CASE STUDY - Lifting	
TASK TITLE: Lifting	
Task Description:	Lifting involves the manual handling of items of varying weights and sizes. It involves the transfer of items at between varying heights and locations (floor/shelves or a work surface). Pushing and pulling typically occur while moving carts or pieces of equipment. Pushing and pulling can also occur while removing and installing components. • Lifting/pushing/pulling are components of many jobs.
Job Performance Measures Most Often Impacted by Lifting:	• Speed of completion of the larger task. • Component damage during handling.
Typical Employee Comments about Lifting:	Employees typically complain about discomfort in the back/torso, legs/feet, hands/wrists, arms, and shoulders/neck. Primary: The primary body part affected is typically the **back/torso** Secondary: The following body parts are also affected: shoulders/neck, hands/wrists/arms, and legs/feet may also be affected.
Suggested Level II Analysis:	NIOSH Lifting Equation, Biomechanical Lifting Analysis, Push/Pull Force Analysis

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	• Object is too high	32. Lower the work piece/work surface					
		• place heaviest items below shoulder height (50" (127 cm) or less)	✓		low	med	med
		• place heaviest items on middle shelves of storage racks	✓		low	med	med
	• Object is too far away	38. Move closer to the work location	✓	✓	med	med	med
		41. Move work piece closer to body	✓		low	med	med
2. Arm forces: Repeated contraction of the muscles of the arm or holding/ carrying materials	• Item is too heavy	61. Provide a mechanical lift device		✓	high	low	med
		131. Reduce weight of work piece		✓	med	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
		26. Increase weight of work piece					
		• ensures that the item will be handled mechanically		✓	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
	• High forces required to install or remove component	128. Reduce force required to install or remove the component					
		• use lubricant where feasible	✓		low	med	med
		• modify design of component or subsystem to reduce forces during installation or removal		✓	high	med	med
	• Rolling/sliding resistance of cart or piece of equipment causes high forces	19. Improve wheel condition					
		• repair wheels on carts or equipment	✓		med	med	med
		• install appropriate wheels		✓	low to med	med	med
	• Cart or piece of equipment is too heavy to be pushed manually	131. Reduce weight of work piece					
		• reduce number of items or weight of items on cart	✓		low	low	med
		67. Provide a powered cart		✓	med to high	low	med
	• Floor/surface condition causes high forces during a rolling or sliding task	17. Improve floor condition					
		• improve housekeeping	✓		low	low	med
		• repair cracks or gaps in floor		✓	med	low	med
		• provide ramps to compensate for minor differences in floor height		✓	med to high	low	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Carry distance is more than three steps	126. Reduce carry distance • arrange storage and work areas to reduce travel distances	✓		low	low	med
		48. Provide a cart • to transport materials		✓	med	low	med
		11. Eliminate unnecessary tasks • eliminate or combine handling tasks	✓		low	low	med
		• transport items in larger quantities instead of handling them individually	✓		low	low	med
		37. Modify facilities to decrease handling • widen doors to allow materials to be handled on carts		✓	high	low	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	• Speed of lift	13. Encourage ergonomic work techniques • encourage person to avoid rushing while handling items	✓		low	low	med
	• Item is stuck in location • Item is difficult to install	128. Reduce force required to install or remove the component • use lubricant where feasible • modify design of component or subsystem to reduce forces during installation or removal	✓	✓	low high	med med	med med
4. Head/neck bent or twisted	• Inadequate head room causes awkward postures	82. Provide adequate workspace • store item in area where there is adequate headroom • use flow-racks to cue items to the front of a storage rack	✓	✓	low high	low low	med high
		55. Provide a hook-type tool to pull items		✓	low	low	med

Hands/Wrists/Arms

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	• Shape of grasping location (handle) on work piece causes awkward wrist positions	94. Provide appropriate handles • provide handles which pivot slightly to permit a straight wrist during handling • provide cut-outs on boxes or containers		✓ ✓	med med	low low	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					

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	• Item is difficult to grasp • Item has no handles • Item is slippery (see Figure 1.1)  **Figure 1.1**	76. Provide a tool which requires minimum force to use • provide handles with compressible grips 61. Provide a mechanical lift device	✓	 ✓	med med to high	low low	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	• Rarely occurs	N/A					
11. Hands and fingers exposed to cold temperatures	• Work area is too cold	105. Provide portable heaters 93. Provide appropriate gloves	 ✓	✓ ✓	med med	med 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	• Object is too low (see Figure 1.2)  **Figure 1.2**	124. Raise the work piece/work surface					
		• place heaviest items between knuckle and shoulder height (25”-50”) (64-127 cm)	✓		low	low	low
		• provide a fixed table to support work piece		✓	low	med	med
		• provide an adjustable table for work piece		✓	high	med	high
		• place heaviest items on middle shelves of storage racks	✓		low	low	med
	• Object is too far away	38. Move closer to the work location					
		• remove obstructions	✓	✓	med	med	med
		41. Move work piece closer to the body	✓		low	med	med
	• Lifting item out of a deep container causes awkward bending	69. Provide a smaller container	✓	✓	med	low	med
	• Item is handled in a restricted space	82. Provide adequate work space		✓	low to med to	low	med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Person tends to use the back to lift instead of using the legs to assist in the lift (check to make sure that there is no contributing factor in the workplace)	13. Encourage ergonomic work techniques • provide training on ergonomics principles and lifting techniques • encourage person to use leg muscles to lift	✓ ✓		low low	low low	med med
13. Twisting of the lower back	• Access is restricted to a component that needs to be removed	82. Provide adequate workspace • improve access during installation and removal	✓		low	low	high
	• Item is handled in a restricted space	61. Provide mechanical lift device • provide mechanical assistance for handling the load		✓	med to high	low	med
	• Work area layout	130. Reduce the angle a person turn to transfer an item • for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less	✓		low	low	med
	• Person tends to twist with the back instead of using the legs and feet to pivot	13. Encourage ergonomic work techniques • provide training on ergonomics principles and lifting techniques • encourage person to use legs pivot when handling a load	✓ ✓		low low	low 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
14. High speed, sudden movements	• Item is stuck in location • Item is difficult to install or remove	128. Reduce force required to install or remove the component • use lubricant where feasible • modify design of component or subsystem to reduce forces during installation or removal	✓	✓	low high	low med	med high
	• Person tends to lift with a jerky motion instead of a smooth motion	13. Encourage ergonomic work techniques • encourage person to avoid rushing while handling items	✓		low	low	med
15. Static, awkward back postures	• Rarely occurs	N/A					
16. Lifting forces	• Item is too heavy	61. Provide a mechanical lift device		✓	high	low	med
		131. Reduce weight of work piece (object)	✓		low	low	med
		142. Use two or more persons to perform the transfer	✓		low	low	med
		26. Increase weight of work piece • ensures that the item will be handled mechanically		✓	high	low	med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• High forces are required to install or remove the component	128. Reduce force required to install or remove the component • use lubricant where feasible • modify design of component or subsystem to reduce forces during installation or removal	✓	✓	low high	low low	med med
17. Pushing or pulling	• Rolling/sliding resistance of cart or piece of equipment causes high forces	19. Improve wheel condition • repair wheels on carts or equipment • provide wheels with appropriate bearings and tread composition	✓	✓	low med	low low	med med
	• Cart or piece of equipment is too heavy to be pushed manually	131. Reduce weight of work piece • reduce number of items or weight of items on cart	✓		low	low	med
		67. Provide a powered cart • provide motorized assistance to transport cart or piece of equipment		✓	high	low	high
	• Floor/surface condition causes high forces during a rolling or sliding task	17. Improve floor condition • improve housekeeping • repair cracks or gaps in floor • provide ramps to compensate for minor differences in floor height	✓	✓ ✓	low med high	low low low	med med med
18. Whole body vibration	• Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	Rarely occurs	N/A					
20. Exposure to hard edges on legs, knees, and feet	• Rarely occurs	N/A					
21. Awkward leg postures	• Work object is too low	124. Raise the work piece/ work surface 118. Provide support for the work piece • provide an adjustable table for work piece	✓	✓ ✓	med high	med med	med high
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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