

TASK ANALYSIS WORKSHEET

Company: The Corporation of DeltaDepartment: Engineering OperationsJob Title: Utility Maintenance Worker – Vector 2100 Series TruckDate: April 3, 2003**Job Summary:**

Tasks performed using the Vector 2100 Series Truck are performed by a 2-person crew. They perform the following:

Primary tasks include:

- Sanitary services – trouble spots
- Storm / sanitary main flushing (also referred to as Jet Rodding)
- Excavating

Secondary tasks include:


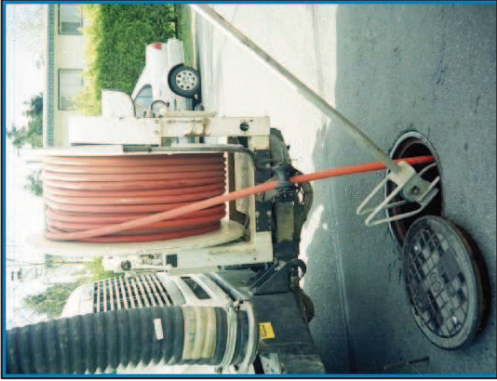
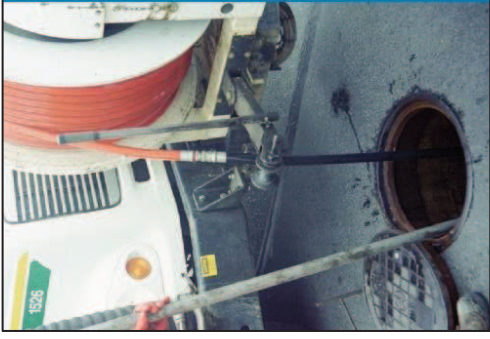
- Driving between sites (not assessed)
- Flush roads (not assessed)



Job tasks are shared between the two crew members. A routine and pattern has developed, and the work proceeds efficiently. Personal protective equipment include: safety boots and coveralls.

The sanitary services task (for trouble spots only) is performed once a month for 3 consecutive days. Approximately 20 trouble spots are cleaned in the 3 days. The storm main flushing job is performed at the end of April. The drive between sites (i.e. trouble spots, dumping area, excavation points) varied. The crew stated that 40% of their day was spent driving from one site to another.

N.B.: This assessment was based on a working population of males only.

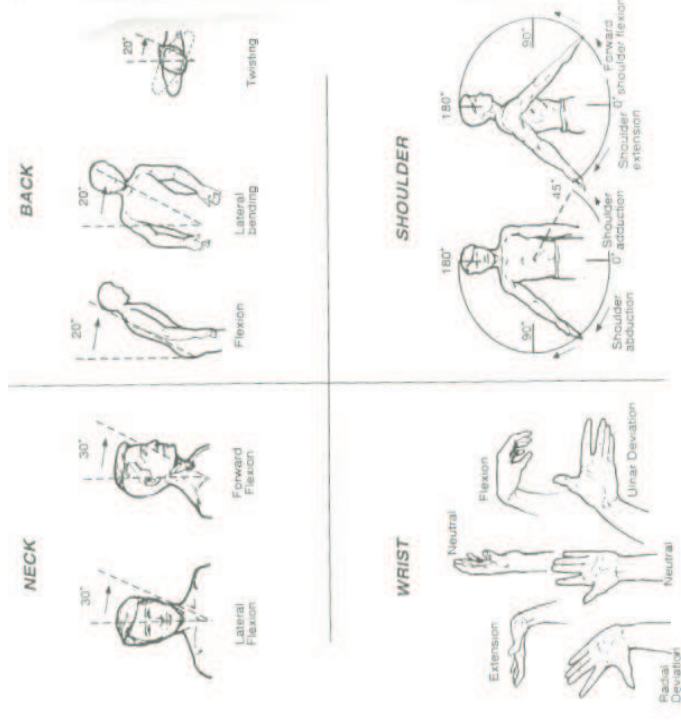
Tasks & Description of Activities	Frequency	Duration
<p>1. Sanitary Services, i.e. Trouble Spots</p> <ul style="list-style-type: none"> i. Lift clean-out lid using a lid lifter (pull-up force 13 kg at a height of 60 cm). Weight of valve lifter < 1 kg. <ul style="list-style-type: none"> ▪ Occasionally, may have to lift a sanitary lid (2 bolts – use screwdriver + different lid lifter). Pull-up force up 33 kg at a height of 67 cm. ii. Place hose in inspection chamber – weight of hose 6 kg. Force water down sanitary service to clean out using controls on Vector truck (138 cm). iii. Spray hose using pressure gun (wt. = 2.7 kg) iv. Place lid back in position <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>Lifting clean-out lid</p> </div> <div style="text-align: center;">  <p>Place hose in inspection chamber</p> </div> <div style="text-align: center;">  <p>Spray hose with pressure gun</p> </div> </div>	<p>20 spots / 3 days (once a month) (>66 % of shift)</p>	<p>▪ ~ 10-15 minutes per spot</p>

Tasks & Description of Activities	Frequency	Duration
<p>2. Storm / sanitary main flushing (or Jet Rodding)</p> <ul style="list-style-type: none"> i. Secure nozzle (weight = 3.2 kg) to hose <ul style="list-style-type: none"> ▪ Tighten connection using 2 wrenches – open-end combination wrench and crescent wrench. ii. Run the rodder hose through the pipe using control panel (138 cm high) on Vector truck. iii. Position guide (378 cm long) to prevent hose from tearing as it comes back up. <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>Secure nozzle to hose</p> </div> <div style="text-align: center;">  <p>Run rodder hose through pipe</p> </div> <div style="text-align: center;">  <p>Position guide</p> </div> </div>	<p>n/a</p>	<ul style="list-style-type: none"> ▪ 20-30 min per spot

Tasks & Description of Activities	Frequency	Duration
<p>3. Excavating</p> <ul style="list-style-type: none"> ▪ Excavating using the Vactor 2100 Series truck is performed when there are gas pipes, mines or trees in the surrounding area, i.e. areas where a backhoe cannot be used. i. Release pipe extensions (depending on length requirements) from truck. ii. Adjust height and location of black vacuum hose on truck (using controls on truck – 45”). iii. Secure pipe extensions to black vacuum hose using hose clamps. iv. Once positioned, assist other crews in shoveling. v. Spray hoses and pipe extensions using pressure gun. vi. Place pipe extensions back on truck. vii. Dewatering and dumping. <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Pipe extensions</p> </div> <div style="text-align: center;">  <p>Excavated ditch</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>Dewatering truck</p> </div> <div style="text-align: center;">  <p>Dumping truck</p> </div> </div>	<p>0-3 times per shift</p>	<p>variable</p>

Risk Factors considered:

- Joint posture: wrist, elbow, shoulder, neck, back, knees
- Awkward posture: reach, twist, bend, stoop, squat, climb, static, dynamic
- Force: lift, lower, carry, push/pull, pinch or power grip
- Repetition: frequency, duration
- Contact Stress
- Object weight, location, size, shape, handles, stability of load
- Work height, layout, seating, space
- Tool/equipment use
- Environment: layout, flooring, temperature, noise, light, glare, vibration
- Work Organization: recovery, schedule, workload, task variability, pace, PPE use, interruptions



Postures, WCB of BC

WorkWell Consulting

Ergonomic Risk Identification & Assessment

Department/Work Area: Engineering Operations, Utility Operations	Occupation: Utility Maintenance – Vector 2100 Series
Specific Location: Delta (assorted)	Contact Name:
Assessed By: F. Ismail	Assessment Date: April 3, 2003

Description of work area: Outdoor roadside urban and industrial park location.
Hours of Work/Shift Schedule: 8:00 a.m. to 4:30 p.m.
MSI signs / symptoms noted: back, shoulder

Tasks for Ergonomics Risk Assessment (from Task Analysis worksheet):		Frequency / Duration of Task:
1. Sanitary Services – Trouble spots (3 days per month)		8 hours/day >66% of shift
2. Storm / sanitary main flushing (also referred to as Jet Rodding)		n/a
3. Excavating		0 – 3 times / day variable

Task	Risk Factors	Freq/Dur	Mag/Range	Assessment	Assessment/Observations/Comments
1. Sanitary Services – Trouble Spots	Awkward Posture: <ul style="list-style-type: none"> Back flexion Shoulder flexion Squatting 	10-15 min. duration >66% of shift	Dynamic (<30 sec.) <ul style="list-style-type: none"> Back flexion up to 80° Shoulder flexion 45 -90° Static (>30 sec.) <ul style="list-style-type: none"> Squatting 	Assessment	<ul style="list-style-type: none"> Lifts and carries tools from truck to ground. Short distance walking on combination of pavement and grass. Back flexion 80°, shoulder flexion to lift clean-out lid using lid lifter. Static squatting (30 sec) while spraying hose using pressure gun. May squat to place clean-out lid back in position. <p>The dynamic nature and frequency and duration of the tasks do not exceed ergonomic guidelines for awkward postures (WCB Worksheet B).</p> <ul style="list-style-type: none"> Lid lifter, screwdriver < 1 kg. Pressure gun – 2.7 kg. Pull-up force while lifting clean-out lid using lid lifter (60 cm high) with back flexed 80° - 13 kg. Pull-up force while lifting sanitary lid using lid lifter (67 cm high), 2 hands – 33 kg. Weight of hose – 6 kg Pull gun hose at a height of 122 cm – 11 kg. <p>The lifts are within recommended weight limits for lifting tasks (WCB Worksheet B). Pull up force to lift clean-out lid is acceptable (Kodak, 1986). Pull up force to lift sanitary lid exceeds ergonomic guidelines (Kodak, 1986). Weight of hose is acceptable for infrequent one-handed lifting (Mital et al., 1993). Pulling gun hose with one hand is unacceptable (Mital et al., 1993) but is within guidelines if pulled with two hands (Kodak, 1986).</p>
	Force: <ul style="list-style-type: none"> Lifting assorted tools Force to lift clean-out lids Force to lift sanitary lid Weight of hose Pull gun hose 	10-15 min. duration >66% of shift	Weights of tools 1-2.7 kg. Force to lift lids range from 13 – 33 kg Weight of hose – 6 kg Pull gun hose (122 cm) – 11 kg		
Identification					

Task	Risk Factors	Freq/Dur	Mag/Range	Assessment	Assessment/Observations/Comments
Sanitary services – trouble spots ... continued	Repetition: <ul style="list-style-type: none"> Performs a variety of movements 	10-15 min. duration >66% of shift			Not considered repetitive work. The frequency and duration of the tasks does not exceed ergonomic guidelines for repetition (WCB Worksheet B).
2. Storm / sanitary main flushing – also referred to as Jet Rodding	Awkward Posture: <ul style="list-style-type: none"> Back flexion Squatting Shoulder flexion Elbow extension 	20-30 min. duration	Static (>30 sec.) <ul style="list-style-type: none"> Squatting Dynamic <ul style="list-style-type: none"> Shoulder/back flexion Elbow extension 	Assessment	<ul style="list-style-type: none"> Squatting while securing nozzle to hose and when tightening connection using wrenches. Dynamic shoulder flexion 45° and elbow extension while tightening connection using wrenches Dynamic back flexion to pick-up guide. The frequency and duration of the tasks does not exceed ergonomic guidelines for awkward postures (WCB Worksheet B). Able to pause and change position as required.
	Force: <ul style="list-style-type: none"> Weight of attachments and tools 	20-30 min. duration	Wt of parts - nozzle – 3.2 kg Wt of tools - < 1kg Wt of guide – 9.5 kg	Assessment	<ul style="list-style-type: none"> Holding nozzle with one hand (3.2 kg). Tools: Westward 1-3/8 CW302 open-end combination wrench < 1 kg, Westward AW15 15” crescent wrench 1 kg. Lifting guide (9.5 kg) off ground. Carry guide to and from back of truck. The gripping of the nozzle and tools with one hand is acceptable (WCB Worksheet B). Lifting guide off ground is also acceptable (WCB Worksheet B). Carrying the guide to and from back of truck is acceptable (Mital et al., 1993).
	Repetition: <ul style="list-style-type: none"> Performs a variety of movements 	20-30 min. duration		Assessment	<ul style="list-style-type: none"> Not considered repetitive work. The frequency and duration of the tasks does not exceed ergonomic guidelines for repetition (WCB Worksheet B).

Task	Risk Factors	Freq/Dur	Mag/Range	Assessment/Observations/Comments
<p>3. Excavating</p> <p style="text-align: right;">Identification</p>	<p>Awkward Posture</p> <ul style="list-style-type: none"> ▪ Back flexion ▪ Shoulder flexion ▪ Arm behind body ▪ Elbow extension ▪ Knee bending 	<p>0-3 times per day</p> <p>duration varies</p>	<p>Dynamic</p> <ul style="list-style-type: none"> ▪ Back flexion 90° ▪ Shoulder flexion 90° ▪ Arm behind body ▪ Elbow extension ▪ Knee bending 	<ul style="list-style-type: none"> ▪ Dynamic back flexion up to 90°, shoulder flexion up to 90°, arm behind the body and elbow extension while shoveling during excavation – to loosen soil so that the vacuum hose is able to pick up the soil easier (assisting other crews) ▪ Shoulder flexion >45° to retrieve pipe extensions from side of truck ▪ Climbing in and out of ditch <p>Repetitive awkward postures (shoulder and back) may lead to overall physical fatigue. If increased shoveling occurs and in combination with awkward postures may exceed ergonomic guidelines. Able to pause and change position as required. Exposed to risk of slips/trips or falls.</p>
	<p>Force</p> <ul style="list-style-type: none"> ▪ Shoveling ▪ Bin on back of truck ▪ Pipe extensions 	<p>0-3 times per day</p> <p>duration varies</p>	<p>Weight could vary from <1 to 50 kg.</p> <ul style="list-style-type: none"> ▪ (PJDC–GVRD) <p>Weight of bin on back of truck 21 kg</p> <p>Weight of pipe extension – 6.8-8 kg</p>	<p style="text-align: center;">Assessment</p> <ul style="list-style-type: none"> ▪ Pipe extensions weigh 6.8-8 kg, minimal reach, original heights ranged from 142-173 cm ▪ Shoveling during excavation to loosen dirt ▪ Before dumping excavated dirt, remove bin from back of truck – weight = 21 kg; good grip; lift from waist height (104 cm) to ground; width of bin 33 cm <p>May experience local muscle fatigue, including postural fatigue from forward bending. The risk decreases when the height the shovel is raised is minimal. Recovery time of 5 to 10 min., and the short duration time the task is performed will minimize the risk (Eastman Kodak). If increased shoveling occurs and in combination with awkward postures may exceed ergonomic guidelines.</p> <p>Lifting and lowering of bin is acceptable (WCB – Worksheet B). Retrieval and placing of pipe extensions is acceptable (WCB – Worksheet B).</p>

Note: Risk factors associated with shoveling obtained from RA-Construction report (July 18, 2002).

SUMMARY

The risk identification and assessment for the tasks associated with the Vactor 2100 Series Truck have identified some risk factors that exceed recommended guidelines. While these tasks have been assessed individually, cumulative effects of combined tasks may increase the level of risk.

In general the risk factors for the workers are related to exerting high forces (using back and shoulder muscles).

New crew members who have not acclimatized to the physical demands of work may be at an increased risk of injury. All crew members are at a higher risk of injury in the morning hours when they may not be physically prepared or warmed up prior to performing physically demanding work. This was demonstrated in the Corporation of Delta's musculoskeletal injury (MSI) analyses (2001) report where 55% of MSI WCB claims occurred in the AM.

Additionally, while not exceeding guidelines for the individual tasks, cumulative effects of awkward postures of the neck, back, shoulder and arm/wrist may increase the risk of injury (> 66% of shift when all activities or tasks are combined).

CONTROLS

Recommendations for control of identified risk factors will focus on methods to minimize risk.

**Control Priority Note: 1 = recommended for implementation to reduce risk factors; 2 = optional, for consideration as a means of reducing risk factors; 3 = not for immediate action but for future consideration as appropriate.*

Risk Factor	Recommended Controls	Control Priority*	Responsible Person	Status
Endurance for physically demanding work	Maintain an increased level of fitness focusing on cardiovascular and muscular endurance and muscular flexibility. This is especially important for new workers who may not be acclimatized to the demands of work.	2	Employee	
Preparation for all physically demanding work	Develop a physical warm up program and train workers (through the use of certified fitness instructors) specific to the demands of the job. Workers should perform this warm up prior to the start of the day and before resuming work following >30 min. breaks. The duration of the warm up is less than 10 min. Micro stretches should also be performed following static, awkward postures e.g. neck and back bending.	2	Superintendent / Safety Dept.	
Awkward and Static Postures	Consider job rotation between crew members to provide a distribution of workload and decrease the cumulative effects of the combined tasks.	1	Superintendent	
Overall risk factors	Provide education related to identified risk factors and methods of working to reduce risk e.g. neutral joint positions, leg position, reduction of twisting etc.	1	Superintendent	
Force: Tools and equipment	Ensure all tools and equipment is in good shape and repair. Static forces will increase if tools and equipment require more work or repetition of work due to poor maintenance including cleaning. Evaluate tools and equipment when being replaced to ensure the weight and design (e.g. grip) will reduce the workload (e.g. wrenches, shovels etc.). Investigate techniques to reduce forces required to lift lids (e.g. rocking the lid lifter to loosen the lid, pulling from opposite side of the lid lifter hole instead of same side).	1 3 1	Superintendent Employee Superintendent Employee Superintendent Employee	

References:

- WCB of BC, Worksheet A, Risk Identification and Worksheet B, Risk Assessment.
- Eastman Kodak (1986), Ergonomic Design for People at Work, Volume 1
- Mital, Nicholson & Ayoub (1993), A Guide to Manual Material Handling

Prepared by: Farzana Ismail, May 30, 2003