JOB DEMANDS ANALYSIS

Company: City of Burnaby Parks **Location:** Works Yard

Job Title: Labourer – Sewers **Classification:** Regular Duty

Purpose of Activities

The Labourer – Sewers is responsible for performing the labouring duties associated with catch basin installation, sewer line connections, installing storm and sanitary sewer lines, manhole installation and for scoping sewer lines with a television camera and small monitor.

Tools and Equipment

The Labourer - Sewers will use the following tools and equipment to perform his duties:

- Power tools – jack hammer, chain saw, circular pipe saw, fan, hydraulic pump, gas sniffer
- Hand tools – long and short handle shovels, small digging shovel, long bar, chains, sledge hammers, broom, rake, screw drivers and sockets sets for couplers
- Cement mix (25 kg bags), hot cement mix, catch basins, cement rings, grates, manholes and manhole covers, plastic and clay pipe (various diameters and length), television monitor with scope, couplers, elbows, Y's, pipe dope, rags, pipe grease
- Rubber and leather gloves, long pants, hard hat, face shield or safety glasses, ear protection or foam ear plugs, reflective vest, steel toe boots
- First aid kit
- Traffic cones, traffic signs (lane closure, men and equipment working)

Usual Methods

The Labourer – Sewers will ensure that the truck is loaded with all required tools and equipment for the upcoming day. The crew will drive out to the job site and set out traffic signs and cones to notify motorists and the public of their presence in the area. The Sewers crew may close a lane of traffic depending on the location of the work and traffic volume.

Usual Methods (Continued)

After the traffic signs and cones have been placed the Labourers will set out all of the tools and equipment they expect to use during the repair or installation. The tools and equipment are carried to a spot near where the ditch will be dug. The Labourers must wait for the backhoe or excavator to expose the pipe or grade the new trench. As the Labourers wait, they will use brooms and shovels to keep the edges of the ditch clear of any dirt, rocks or debris that may interfere with their work later. The Padman nonverbal and verbal communication to assist the Backhoe Operator with the dig.

Once the Backhoe Operator has proceeded far enough along with the ditch, the Labourers will enter the ditch, either by jumping into a shallow ditch or by using a ladder if the ditch is

deeper. Ditches over one metre deep require the use of a cage(s) to protect the Labourers while they work in the ditch. The cage(s) is lowered into the ditch by the Backhoe. The cage(s) are pulled along the ditch as work proceeds.

One Labourer will stay on the surface and he is responsible for anticipating the tool and equipment needs of the Labourer who is down in the ditch. This Labourer will make the necessary preparations to the pipe and other components on the surface before they are lowered into the ditch for assembly. He will cut pipe, string pip, grease the pipe, mix cement and have all the couplers and connections required for the job ready. As they are needed, he will lower them into the ditch either by hand or by rope.

The Labourer in the ditch is responsible for the making the repair or installation of the pipe or component in the ditch. He will most likely be required to dig dirt, rock and debris away from the connection. He will use a long handled shovel at first and then as the working area becomes more confined a small handled scoop is used to remove the remaining debris from around the connection. The connection may be made on a live storm or sanitary sewer line or the Labourer may elect to "pump around" the connection or tie in. In this instance the Labourers will tie into the line above and below to create a bypass.

Once the connection is clear of debris, the Labourer will make the will cut or tie into the line he is working on. A hand or power saw may be used to cut the pipe. The pipes are primarily made of plastic, vetrified clay or they may have been made of an asbestos-clay mix. Ninety-five per cent of existing pipe is plastic. The labourer completes the tie in with a Y and couplers or a straight connection and will tighten the couplers with a screw driver socket. Grease is placed in the bell of the connection and a pipe (up to a four -metre section) is lowered into the ditch. The pipe is roughly fit into the bell opening. The Labourer uses a long bar to push or pull the pipe onto the bell. The step is repeated until pipe is laid the length of the ditch.

In some area catch basins are installed. The catch basin is a large concrete cylinder and grate component that collects storm run off and funnels this water into the storm sewers system. The Backhoe will dig out the area for the catch basin and then lift the catch basin components into position. The Labourers assist with the final installation and tie in to the main line as described above.

The Labourers will also use a television camera and monitor that is fed into the sewer lines to detect problems or check for irregularities.

<u>Administrative Issues</u>

The Labourer- Sewers 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 Labourer – Sewers is part of a crew that includes a Foreman, Padman, Truck Driver and a Backhoe or Excavation Operator. There are usually two Labourers – Sewers on a crew. There are three Sewers crews. One crew is assigned to North Burnaby, one to Central Burnaby and one to South Burnaby. The Labourer – Sewers can be called out 24 hours per day, seven days per week in an emergency and will occasionally work overtime. Overtime can be an extended day or called in during off-hours. The Labourer – Sewers will work on residential streets, lanes and major thoroughfares in the City of Burnaby. In the course of their work the Labourers are required to enter confined spaces where various

gases may be present. They will use a gas sniffer to detect these gases and will only enter the area when it has been deemed safe to do so.

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.

- Shovel or dig around sewer pipe and/or utilities (gas, water, sewer, electric) in the ditch
- Climb up and down a ladder into the ditch that can range from one to seven metres deep
- Raise and lower tools and equipment by hand or rope into a ditch that can range form one to seven metres deep
- Lift and carry tools, equipment and sewer parts (pipes, catch basins, grates, manholes, etc.) from the truck to the ditch (usually get truck as close as possible to the ditch or work area)
- Repair or install pipe in a live sewer
- Kneel, crouch, bend, stoop in a ditch while installing or repairing sewers line
- Push and/or pull tools and equipment
- 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
- Enter confined spaces that may contain sewer gases

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 machine (backhoe, excavator) to lift and place heavy tools, equipment and parts
- Maintain a minimum level of fitness away from work that will provide an adequate fitness level (aerobic, anaerobic, range of motion, muscular strength and muscular endurance) to perform this job safely and effectively

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 of 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 install and repair sewers, catch basins, etc.
3. People with forearm and elbow injuries such as tennis elbow may have difficulty with the repeated jarring and the static grip forces required to shovel, dig and power tool use including the jackhammer.
4. People with nerve compression injuries in the upper extremities may have difficulty with the repeated and prolonged use hand and power tools (compression and vibration).

Prepared By: Jeffrey J. McGinn, Kinesiologist February 10, 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 Labourer - Sewers. This energy system will be utilized during the repair and installation of storm drains, sanitary mains, catch basins, manholes and scoping sewer lines with the video camera. The anaerobic energy systems may be required to supply energy for brief intense periods of work, which may include heavy or sustained 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 –Significant loading of the spinal structures are likely in this position. Prolonged loaded and unloaded forward flexion, extension, lateral flexion and rotation of the spine are all movements required by the Sewers Labourer. 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. The Sewers Labourer will handle loads from less than one to 82 kilograms.

Neck, Shoulders and Upper Extremity– the Sewers Labourer will often perform prolonged and repeated static and dynamic movements. These static and dynamic movements through the shoulder and upper extremity require the rotator cuff muscle groups, upper trapezius and scalene muscles of the neck to maintain a significant load. Static loading of the of the forearm flexors, extensors, supinator, pronator teres and the pronator quadratus during tool use (shovel, hand and power tools, etc) will increase the risk of injury to these areas. Power and air tool use (saws, jackhammers, etc) will also increase the vibration, jarring and compressive forces from the grip to the elbow and shoulder that may lead to over use tendon or nerve injuries.

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

INTERVENTIONS

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

1. Encourage the Sewers Labourer to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.

2. Install a Sidewinder on the back of the Sewer Crews Five-Ton Trucks. The Sidewinder will place gravel into the ditch in a more effective and efficient manner. Presently, the gravel is either dumped (truck or wheelbarrow) into the ditch and moved by shovel to where it is required.

3. Provide knee pads for the Sewers Labourer for any work where kneeling is required, specifically in an open excavation.

4. Provide regular education in effective use of the body and neutral joint positions for this type of work.

5. Encourage the Sewers labourer to ask for assistance (co-worker or backhoe) when handling heavy and/or oversized parts or pieces

Referral: Lana Ho		Organization: City of Burnaby								Title: Labourers - Sewers
Dept.: Engineering		Division: Sewers								Contact:
				FREQUENCY*						Date: February 4, 1999
	PHYSICAL DEMANDS	REQD	SIDE	Sel 1	Low 2	Mod 3	High 4	Max. Weight (kg)	Usual Weight (kg)	COMMENTS
STRENGTH	Lifting - Floor to Knuckle	X	D			X		60	<1-8	tools,equip.,cement bags,pipe section
	Lifting - Knuckle to Waist	X	D				X	60	<1-8	tools,equip., cement bags,pipe section
	Lifting - Waist to Shoulder	X	D			X		60	<1-8	tools,equip.,cement bags,pipe section
	Lifting - Over Head	X	D		X			25	<1-5	tools/equip out of ditch
	Carrying - With Handles	X	D			X		60	<1-5	tools,equip.
	Carrying - Without Handles	X	D				X	60	<2-10	tools/equp. ,pipe sections, rings
	Pushing - Upper Extremity	X	D			X		20	<1-8	tool use, install/connect pipe
	Pushing - Hip/Leg Assist	X	D				X	55	<1-8	push pipe into bell with bar,tool use
	Pulling - Upper Extremity	X	D			X		20	<1-8	tool use, install/connect pipe
	Pulling - Hip/Leg Assist	X	D				X	82	<1-8	CB section upright to roll,tool use
	Reach - Shoulder or Above	X	D			X		25	<1-8	tools/equip in/out of ditch
	Reach - Sho. or Above extnd	X	D		X			82	<1-8	tools/equip in/out of ditch
	Reach - Below Shoulder	X	D				X	82	<1-8	lift, carry, install connect pipe, CB's
	Reach - Bel. Shoulder extnd	X	D			X		60	<1-8	shovel, tool use, lift, carry tools/equip.
	Handling	X	D				X	60	<1-8	lift/carry tools/equip., pipe sections
	Gripping	X	D				X	50	<1-8	tools/equip., pipe sections, CB's
	Fine Finger Movements	X	D			X		max	low	tighten couplers,apply pipe
ENRG	Aerobic (percent)	X						shovel dirt, install/conncect pipe, catch basin		
	Anaerobic (percent)							possibly some digging or heavy lifting		
	High Energy Expenditure							possibly some digging or heavy lifting		
	Low Energy Expenditure	X						shovel dirt, install/connect pipe, catch basin		
POSTURE	Neck - Static Flexion	X					X	work below shoulders on pipe/catch basin look into ditch		
	Neck - Static Neutral	X					X	stand, walk, sit		
	Neck - Static Extension	X					X	work above shoulders from bend/stoop, kneel, crouch		
	Neck - Rotation	X	L/R				X	visual contact with work in ditch,install/conncet pipe, CB		
	Throwing	X	D					dirt from shovel in ditch		
	Sitting	X			X			in truck driving to/from work site and shop		
	Standing	X					X	on asphalt/concrete/grass, in ditch in dirt/mud/water		
	Walking	X					X	on asphalt/concrete/grass, in ditch on dirt/mud/water		
+MOBILITY	Running/Jumping									
	Climbing - Arms and Legs	X			X			in out of ditch, up to truck, ladder in/out of ditch		
	Climbing - Legs Only	X			X			in/out of shallow ditch,		
	Bending/Stooping	X					X	ditch to install/connect pipe,CB's,prep tools/equip.		
	Crouching	X				X		ditch to install/connect pipe,CB's,prep tools/equip.		
	Kneeling	X			X			ditch to install/connect pipe,CB's,prep tools/equip.		
	Crawling									
	Twisting	X	L/R				X	install/conncet pipe, CB's, prep tools/equip		
	Balancing	X			X			in ditch, on road near ditch, on ladder		
GEN	Traveling	X			X			in city of Burnaby from shop to job site		
	Work Alone									
	Interact with Public	X		X				possibly at job site		
	Operate Equip/Machinery	X			X			chain saw, saw, pumps, sniffer		
	Irregular/Extended Hours							8 hour day, 2X10 min rest period, 30 min lunch,OT rare		

* 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:
	FREQUENCY*	Date:

	PHYSICAL DEMANDS	REQD	SIDE	Sel. 1	Low 2	Mod. 3	High 4	COMMENTS
PERCEPTION	Hearing - Conversations	X				X		with Labourer, Padman, Foreman, Equip. Op., public
	Hearing - Other Sounds	X					X	Trucks, Backhoe, power tools, vehicle traffic
	Vision - Far	X					X	install/conncet pipes, CB's, storm sewers, manholes
	Vision - Near							
	Vision - Colour	X			X			dig around utilities with shovel or assit backhoe op.
	Vision - Depth	X					X	dig around pipes/utilities with shovel,install/conncet pipe
	Perception - Spatial	X					X	dig around pipes/utilities with shovel,install/conncet pipe
	Perception - Form	X					X	pipe size and type, tools and equipment, utilities
	Feeling (Tactile)	X					X	leather, rubber gloves for install/conncet pipe, CB's, etc.
	Reading							
	Writing							
	Speech	X				X		with Labourer, Padman, Foreman, Euip. Op, public
WORK ENVIRONMENT	Inside Work	X			X			possibly in truck, in manhole, confined space
	Outside Work	X					X	at job site in all weather in/out of ditch
	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				during rain, some heat, in manhole, confimed space
	Dust	X		X				while backhoe digs ditch, work in ditch to install
	Vapor Fumes	X					X	diesel from truck, back hoe, traffic, gas line rupture
	Hazardous Machines	X					X	work around truck, backhoe, traffic, power tools
	Proximity to Moving Object	X					X	work around truck, backhoe, traffic, power tools
	Noise	X					X	truck, bachoe, traffic, power tools, hearing protection ??
	Electrical Hazard	X					X	shovel/dig in ditch around utilities, overhead wires
	Sharp Tools	X					X	shovels, hand/power tools
	Radiant/Thermal Energy	X		X				sun burn
	Slippery Conditions	X					X	water in ditch on road or work area, mud around job site
	Vibration and Related	X				X		shovel/dig in ditch, power tool use, jack hammer use
	Chemical Irritants	X				X		pipe dope, hot mix cement,
	Organic Substances	X		X				live sewers install/repairs, bacteria on tools, truck
	Medical Waste							
	Blood Products							
	Congested Worksite	X					X	in ditch, on street around vehicles/equip.
	Lighting - Direct	X					X	sunlight
	Lighting - Indirect	X					X	sunlight
	Lighting - Adjustable	X		X				possibly use a flashlight in manhole or confined space
	Lighting - Fluorescent							
	Lighting - Incandescent							
	Lighting - Shadows etc.	X			X			depends on time of day and available light source

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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