.
- Crouch, kneel, bend and stoop to build wood and metal concrete forms
- Crouch, kneel, bend and stoop to grease and perform pre-trip Inspection on Truck every morning
- Reach below and above shoulder height to break and load concrete and build concrete forms
- Reach below right shoulder to operate dump box, sander and plow controls

### 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 when lifting, carrying or placing tools, equipment or concrete in or out of the dump box
- Choose body posture when building forms
- The Sidewalk's crew can take turns breaking the concrete with a jackhammer and loading the concrete into the back of the dump box

### Accommodative Considerations

1. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required during the labouring duties associated with form setting and breaking and loading concrete.
2. People with shoulder injuries such as rotator cuff tendonitis, bursitis and instability may have difficulty with dynamic and static loading and reaching when setting forms and breaking and loading concrete.
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 when breaking and loading concrete and form setting.
4. People with nerve compression injuries in the upper extremities may have difficulty with the repeated and prolonged use of the jackhammer and tamper (compression and vibration).
5. People with lower extremity injuries may have difficulty with the constant change of position from standing, to bending, to stooping, to crouching and to kneeling.

Prepared By: Jeffrey J. McGinn, Kinesiologist

February 15, 1999



## Summary of Stresses

### Metabolic Stresses

The aerobic energy systems will provide the major source of energy for the Form Setter. This position requires a moderate to high level of aerobic function specifically when building the wood or metal form. A considerable amount of labouring is required to load or unload tools, equipment and broken concrete to or from the Five-Ton Truck Dump Box. The anaerobic energy system will be required during the heavy labouring tasks of this position (breaking concrete with a jackhammer and loading the broken concrete pieces into the dump box). This energy system will also take over as the primary energy source later in the day as an unfit Form Setter becomes fatigued and the aerobic energy system can no longer supply the required energy.

### Structural Stresses

**Spine** – There are two main risks to the spine from this position. The first deals with the prolonged forward flexed postures encountered by the Form Setter as he builds the concrete forms. These forward flexed postures will occur in flexion, extension, lateral flexion and rotation and most likely while the Form Setter is handling a load (< 1-50 kg). This posture require no activity from the torso musculature, but increases 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.

The second risk to the spine will occur during the non-value-added and high risk movements encountered during the breaking and loading of concrete to the Five-Ton Truck Dump Box. Again, the spine will be loaded (<1-50 kg) and moving through all of the above ranges of motion. Loading concrete to the five ton truck dump box will likely require excessive lumbar/thoracic extension to lift the concrete block high enough to clear the edge of the dump box (approximately 1.5-2 metres from the ground). Significant, unnecessary loading of the spine occurs during this task. Use of the jackhammer will also increase the compression forces on the discs.

**Shoulders and Upper Extremity**– The Form Setter handles extreme static (grip forces) and dynamic (build/strip forms, break and load concrete) loads to perform the tasks required in this position. Compression injuries to the carpal tunnel and overuse injuries to the tendons of the elbow (hammer, jackhammer use) are likely. The static grip required during some tool use will also decrease the blood flow in the upper extremities.

**Hips and Lower Extremities** – The Form Setter is required to work at many levels as he builds a concrete form. Bending, stopping, crouching and kneeling are all required movements. The ground may be uneven and wet which will decrease the stability of the Labourer as he works in the above positions. It is likely that the Form Setter will be handling a load (<1-50 kg) from these positions as well. Standing on concrete, asphalt and other hard surfaces will increase the compressive forces up through the ankle, knee, and hip and into the spine.



## **INTERVENTIONS**

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

1. Encourage the Form Setter to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.
2. Risk of injury can be decreased (soft tissue, nerve compression, disc, pinch or crush injuries) and productivity increased by eliminating the breaking and loading of concrete by hand. A Bobcat with a jackhammer and front bucket loader can both break the concrete and load it into the dump box more quickly and safely. This is a non-value added task that slows production and increases the risk of injury to the Form Setter.
3. Encourage the Form Setter to ask for assistance when handling heavy metal or wooden forms.
4. Store the wooden forms out of the rain to decrease their weight.
5. Install a Sidewinder on the back of the Sidewalk Crews Five-Ton Trucks. The Sidewinder will place gravel into the concrete form in a more effective and efficient manner. Presently, the gravel is either dumped (truck or wheelbarrow) into the concrete form and moved by shovel to where it is required.
6. A two-trailer system could be used to decrease the manual handling of the concrete forms. The first trailer is loaded with the concrete forms and is used by the Form Setter. The second trailer is used to strip the forms after the concrete has set. This empty trailer is then loaded with concrete forms until it is full. The Form Setter and the Labourer then switch trailers. Presently, the concrete forms are loaded and unloaded each day at the Works Yard, as they are required.
7. Provide regular education in effective use of the body and neutral joint positions for this type of work.
8. Provide kneepads for the Form Setter for the times he will spend in a kneeling position when setting forms.

|   |                             |                                |                  |          |          |          |           |                        |   |   |
|---|-----------------------------|--------------------------------|------------------|----------|----------|----------|-----------|------------------------|---|---|
| Referral: Lana Ho   |                             | Organization: City of Burnaby  |                  |          |          |          |           |                        | Title: Form Setter  |   |
| Dept.: Public Works   |                             | Division: Concrete - Sidewalks |                  |          |          |          |           |                        | Contact:  |   |
|   |                             | FREQUENCY*                     |                  |          |          |          |           |                        | Date: February 10, 1999                                   |   |
| PHYSICAL DEMANDS  |                             | R<br>E<br>Q<br>D               | S<br>I<br>D<br>E | Sel<br>1 | Low<br>2 | Mod<br>3 | High<br>4 | Max.<br>Weight<br>(kg) | Usual<br>Weight<br>(kg)                                   | COMMENTS  |
| S<br>T<br>R<br>E<br>N<br>G<br>T<br>H  | Lifting - Floor to Knuckle  | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, jackhammer, tools, concrete                        |
|   | Lifting - Knuckle to Waist  | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, jackhammer, tools, concrete                        |
|   | Lifting - Waist to Shoulder | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, jackhammer, tools, concrete                        |
|   | Lifting - Over Head         | X                              | D                |          |          | X        |           | 50                     | <1-50   | forms, tools, concrete                                    |
|   | Carrying - With Handles     | X                              | D                |          |          | X        |           | 50                     | <1-50   | wheel barrow, tamper                                      |
|   | Carrying - Without Handles  | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, tools, jackhammer, concrete                        |
|   | Pushing - Upper Extremity   | X                              | D                |          |          |          | X         | 36                     | <1-36   | forms, some tool use                                      |
|   | Pushing - Hip/Leg Assist    | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, concrete, jackhammer, tamper                       |
|   | Pulling - Upper Extremity   | X                              | D                |          |          |          | X         | 36                     | <1-36   | forms, some tool use                                      |
|   | Pulling - Hip/Leg Assist    | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, concrete, jackhammer, tamper                       |
|   | Reach - Shoulder or Above   | X                              | D                |          |          | X        |           | 50                     | <1-50   | load/unload forms/tools/concrete                          |
|   | Reach - Sho. or Above extnd |                                |                  |          |          |          |           |                        |   |   |
|   | Reach - Below Shoulder      | X                              | D                |          |          |          | X         | 50                     | <1-50   | break/load concrete, tool use, build form                 |
|   | Reach - Bel. Shoulder extnd | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, tools, jackhammer, concrete                        |
| E<br>N<br>R<br>G<br>P<br>O<br>S<br>T<br>U<br>R<br>E<br>+<br>M<br>O<br>B<br>I<br>L<br>I<br>T<br>Y<br>G<br>E<br>N<br>E<br>R<br>A<br>L | Handling                    | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, tools, jackhammer, concrete                        |
|   | Gripping                    | X                              | D                |          |          |          | X         | 50                     | <1-50   | forms, tools, jackhammer, concrete                        |
|   | Fine Finger Movements       | X                              | D                |          |          | X        |           | mod.                   | low   | build forms, some tool use                                |
|   | Aerobic (percent)           | X                              |                  |          |          |          | 75        |                        |   | jack hammer, break/load concrete, build form, strip form  |
|   | Anaerobic (percent)         | X                              |                  |          |          | 25       |           |                        |   | jack hammer, break/load concrete                          |
|   | High Energy Expenditure     | X                              |                  |          |          | X        |           |                        |   | jack hammer, break/load concrete                          |
|   | Low Energy Expenditure      | X                              |                  |          |          |          | X         |                        |   | jack hammer, break/load concrete, build form, strip form  |
|   | Neck - Static Flexion       | X                              |                  |          |          |          | X         |                        |   | jack hammer, break/load concrete, build form, strip form  |
|   | Neck - Static Neutral       | X                              |                  |          |          | X        |           |                        |   | sit in truck, stand, walk at work site                    |
|   | Neck - Static Extension     | X                              |                  |          |          |          | X         |                        |   | above shoulders from bend/stoop, crouch, lift to truck    |
|   | Neck - Rotation             | X                              | E                |          |          | X        |           |                        |   | build/strip forms, turn drive, shoulder check             |
|   | Throwing                    | X                              |                  |          |          | X        |           |                        |   | concrete up to truck, debris from shovel, forms to truck  |
|   | Sitting                     | X                              |                  |          | X        |          |           |                        |   | drive in truck to work site                               |
|   | Standing                    | X                              |                  |          |          |          | X         |                        |   | at work site, on concrete, asphalt, grass, gravel, uneven |
| Walking   | X                           |                                |                  |          |          | X        |           |                        | at work site, on concrete, asphalt, grass, gravel, uneven |   |
| Running/Jumping   |                             |                                |                  | X        |          |          |           |                        | possibly jump down from truck box (1.5m)                  |   |
| Climbing - Arms and Legs  | X                           |                                |                  | X        |          |          |           |                        | to truck box to/from ground (1.5m), in/out of truck       |   |
| Climbing - Legs Only  | X                           |                                |                  | X        |          |          |           |                        | in/out of open sidewalk excavation                        |   |
| Bending/Stooping  | X                           |                                |                  |          |          | X        |           |                        | break/load concrete, jackhammer, build/strip form, tamper |   |
| Crouching   | X                           |                                |                  |          |          | X        |           |                        | build/strip form, load concrete to truck from ground      |   |
| Kneeling  | X                           |                                |                  |          |          | X        |           |                        | build/strip form, load concrete to truck from ground      |   |
| Crawling  |                             |                                | X                |          |          |          |           |                        | build form  |   |
| Twisting  | X                           | E                              |                  |          |          | X        |           |                        | build/strip form, load concrete, shovel                   |   |
| Balancing   | X                           |                                |                  | X        |          |          |           |                        | climbing in/out of truck box                              |   |
| Traveling   | X                           |                                |                  | X        |          |          |           |                        | in city to work site                                      |   |
| Work Alone  |                             |                                |                  |          |          |          |           |                        |   |   |
| Interact with Public  | X                           |                                |                  | X        |          |          |           |                        | possibly at work site, in front of homes, in traffic      |   |
| Operate Equip/Machinery   | X                           |                                |                  |          |          | X        |           |                        | jackhammer, tamper, saw, truck dump box                   |   |
| Irregular/Extended Hours  |                             |                                |                  |          |          |          |           |                        | 8 hour day, Monday-Friday, 2X10 min. break, 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.

|   |                            |                  |                  |            |          |           |           |  |  |
|---|----------------------------|------------------|------------------|------------|----------|-----------|-----------|--|--|
| Referral:   |                            | Organization:    |                  |            |          |           |           | Title: see 1st page header                               |  |
| Dept.:  |                            | Division:        |                  |            |          |           |           | Contact:   |  |
| PHYSICAL DEMANDS                                    |                            | R<br>E<br>Q<br>D | S<br>I<br>D<br>E | FREQUENCY* |          |           |           | COMMENTS   |  |
|   |                            |                  |                  | Sel.<br>1  | Low<br>2 | Mod.<br>3 | High<br>4 |  |  |
| P<br>E<br>R<br>C<br>E<br>P<br>T<br>I<br>O<br>N      | Hearing - Conversations    | X                |                  |            |          | X         |           | Labourers, Concrete Finisher, Foreman, public            |  |
|   | Hearing - Other Sounds     | X                |                  |            |          | X         |           | vehicles in traffic, jackhammer, truck, tamper           |  |
|   | Vision - Far               | X                |                  |            |          |           | X         | jack hammer, break/load concrete, build form, strip form |  |
|   | Vision - Near              |                  |                  |            |          |           |           |  |  |
|   | Vision - Colour            | X                |                  |            | X        |           |           | traffic lights   |  |
|   | Vision - Depth             | X                |                  |            |          |           | X         | build/strip forms, jackhammer, level fill in form        |  |
|   | Perception - Spatial       | X                |                  |            |          |           | X         | move about at work site, in traffic, tools/equipment     |  |
|   | Perception - Form          | X                |                  |            |          | X         |           | types/sizes of lumber, wood/metal forms                  |  |
|   | Feeling (Tactile)          | X                |                  |            |          |           | X         | jackhammer/tamper use, build/strip forms                 |  |
|   | Reading                    | X                |                  |            | X        |           |           | work site locations, street signs                        |  |
| W<br>O<br>R<br>K                                    | Writing                    | X                |                  |            | X        |           |           | job reports  |  |
|   | Speech                     | X                |                  |            |          | X         |           | Labourers, Concrete Finisher, Foreman, public            |  |
| W<br>O<br>R<br>K                                    | Inside Work                | X                |                  |            | X        |           |           | drive to work site in cab of truck                       |  |
|   | Outside Work               | X                |                  |            |          |           | X         | build/strip/labourer at form in all weather conditions   |  |
|   | Hot Conditions >25 deg. C  | X                |                  | X          |          |           |           | spring, summer, fall                                     |  |
|   | Cold Conditions <10 deg.C  | X                |                  | X          |          |           |           | fall, winter, spring                                     |  |
|   | Humid                      | X                |                  | X          |          |           |           | wet, rainy weather conditions                            |  |
|   | Dust                       | X                |                  |            |          | X         |           | concrete dust, gravel fill for sidewalk                  |  |
|   | Vapor Fumes                | X                |                  |            |          |           | X         | traffic fumes, diesel fumes from compressor              |  |
|   | Hazardous Machines         | X                |                  |            |          | X         |           | jackhammer, tamper, trucks                               |  |
|   | Proximity to Moving Object | X                |                  | X          |          |           |           | vehicles in traffic                                      |  |
|   | Noise                      | X                |                  |            |          |           | X         | jackhammer, tamper, trucks, ear protection required      |  |
| E<br>N<br>V<br>I<br>R<br>O<br>N<br>M<br>E<br>N<br>T | Electrical Hazard          |                  |                  |            |          |           |           |  |  |
|   | Sharp Tools                | X                |                  |            |          |           | X         | saw, nails, edges of wood/metal forms, broken concrete   |  |
|   | Radiant/Thermal Energy     | X                |                  | X          |          |           |           | sun burn during hot weather                              |  |
|   | Slippery Conditions        | X                |                  | X          |          |           |           | ground conditions during wet weather                     |  |
|   | Vibration and Related      | X                |                  |            |          | X         |           | jackhammer, tamper use                                   |  |
|   | Chemical Irritants         |                  |                  |            |          |           |           |  |  |
|   | Organic Substances         | X                |                  | X          |          |           |           | possibly dog feces at work site                          |  |
|   | Medical Waste              | X                |                  | X          |          |           |           | possibly needles at work site                            |  |
|   | Blood Products             |                  |                  |            |          |           |           |  |  |
|   | Congested Worksite         | X                |                  | X          |          |           |           | depends on location of work site                         |  |
| T   | Lighting - Direct          | X                |                  |            |          |           | X         | sun light, day 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 or work site         |  |

\* 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.

For detailed descriptions of each of the different categories, please refer to the reference guide or inquire with Human Effort at 1-888-4EFFORT