

CASE STUDY – Loading and Unloading

TASK TITLE: Loading and Unloading

Task Description:	<p>The Loading and Unloading task, which can occur in a wide variety of jobs, often occurs as part of another job. For instance, meat cutters often must load boxes of meat onto carts and unload onto the cutting area. Other case studies that may provide additional information on related tasks are as follows: In the M/I Guide: Lifting – Case Study 22; in the W/S Guide Supplement Fork Truck Operation (sitting) (Case Study #8) Fork Truck Operation (standing) (Case Study #9), Packing/Shipping (Case Study #14), Picking/Stocking (Case Study #17), and Transporting Loads on Non Powered Carts (Case Study #20).</p> <p>Typical environments in which the Loading and Unloading task may be found can include:</p> <ul style="list-style-type: none">• Loading docks• Storage areas• Maintenance shops• Mail rooms
Job Performance Measures Most Often Impacted by Loading and Unloading:	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none">• Time per box• Rate of damaged boxes <p>In most applications, there are no formal measures.</p>
Typical Employee Comments about Loading and Unloading:	<p>Employees typically experience discomfort in the lower or middle back.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
Suggested Level II Analysis:	<p>NIOSH Lifting Equation, Biomechanical Lifting Analysis</p>

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"> Object is too high Object is too far away 	32. Lower the work piece/work surface <ul style="list-style-type: none"> place heaviest items below shoulder height and above knuckle height (25"-50") (64-127cm) 	✓		low	low	med
		38. Move closer to the work location <ul style="list-style-type: none"> step closer to load 	✓		low	low	low
		41. Move work piece closer to body <ul style="list-style-type: none"> slide load to edge before lifting 	✓		low	low	low
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> Item is too heavy 	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> use a lift cart to retrieve and deliver objects – the operator can slide objects rather than lift 		✓	low to med	med	med
		61. Provide a mechanical lift device		✓	med	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
		26. Increase weight of work piece <ul style="list-style-type: none"> increase work piece mass to ensure handling with a lifting device 		✓	low to high	low	low
		131. Reduce weight of work piece <ul style="list-style-type: none"> contact vendor and inquire about receiving units in less mass 		✓	med	low	low

Shoulder/Neck (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"> Item is stuck or wedged in place 	132. Remove obstructions <ul style="list-style-type: none"> take time to remove obstacles interfering with movement rather than trying to “force” the object free 	✓		low	low	low
		149. Provide appropriate tool <ul style="list-style-type: none"> provide a tool that would help dislodge the item, without using excessive force 		✓	low	low	med
	<ul style="list-style-type: none"> Rolling/sliding resistance of cart causes high forces Pulling object across shelf results in high forces 	19. Improve wheel condition <ul style="list-style-type: none"> repair wheels on carts or equipment 	✓		low	low	high
		119. Provide wheels <ul style="list-style-type: none"> install appropriate wheels 	✓		med	low	low
		46. Provide a ball-bearing rotation table <ul style="list-style-type: none"> provide a ball-bearing rotation table to slide the object closer 		✓	med to high	low	med
		151. Reduce weight of the load placed on the cart	✓		low	low	low
	<ul style="list-style-type: none"> Cart or piece of equipment is too heavy to be pushed manually 	67. Provide a powered cart (Note: This may require wide doors and/or ramps.)		✓	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
	<ul style="list-style-type: none"> Floor/surface condition causes high forces during a rolling or sliding task Carry distance is more than three steps 	<p>17. Improve floor condition</p> <ul style="list-style-type: none"> improve housekeeping repair cracks or gaps in floor provide ramps to compensate for minor differences in floor height <p>126. Reduce carry distance</p> <ul style="list-style-type: none"> arrange storage and work areas to reduce travel distances <p>67. Provide a powered cart (Note: This may require wide doors and/or ramps.)</p> <p>11. Eliminate unnecessary tasks</p> <ul style="list-style-type: none"> eliminate or combine handling tasks transport items in larger quantities instead of handling them individually (Note: Exercise caution when increasing quantities in a load to avoid overloading the operator. Using powered assistance is the best strategy in this case) 	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>low</p> <p>low</p> <p>high</p> <p>low to high</p> <p>high</p> <p>low</p> <p>med to high</p>	<p>med</p> <p>med</p> <p>med</p> <p>low</p> <p>low</p> <p>low</p>	<p>med</p> <p>med</p> <p>med</p> <p>high</p> <p>med</p> <p>high</p> <p>med</p>

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"> Speed of lift 	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> encourage person to use smooth controlled motions while handling items 					
		61. Provide a mechanical lift device		✓	med to high	med	high
4. Head/neck bent or twisted	<ul style="list-style-type: none"> Inadequate head room causes awkward postures 	82. Provide adequate workspace	✓		low	med	med
		<ul style="list-style-type: none"> store item in area where there is adequate headroom use flow-racks to cue items to the front of a storage rack 		✓	high	med	high
		55. Provide a hook-type tool to pull items		✓	med	med	high

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	<ul style="list-style-type: none"> Shape of grasping location (handle) on work piece causes awkward wrist positions 	94. Provide appropriate handles <ul style="list-style-type: none"> provide handles which pivot slightly to permit a straight wrist during handling provide cut-outs on boxes or containers 		✓	med	low	low
				✓	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"> Handling large products 	147. Provide alternate container <ul style="list-style-type: none"> provide a smaller container provide a more stable container 94. Provide appropriate handles 61. Provide a mechanical lift device		✓	med	med	med
				✓	med	med	med
				✓	med	med	med
				✓	med	med	low

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	<ul style="list-style-type: none"> Item is difficult to grasp Item has no handles Item is slippery  <ul style="list-style-type: none"> Item is too heavy Item is stuck or wedged in place 	147. Provide an alternate container <ul style="list-style-type: none"> provide a smaller container provide a more stable container 	✓	✓	med	med	med
		94. Provide appropriate handles		✓	med	med	med
		93. Provide appropriate gloves <ul style="list-style-type: none"> provide gloves with a high friction surface 	✓		low	low	low
		4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> use a portable lift cart to retrieve and deliver objects - the operator can slide objects rather than lift 		✓	low to med	med	med
		61. Provide a mechanical lift device		✓	med	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
		131. Reduce weight of work piece	✓	✓	low to high	low	low
		132. Remove obstructions <ul style="list-style-type: none"> take time to remove obstacles interfering with movement. Avoid trying to “force” the object free 	✓		low	low	high

Hands/Wrists/Arms (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"> Item is stuck or wedged in place (continued) 	149. Provide appropriate tools <ul style="list-style-type: none"> provide a pry bar or wedge 61. Provide a mechanical lift device	✓		med	low	low
				✓	med to high	med	med
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> Tearing open boxes 	149. Provide appropriate tools <ul style="list-style-type: none"> use a utility knife for opening boxes if performing highly repetitive box opening, use a knife with an angled handle 	✓		low	med	med
			✓		low	med	med
10. Exposure to hard edges	<ul style="list-style-type: none"> Item has small handles Handles have hard edges 	88. Provide appropriate handle diameter 94. Provide appropriate handles <ul style="list-style-type: none"> provide rounded slightly compressible handles 61. Provide a mechanical lift device	✓		low to med	low	low
				✓	low to med	low	low
				✓	med to high	med	med

Hands/Wrists/Arms (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	<ul style="list-style-type: none"> Work area is too cold 	12. Encourage appropriate seasonal clothing	✓		low to med	med	med
		93. Provide appropriate gloves	✓		low to med	med	low

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"> Object is too low 	124. Raise the work piece/work surface <ul style="list-style-type: none"> place heaviest items between knuckle and shoulder height and on middle shelves of storage racks provide a fixed table to support work piece provide an adjustable table 	✓		low	med	med
					med	med	med
					med to high	med	med
	<ul style="list-style-type: none"> Object is too far away 	38. Move closer to the work location <ul style="list-style-type: none"> step closer to load 	✓		low	med	low
		41. Move work piece closer to body <ul style="list-style-type: none"> slide load to edge before lifting 	✓		low	med	low
		46. Provide a ball-bearing rotation table <ul style="list-style-type: none"> provide a ball-bearing transfer table to slide the object closer 		✓	med to 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
13. Twisting of the lower back	<ul style="list-style-type: none"> Lifting item out of a deep container causes awkward bending 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) Work area layout 	147. Provide alternate container <ul style="list-style-type: none"> use a smaller container use a container with drop down sides use a pallet instead of a bin 		✓ ✓ ✓	high high med	med med med	med med med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> provide training on ergonomics principles and lifting techniques encourage person to use leg muscles to lift 	✓		low	low	low
			✓		low	low	low
		130. Reduce the angle a person has to turn to transfer the item <ul style="list-style-type: none"> for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less reposition supplies/materials to reduce twisting 	✓	✓	low to high	low	med
			✓		low	low	med

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"> Person tends to twist with the back instead of using the legs and feet to pivot 	<p>13. Encourage ergonomic work techniques</p> <ul style="list-style-type: none"> provide training on ergonomics principles and lifting techniques encourage person to use legs to pivot when handling a load <p>130.Reduce the angle a person has to turn to transfer an item</p> <ul style="list-style-type: none"> place adjacent pallets at 90° to one another 	✓	✓	low	low	low
			✓		low	low	low
				✓	med	low	med
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> Item is bulky, awkward and/or shifts easily Person tends to lift with a jerky motion instead of a smooth motion 	<p>61. Provide a mechanical lift device</p> <p>13. Encourage ergonomic work techniques</p> <ul style="list-style-type: none"> encourage person to use smooth controlled movements while handling items 	✓	✓	med to high	med	med
			✓		low	low	low

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"> • Sorting from a low location 	124. Raise the work piece/ work surface	✓		low	med	med
		<ul style="list-style-type: none"> • place heaviest items between knuckle and shoulder height and on middle shelves of storage racks 		✓	med	med	med
		<ul style="list-style-type: none"> • provide a fixed table to support work piece • provide an adjustable table 		✓	med to high	med	med
16. Lifting forces	<ul style="list-style-type: none"> • Item is too heavy 	61. Provide a mechanical lift device		✓	med to high	med	med
		142. Use two or more persons to perform the transfer	✓				
17. Pushing or pulling	<ul style="list-style-type: none"> • Rolling/sliding resistance of cart or piece of equipment causes high forces 	19. Improve wheel condition		✓	med	med	med
		<ul style="list-style-type: none"> • repair wheels on carts or equipment 119. Provide wheels <ul style="list-style-type: none"> • provide wheels with appropriate bearings and tread composition 		✓	med	med	med

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"> • Cart or piece of equipment is too heavy to be pushed manually 	151. Reduce the weight of the load placed on the cart <ul style="list-style-type: none"> • reduce number of items or weight of items on cart 	✓		low	med	low
		67. Provide a powered cart <ul style="list-style-type: none"> • provide motorized assistance to transport cart or piece of equipment 		✓	med to high	med	med
	<ul style="list-style-type: none"> • Floor/surface condition causes high forces during a rolling or sliding task 	17. Improve floor condition <ul style="list-style-type: none"> • improve housekeeping • repair cracks or gaps in floor • provide ramps to compensate for minor differences in floor height 	✓ ✓	✓	low high med	med med low	med med low
18. Whole body vibration	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> Rarely occurs 	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> Standing on hard surface Leaning against bin during loading 	86. Provide an appropriate anti-fatigue mat	✓		low to med	low	med
		96. Provide appropriate shoe inserts	✓		low	low	low
		147. Provide an alternate container <ul style="list-style-type: none"> use a smaller container use a container with drop down sides 		✓ ✓	med low	low low	med low
		95. Provide appropriate knee protection	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> Work object is too low, causing the foot to bend at the toes for balance 	124. Raise the work piece/work surface	✓	✓	low to med med to high	med	med
		<ul style="list-style-type: none"> provide support for the work piece provide an adjustable table for work piece 				med	med
22. Awkward foot postures	<ul style="list-style-type: none"> Work object is too low, causing the foot to bend at the toes for balance 	124. Raise the work piece/work surface	✓	✓	low to med med to high	med	med
		<ul style="list-style-type: none"> provide support for the work piece provide an adjustable table for work piece 				med	med
		132. Remove obstructions <ul style="list-style-type: none"> clear boxes and other items off the floor 	✓		low	med	med

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	<ul style="list-style-type: none"> Rarely occurs 	18. Improve visual access to work <ul style="list-style-type: none"> light levels should be 50fc to 75fc for work 		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> Rarely occurs 	N/A					

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