CASE STUDY - Excavating/Shoveling	
TASK TITLE: Excavating/Shoveling	
Task Description:	Excavating involves the use of a shovel. The shovel may be stored on a vehicle or within the vehicle. The task performed for varying amounts of time depending on the complexity of the shoveling task. Typical jobs in which shoveling is performed include (not necessarily limited to): • road maintenance and repair • gardening • trenching
Job Performance Measures Most Often Impacted by Shoveling:	Speed of the shoveling task.
Typical Employee Comments about Shoveling:	Employees typically complain about discomfort and/or stiffness in the shoulder/neck, back and legs/feet.
Suggested Level II Analysis:	Dynamic Task Analysis, 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	• Work is too far away - (manual shoveling) • One hand must hold shovel near the scoop	132. Remove obstructions to get closer to the work 103. Provide extensions for tools • provide handle attachment that can be attached to the shaft of the shovel	✓ ✓		low low	med med	med med
2. Arm forces: Repeated contraction of the muscles of the arm or holding/carry-ing materials	• Shovel is too heavy • Ground is too hard for shoveling	59. Provide a lighter weight tool 144. Provide a machine/automate • use a backhoe	✓	✓	low high	med med	med high
3. High speed, sudden shoulder movements	• Poor shoveling technique	20. Incorporate rest pauses 13. Encourage ergonomic work techniques • pace the work task.	✓ ✓		low low	med med	med med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	• Work location too low for prolonged periods causes strain on the neck	20. Incorporate rest pauses 13. Encourage ergonomic work techniques	✓		low	med	med
		• encourage employee to look up frequently	✓		low	med	med
	• Work location positioned behind operator when in back hoe	20. Incorporate rest pauses	✓		low	med	med

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	• Control lever location too high (back hoe)	123. Raise the person • adjust seat higher • provide seat cushion	 ✓ ✓		 low low	 med med	 med med
	• Control lever distance traveled too far (back hoe)	101. Provide controls which do not require excessive forces • appropriate control levers • contact supplier to investigate adjustable levers and smoother traveling levers		 ✓ ✓	 med med	 med med	 med med
6. Repeated manipulations with fingers	• Rarely occurs	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	• Rarely occurs	N/A					
8. Hand/grip forces	• Handle diameter is too large	88. Provide an appropriate handle diameter • provide shovel with an appropriate hand diameter between 1”-1.5” (2.5-3.8 cm).		 ✓	 med	 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
	• Non-compressible surface on handle	54. Provide a high friction gripping surface • provide a shovel with a compressible handle surface	✓		med	med	med
9. High speed hand/wrist/arm movements or vibration, impact, or torque to the hand	• Rarely occurs	N/A					
10. Exposure to hard edges	• Tool handle has hard edges	9. Eliminate exposure to hard edges • provide a tool with a round smooth handle with no ridges or edges		✓	med	med	med
		• provide a handle of at least 5" in length.		✓	med	med	med
	• Controls lever knobs have hard edges (back hoe)	9. Eliminate exposure to hard edges • a knob with a round smooth handle, smooth knob with no ridges or edges	✓		med	med	med
		• provide knobs of at least 1.5" and not greater than 3.0"	✓		med	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
11. Hands and fingers exposed to cold temperatures	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	✓		med	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	• One hand must hold shovel near the scoop	103. Provide extensions for tools • provide shovel handle attachment		✓	med	med	med
	• Task duration is too long.	141. Use heavy excavation equipment (e.g., backhoes) • Use backhoe for long duration tasks with good access.		✓	high	med	high
		20. Incorporate rest pauses	✓		low	med	med
	• Leaning forward in seat (back hoe)	115. Provide support for the lower back • ensure person sits back in seat to utilize back support	✓		low	med	med
		• adjust backrest forward	✓		low	med	med
		• insert additional back support such as a commercial back rest or cushion.	✓		low	med	med
13. Twisting of the lower back	• Work positioned behind worker when in cab	18. Improve visual access to work • investigate alternative backhoe design.		✓	high	high	high
	• Work location is blocked or too far away	38. Move closer to the work location	✓		low	med	med
		132. Remove obstructions	✓		low	med	med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Twisting with the lower back instead of feet to transfer load of dirt/sand etc.	13. Encourage ergonomic work techniques	✓		low	med	med
14. High speed, sudden movements	• Rarely occurs	N/A					
15. Static, awkward back postures	• Leaning forward in seat	115. Provide support for the lower back					
		• ensure person sits back in seat to utilize back support	✓		low	med	med
		• adjust back support forward	✓		low	med	med
		• insert additional back support such as a commercial back rest or cushion.	✓		med	med	med
		87. Provide an appropriate chair/stool	✓		med	med	med
16. Lifting forces	• Rarely occurs	N/A					
17. Pushing or pulling	• Rarely occurs	N/A					

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
18. Whole body vibration	• Design and maintenance of seat and mounting increases vibration exposure (back hoe)	87. Provide an appropriate chair/stool • seating should incorporate vibration absorption qualities in base support of the seat either air or mechanical		✓	med	med	med
		• repair seat base	✓		low to med	med	med
	• Tight trousers increases the potential for low back pain	12. Encourage appropriate seasonal clothing • employees in industrial equipment to wear loose fitting trousers.	✓		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	• Standing surface is hard	96. Provide appropriate shoe inserts	✓		med	med	med
20. Exposure to hard edges on legs, knees, and feet	• Kneeling causes external pressure to the knee	95. Provide appropriate knee protection • provide attachable knee pads	✓	✓	med	med	med
21. Awkward leg postures	• Rarely occurs	N/A					
22. Standing foot pedal	• Rarely occurs	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	• Rarely occurs	N/A					
24. Intensive visual tasks, staring at work objects for long periods	• Rarely occurs	N/A					

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