

TASK ANALYSIS WORKSHEET

Company: The Corporation of Delta
Job Title: Flood Box Technicians

Department: Engineering Operations
Date: May 8, 2003 & June 25, 2003


Job Summary:

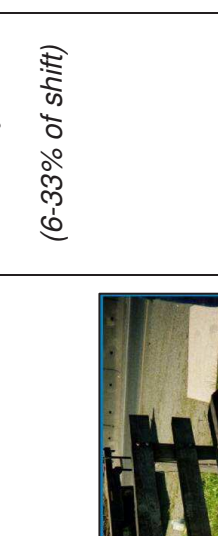

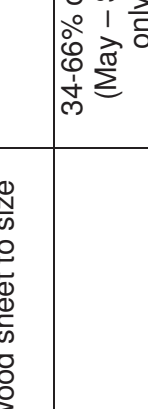
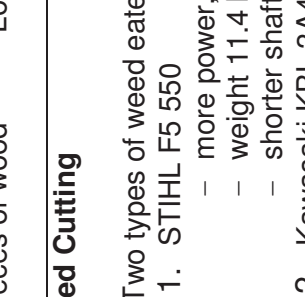
The Flood Box Technicians' tasks and duties are related to maintenance and construction of municipal utilities, roads, dykes and drainage systems. Primary tasks involve cleaning debris at pump stations and drains, as well as grass-cutting. Secondary tasks include driving from one site to another (25% of the shift).






Job tasks are shared between the two crew members (sometimes 3 crew members). A routine and pattern has developed, and the work proceeds efficiently. Tasks that involve manual labour, i.e. major clean-ups (heavy debris such as logs) and cutting grass, are performed on Monday, Wednesday and Friday. Minor clean-ups are performed on Tuesday and Thursday. Personal protective equipment include: safety boots and coveralls. When using weed-eaters, the crew members are required to wear a hardhat, hearing protection and rubber boots (if it's raining).









The Flood Box Technicians' complained about the use of one type of weed eaters (or string line cutters), i.e. STIHL F5 550 (due to the heavier weight and shorter shaft). From May to September (~3.5 months), the crew members spend about 4 – 5 hours of the shift on weed cutting.



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

| Tasks & Description of Activities | Frequency | Duration |
|--|--|--|
| <p>1. Cleaning debris</p> <ul style="list-style-type: none"> ▪ Check routines locations for debris (depth of 36"). ▪ Clean using rake. Pull up debris using rake + fork. If excessive, put away debris in dump truck. ▪ When it rains, there's more debris.  <p>Aerial view of drain (after removal of debris)</p> | <p>20-40 locations per day <i>(34-66 % of shift)</i></p> | <p>30 sec – 4 hours per location</p> |
| <p>2. Position plywood at drains</p> <ul style="list-style-type: none"> ▪ Take 2x6 + 4x8 (1/2") plywood sheets from Workyard. ▪ Clamp hoist hooks (on Hiab – crane truck) to baffles. ▪ Once baffles are lifted off, detach hooks from crane. ▪ Take measurements of drainage area (i.e. where baffle is located). ▪ Using pull fork, measure depth of water. ▪ Remove tailgate from truck to gain access to plywood sheets. ▪ Remove plywood sheets from truck. ▪ Cut plywood sheets to size. ▪ Nail smaller pieces of wood to plywood sheets. ▪ Bend nails. ▪ Drag plywood (with attached pieces of wood) down ramp. ▪ Position plywood at drain. ▪ Using shorter pull fork, push plywood downward. ▪ Position wedges – push wedges downward using sledge hammer. | <p>not performed daily <i>(6-33% of shift)</i></p> | <p>varies <i>(up to 2 hours)</i></p> |

| Tasks & Description of Activities | Frequency | Duration |
|--|---|-----------------------------------|
| <p>Position plywood at drains ... continued</p>    <p>2 x 6 pieces of wood</p> <p>Location to position plywood</p> <p>Cutting the plywood sheet to size</p> | <p>not performed daily (6-33% of shift)</p> | <p>varies (up to 2 hours)</p> |
| <p>3. Weed Cutting</p> <ul style="list-style-type: none"> ▪ Two types of weed eaters (or string line cutters) are used: <ol style="list-style-type: none"> 1. STIHL F5 550 <ul style="list-style-type: none"> – more power, burns gas faster (as per crew members) – weight 11.4 kg (with gas) – shorter shaft (total length – 180 cm, distance to center of gravity – 56 cm) 2. Kawasaki KBL 3A4 <ul style="list-style-type: none"> – weight 7.3 kg (with gas) – longer shaft (total length – 187 cm, distance to center of gravity – 60 cm)  <p>STIHL F5 550</p>  <p>Kawasaki KBL 3A4</p> | <p>34-66% of shift (May – Sept. only)</p> | <p>4-5 hours</p> |

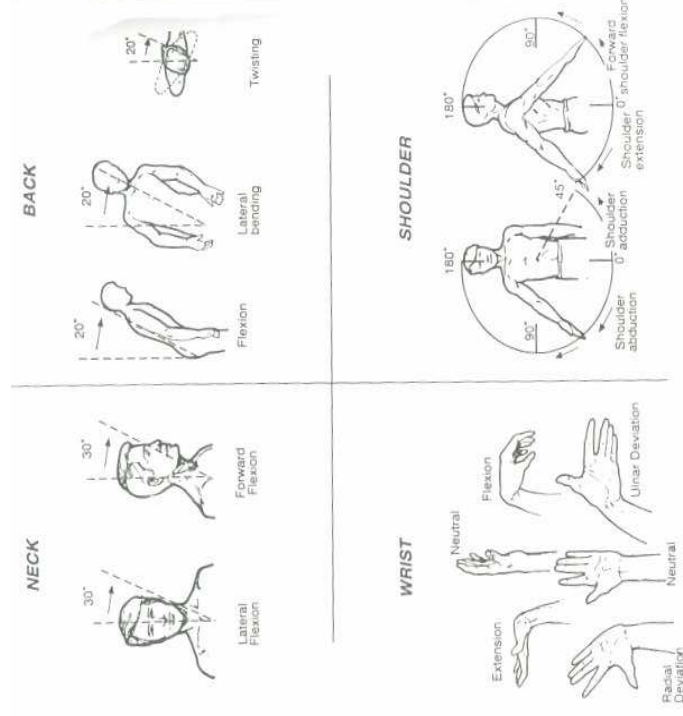
| Tasks & Description of Activities | Frequency | Duration |
|---|---|--|
| <p>Weed cutting ... continued</p> <p>Note: Both weed-eaters are hooked onto broad-strapped suspenders at the hip-joint during use. This allows the muscles in the upper back and shoulders to bear some of the weight of the weed-eater.</p>  <p>Using weed-eater - STIHL F5 550</p>  <p>Using weed-eater -- Kawasaki</p> | <p>34-66% of shift (May – Sept. only)</p> | <p>4-5 hours</p> |
| <p>4. Use of Tools</p> <p><u>Tools:</u></p>  <p>Rake (149 cm long)</p>  <p>Pull fork (267 cm or 386 cm)</p> | <p>varies</p> | <p>varies</p>  <p>Pitch fork (152 cm long)</p> |

| Use of Tools ... continued | Tasks & Description of Activities | Frequency | Duration |
|--|---|---------------|---------------|
|  <p>Round-end Shovel (152 cm long)</p> |  <p>Flat-end Shovel (168 cm)</p> | <p>varies</p> | <p>varies</p> |
|  <p>Pipe pole (381 cm long)</p> |  <p>Sledge Hammer (79 cm)</p> | | |
|  <p>Crescent Wrench (15" Westward AW15)</p> |  <p>Pipe Wrench (18" Ridgid)</p> | | |
|  <p>Saw (Sandvik)</p> |  <p>Swed Saw (Sandvik Force – 24" 607 mm)</p> | | |

| Use of Tools ... continued | Tasks & Description of Activities | Frequency | Duration |
|---|---|-----------|----------|
|  <p>Wheel / Key (Armtec)</p> |  <p>Stop / Slow Sign</p> | varies | varies |

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

| | |
|--|--|
| Department/Work Area: Engineering – Electrical / Mechanical | Occupation: Flood Box Technicians – Labourer II |
| Specific Location: Delta (assorted) | Contact Name: |
| Assessed By: F. Ismail | Assessment Date: May 8, 2003 & June 25, 2003 |

Description of work area: Outdoor roadside urban and industrial park location.
Hours of Work/Shift Schedule: 7:00 a.m. to 3:30 p.m.
MSI signs / symptoms noted: back, shoulder

| Tasks for Ergonomics Risk Assessment (from Task Analysis worksheet): | | Frequency / Duration of Task: |
|---|------------------------|--------------------------------------|
| 1. Cleaning debris | 20 – 40 locations /day | 34-66% of shift |
| 2. Position plywood at drains | varies (not daily) | 6-33% of shift |
| 3. Weed cutting (May – Sept. only) | 4 – 5 hours | 34-66% of shift |
| 4. Use of Tools | varies | varies |

| Identification | | Task | Risk Factors | Freq/Dur | Mag/Range | Assessment | Assessment/Observations/Comments |
|-----------------------|--|---------------------------|---|---|---|-------------------|--|
| | | 1. Cleaning Debris | Awkward Posture: | Duration varies: | Dynamic (<30 sec.) | Assessment | <ul style="list-style-type: none"> While cleaning debris, assumes the following postures: back flexion 45°, back lateral flexion 20°, shoulder flexion 30° / abduction up to 110°/ adduction and pronated elbow. The dynamic nature and frequency and duration of the tasks do not exceed ergonomic guidelines for awkward postures (WCB Worksheet B). Able to pause and change position as required. |
| | | | <ul style="list-style-type: none"> Back flexion Shoulder flexion Shoulder abduction/adduction Elbow pronation Back lateral flexion | <ul style="list-style-type: none"> 30 sec – 4 hour per location 34-66% of shift | <ul style="list-style-type: none"> Back flexion up to 45° Elbow pronated Shoulder flexion 30° Shoulder abduction up to 110° Shoulder adduction Back lateral flexion up to 20° | | |
| | | | Force: | as above | Force to pull up debris – 3 kg | | <ul style="list-style-type: none"> Two-handed lifting (pull-up) of debris – 3 kg. Pull up force to lift debris is acceptable (Kodak, 1986). |
| | | | Repetition: Performs a variety of movements | as above | | | Not considered repetitive work. <ul style="list-style-type: none"> 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 | Assessment/Observations/Comments |
|---|---|--|---|--------------------------|--|
| <p align="center">Identification</p> | <p>Awkward Posture:</p> <ul style="list-style-type: none"> ▪ Back flexion ▪ Squatting ▪ Kneeling ▪ Elbow extension ▪ Climbing ▪ Crawling ▪ Shoulder flexion ▪ Back twisting | <p>up to 2 hr duration</p> <p>6-33% of shift (not daily)</p> | <p>Static (>30 sec.)</p> <ul style="list-style-type: none"> ▪ Back flexion 80° ▪ Shoulder flexion 70° ▪ Elbow extended ▪ Kneeling ▪ Squatting <p>Dynamic</p> <ul style="list-style-type: none"> ▪ Shoulder flexion up to 90° ▪ Squatting ▪ Kneeling ▪ Elbow extension ▪ Climbing ▪ Crawling ▪ Back flexion up to 90° ▪ Back twist | <p>Assessment</p> | <ul style="list-style-type: none"> ▪ Dynamic squatting, back flexion up to 90° and shoulder flexion 90° to clamp hoist hooks onto baffle. ▪ Dynamic squatting, kneeling, shoulder flexion 90° and elbow extension to take measurements at location of baffle. ▪ Climbing up and down rails ▪ Kneeling and crawling while marking measurements on plywood sheet ▪ Static back flexion 80° or kneeling while cutting plywood sheet (when placed on floor) – occasionally slight back twist ▪ Static left shoulder flexion 70° and elbow extension + right shoulder flexion 0-45° and elbow extension 90-180° while cutting plywood sheet (when standing upright) ▪ Static kneeling or squatting while nailing smaller pieces of wood to plywood sheets ▪ Dynamic back flexion 45 – 90° to bend nails. <p>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.</p> |
| | <p>Force:</p> <ul style="list-style-type: none"> ▪ Lifting plywood ▪ Lifting tailgate ▪ Drag plywood down ramp | <p>up to 2 hr duration</p> <p>6-33% of shift (not daily)</p> | <p>Wt of 1 sheet of plywood ~ 6.8 – 9 kg (could not be weighed)</p> <p>Wt of tailgate (from truck) – 23 kg</p> <p>Pull force on plywood down ramp 9 kg</p> | | <ul style="list-style-type: none"> ▪ Lifting sheets of plywood at Worksyard ~ 6.8 – 9 kg. Two person 2-handed lifting. 1) Lift of shelf 66 cm to knuckle height. 2) Thereafter, to place in dump truck, lift from knuckle height to 160 cm. ▪ Lifting tailgate off truck (wt. – 23 kg) – from height of 137 cm to knuckle height. Minimal reaches. ▪ Remove plywood sheets off truck (wt. ~ 6.8-9 kg) – height of 135 cm (2-person). ▪ Drag plywood down ramp (force – 9 kg). <p>Lifting the plywood (2-person lift) is within ergonomic guidelines (Mital et al., 1993). Lifting the tailgate off the truck is within ergonomic guidelines – due to minimal reach and low frequency rate (WCB Worksheet B). Pulling the plywood down the ramp is within ergonomic guidelines (Mital et al., 1993).</p> |

| Task | Risk Factors | Freq/Dur | Mag/Range | Assessment | Assessment/Observations/Comments |
|--|--|---|---|------------|---|
| <p>3. Weed Cutting</p> <p style="text-align: center;">Identification</p> | <p>Awkward Posture:</p> <ul style="list-style-type: none"> ▪ Back twisting | <p>4 – 5 hours</p> <p>34 – 66% of shift</p> | <p>Dynamic</p> <ul style="list-style-type: none"> ▪ Back twisting | | <ul style="list-style-type: none"> ▪ Back twisting while weed cutting, i.e. not turning feet. <p>The frequency and duration of the tasks does not exceed ergonomic guidelines for awkward postures. Able to pause and change position as required.</p> |
| | <p>Force</p> <ul style="list-style-type: none"> ▪ Grip force ▪ Contact stress on lower back ▪ Weight of weed-eaters | <p>4 – 5 hours</p> <p>34 – 66% of shift</p> | <ul style="list-style-type: none"> ▪ Power grip on weed eater handles ▪ Weight of weed-eaters – 7.3 – 11.4 kg | | <ul style="list-style-type: none"> ▪ Crew members complained that with the STIHL weed-eater, due to the shorter shaft, the motor hits their lower back during operation. ▪ The suspenders support the weight of the weed-eaters during operation at the hip height. <p>The dynamic nature and frequency and duration of the task do not indicate this as high risk for grip force. No guidelines available for concern regarding motor on STIHL hitting lower back. No ergonomic guidelines available regarding maximum weight that back can support.</p> <p>As per PJDA, performed by Human Effort, (Greater Vancouver – Parks Maintenance), " chain saw, weed eater and other power tools will increase the vibration and compressive forces from the grip to the elbow and shoulder that may lead to overuse 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."</p> |
| | <p>Repetition:</p> <ul style="list-style-type: none"> ▪ Performs a variety of movements | <p>4 – 5 hours</p> <p>34 – 66% of shift</p> | | | <ul style="list-style-type: none"> ▪ Not considered repetitive work. <p>The frequency and duration of the tasks does not exceed ergonomic guidelines for repetition (WCB Worksheet B).</p> |

| Task | Risk Factors | Freq/Dur | Mag/Range | Assessment/Observations/Comments |
|-----------------|---|-------------------------------------|-------------------------------|---|
| 4. Use of Tools | Force: <ul style="list-style-type: none"> ▪ Lifting assorted tools | Duration varies Frequency varies | Weights range from <1 – 4 kg. | <ul style="list-style-type: none"> ▪ The tools weigh as follows: rake – 1.1 kg, pull fork (267 cm) – 2.5 kg, pull fork (386 cm) – 2.3 kg, pitch fork – 1.4 kg, round-end shovel – 2.5 kg, flat-end shovel – 3 kg, pipe pole – 2 kg, broom – 1.4 kg, sledge hammer – 4 kg, claw hammer - < 1kg, crescent wrench – 1.4 kg, pipe wrench – 2.5 kg, saws - < 1kg, wheel / key – 3.9 kg, stop / slow sign - < 1 kg <p>The lifts are within recommended weight limits for lifting tasks (WCB Worksheet B).</p> |

SUMMARY

The risk identification and assessment for the Flood Box Technician's job tasks 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.

With regards to the flood box technicians' job, in general the risk factors are related to vibration concerns and contact stress.

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 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 /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. During weed cutting, crew members are encouraged to avoid twisting, i.e. to turn their feet in the direction of the turn. | 1 | Superintendent | |
| Force: Tools and equipment | Ensure all tools and equipment are 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, valve key etc.). | 1 | Employee | |
| | | 3 | Superintendent Employee | |

| Risk Factor | Recommended Controls | Control Priority* | Responsible Person | Status |
|---|---|-------------------|--------------------|--------|
| Contact stress caused by using the STIHL weed-eater | <p>Due to the possibility of contact stress on the lower back caused by the STIHL weed-eater (due to the shorter shaft length), it is recommended that:</p> <ol style="list-style-type: none"> Crew members use the Kawasaki weed-eater if available and to only use the STIHL weed-eater if the Kawasaki weed-eater is not available (e.g. if the volume of work requires both crew members to cut weeds – in which case, one will use the Kawasaki and the other will have to use the STIHL). If terrain has flat ground and small hills, the crew member cutting weeds on the flat ground should use the STIHL weed-eater and the crew member cutting weed on the small hills should use the Kawasaki weed-eater. Investigate the feasibility of moving the handle bars away from the motor thereby increasing the shaft distance between the motor and handle bars. Crew members should alternate using the STIHL weed-eater thereby minimizing some of the effects of contact stress. <p>Note: Contact stress may not be evident with all crew members (i.e. those of small to average stature).</p> | 1 | Employee | |
| Vibration | Provide crew members with anti-vibration gloves for use during operation of weed-eaters. | 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 | |

References:

- WCB of BC, Worksheet A, Risk Identification and Worksheet B, Risk Assessment.
- Mital, Nicholson & Ayoub (1993), A Guide to Manual Material Handling

Prepared by: Farzana Ismail, July 18, 2003