

CASE STUDY -Chipping

TASK TITLE: Chipping

Task Description:	<p>There are many different types of chipping tasks such as: chipping using a jack hammer (size may vary) or chipping using a chipping style bit mount onto a back hoe. The task is performed for varying amounts of time depending on complexity.</p> <p>Typical jobs in which chipping is performed include (not necessarily limited to):</p> <ul style="list-style-type: none">• road maintenance and repair. <p>Chipping may be performed on a flat or curved surface such as the flat surface of a roadway vs. the edge of a side walk. Access to the area location may vary due to adjacent barriers such as walls.</p>
Job Performance Measures Most Often Impacted by Chipping:	<ul style="list-style-type: none">• Quality of the product (chipping).• Speed of completion of chipping task.
Typical Employee Comments about Chipping:	<p>Employees typically complain about discomfort and/or stiffness in the shoulder/neck, hand/wrist/arm, back and legs/feet.</p> <p>Primary concern: shoulder/neck, hand/wrist/arm. Secondary concern: back, legs/feet.</p>
Suggested Level II Analysis:	Grip Force Measurement, Postural Analysis, Vibration Measurement, Biomechanical Lifting Analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> • Work is too far away 	38. Move closer to the work location <ul style="list-style-type: none"> • remove obstructions 	✓	✓	med	med	med
	<ul style="list-style-type: none"> • Controls and levers within cab of backhoe too far away 	38. Move closer to the work location <ul style="list-style-type: none"> • adjust seat forward 	✓		low	med	med
2. Arm forces: Repeated contraction of the muscles of the arm or holding/carrying materials	<ul style="list-style-type: none"> • Pulling hoses is difficult <ul style="list-style-type: none"> – Hoses caught on equipment – Poor floor surface or standing surface condition 	17. Improve floor condition <ul style="list-style-type: none"> • repair cracks and gaps in floor • free hoses from interference 	✓ ✓	✓	med low	low med	med low
	<ul style="list-style-type: none"> • Pulling controls levers is difficult <ul style="list-style-type: none"> – Poor control lever maintenance – Poor control lever design 	101. Provide controls which do not require excessive forces <ul style="list-style-type: none"> • contact supplier to investigate adjustable levers and smoother traveling levers 		✓	med to high	med	high
	<ul style="list-style-type: none"> • Carrying and lifting jack hammer 	126. Reduce carry distance <ul style="list-style-type: none"> • transport jack hammer on back of truck from location to location 	✓		low	med	med
		<ul style="list-style-type: none"> • when unloading jack hammer ensure vehicle is next to work area 	✓		low	med	med

Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> Rarely occurs 	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> Work location too low for prolonged periods causes strain on the neck (see Figure 1.1)  <p style="text-align: center;">Figure 1.1</p>	20. Incorporate rest pauses 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> encourage employee to look up frequently 	✓		low	med	med
			✓		low	med	med
			<ul style="list-style-type: none"> Work location positioned behind operator when in back hoe 	20. Incorporate rest pauses	✓		low

Hand/Wrist/Arm

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/ repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> Control lever location too high (back hoe) 	123. Raise the person <ul style="list-style-type: none"> adjust seat higher provide seat cushion 	✓ ✓		low low	med med	med med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> Rarely occurs 	N/A					
7. Hyper- extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> Rarely occurs 	N/A					

Hand/Wrist/Arm (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On		
			✓ Minor Modification	✓ Major Change		Quality	Productivity	
8. Hand/grip forces	<ul style="list-style-type: none"> Chipping tool must be manually supported or steadied. (see Figure 1.2)  <p style="text-align: center;">Figure 1.2</p> <ul style="list-style-type: none"> Duration of holding concentrates stress in hands. Handle diameter is too large 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> let tool do the work hands are to act only to maintain alignment keep the tool in as close to a straight upright position as possible. 	✓		low	med	med	
				✓		low	med	med
				✓		low	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> release grip periodically 	✓		low	med	med	
		88. Provide an appropriate handle diameter <ul style="list-style-type: none"> provide jack hammer with an appropriate hand diameter between 1"-1.5" (2.5-3.8 cm). if tool handle diameter is less than 1", wrap the tool handle 	✓	✓	med	med	med	
			✓		low	med	med	

Hand/Wrist/Arm (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On		
			✓ Minor Modification	✓ Major Change		Quality	Productivity	
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> • Tool or control levers emit high levels of vibration <ul style="list-style-type: none"> – Poor tool maintenance 	34. Maintain hand tools/power tools <ul style="list-style-type: none"> • inspect and repair tool on a regular basis to eliminate unnecessary vibration 	✓		low	med	med	
		74. Provide a tool that minimizes exposure to vibration/ impact/torque <ul style="list-style-type: none"> • provide a tool that creates less vibration • modify existing tool; wrap handles with vibration dampening grips 	✓	✓	med	med	med	
	<ul style="list-style-type: none"> – Poor technique 	93. Provide appropriate gloves <ul style="list-style-type: none"> • provide appropriate anti-vibrating gloves (caution should be used to prevent excessive hand forces) 			✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> • encourage employee to maintain a “loose” grip 	✓		low	med	med	

Hand/Wrist/Arm (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> • Tool handle has hard edges • Controls lever knobs have hard edges (back hoe) 	9. Eliminate exposure to hard edges		✓	med	med	med
		<ul style="list-style-type: none"> • provide a tool with a round smooth handle with no ridges or edges • provide a handle of at least 5” (12.7 cm) in length. 		✓	med	med	med
		88. Provide an appropriate handle diameter <ul style="list-style-type: none"> • provide knobs of at least 1.5” (3.8 cm) and not greater than 3.0” (7.6 cm) 		✓	med	med	med
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> • Work area is too cold 	105. Provide portable heaters		✓	med	med	med
		110. Provide shields or barriers from the wind		✓	med	med	med
		12. Encourage appropriate seasonal clothing	✓		low	med	med
		93. Provide appropriate gloves	✓	✓	med	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> • Prolonged use of chipping tool • Poor technique causes bending 	141. Use heavy excavation equipment (e.g., back hoes) <ul style="list-style-type: none"> • use backhoe with chipping bit on arm for long duration tasks with good access. 		✓	med to high	med	high
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> • encourage employee to maintain tool in upright position 	✓	low	med	med	
13. Twisting of the lower back	<ul style="list-style-type: none"> • Work positioned behind worker when in cab (truck) • Work location is blocked or too far away 	18. Improve visual access to work <ul style="list-style-type: none"> • alternative back hoe design. 		✓	high	high	high
		132. Remove obstructions	✓	med	med	med	
14. High speed, sudden movements	<ul style="list-style-type: none"> • Rarely occurs. If so, refer to lifting case study 	N/A					

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> Leaning forward in seat 	115. Provide support for the lower back					
		<ul style="list-style-type: none"> modify or adjust existing seat ensure person sits back in seat to utilize back support adjust back support forward insert additional back support such as a commercial back rest or cushion. 	✓ ✓ ✓		low low low med	med med med med	
		87. Provide an appropriate chair/stool		✓	med	med	med
					✓		
16. Lifting forces	<ul style="list-style-type: none"> Weight of the jack hammer requires high lifting forces when moving or lifting jack hammer 	126. Reduce carry distance	✓		low	med	med
		4. Change lifting/carrying task into a rolling or sliding task	✓		low	low	med
		32. Lower the work piece/work surface		✓	med to high	low	med
		<ul style="list-style-type: none"> fabricate storage compartment on side of truck to house jack hammer so that it is low. 					

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Lifting heavy pieces of concrete <ul style="list-style-type: none"> low work height poor hand holds 	131. Reduce weight of work piece <ul style="list-style-type: none"> break up concrete section into smaller pieces 141. Use heavy excavation equipment (e.g., back hoes) <ul style="list-style-type: none"> remove concrete pieces with the aid of a bobcat loader. 	✓		low	low	med
				✓	med to high	med	high
17. Pushing or pulling	<ul style="list-style-type: none"> Rarely occurs 	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> Design and maintenance of seat and mounting increases vibration exposure (back hoe) 	87. Provide an appropriate chair/stool <ul style="list-style-type: none"> seating should incorporate vibration absorption qualities in base support of the seat either air or mechanical 35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> repair seat base 		✓	high	med	med
				✓	med	med	med

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> Standing surface is hard (see Figure 1.3) 	96. Provide appropriate shoe inserts.	✓		low	med	med
	 <p style="text-align: center;">Figure 1.3</p> <ul style="list-style-type: none"> Design or poor condition of foot pedals (industrial equipment) may increase force requirements. 	50. Provide a foot pedal which requires the correct amount of force to use <ul style="list-style-type: none"> repair foot pedals contact vehicle supplier <ul style="list-style-type: none"> – 4-10 lb. minimum – 20 lb. maximum 	✓	✓ ✓	med med	med med	med med
20. Exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> Front edge of seat is hard or square 	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> use a cushion to eliminate exposure to pressure point provide seating with rounded front edge of seat 	✓	✓	low med	med med	med med
21. Awkward leg postures	<ul style="list-style-type: none"> Rarely occurs 	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Standing foot pedal	<ul style="list-style-type: none"> Rarely occurs 	N/A					
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> Light levels are too low during task 	22. Increase light levels <ul style="list-style-type: none"> provide a flood light with adjustable intensity 	✓	✓	high	high	high
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> Rarely occurs 	N/A					