

## CASE STUDY - Transporting Loads on Non-Powered Carts

### TASK TITLE: Transporting Loads on Non-Powered Carts

<p><b>Task Description:</b></p>	<p>The Transporting Loads on Non-Powered Carts task involves the use of non-powered carts to move loads (palletized or loose) from one location to another. While the most common cart in a warehouse setting is the pallet jack, other devices considered include: hand truck, shelf style truck (e.g., bottom, center, and top shelves with a handle at one end), and flatbed style (e.g., single surface low to the ground with a handle at one end). Carts may be equipped with swivel wheels that may or may not lock into position. Carts may be used in open areas or to navigate narrow aisles. The carts are typically pushed as well as pulled. [Since the work situation can also include loading and unloading carts, please refer to Case Study 11 – Loading/Unloading for further guidance.]</p> <p>Typical environments in which transporting loads on non-powered carts occurs (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• pallet transport/transfer</li> <li>• short distance stock delivery (e.g., from storage to point of use)</li> </ul>
<p><b>Job Performance Measures Most Often Impacted by Transporting Loads on Non-Powered Carts</b></p>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• the number of loads handled per day.</li> </ul> <p>(Note: It is also important that the carts are handled in such a way as to avoid damage to the materials being transported or accidents involving other personnel and the surrounding area and equipment.)</p>
<p><b>Typical Employee Comments about Transporting loads on Non-Powered Carts</b></p>	<p>Employees typically experience discomfort in the back/torso, shoulders and sometimes legs/feet.</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>
<p><b>Suggested Level II Analysis:</b></p>	<p>Dynamic task Analysis, Biomechanical Lifting Analysis, NIOSH Lifting Equation, Push/Pull 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"> <li>Handles are too high</li> <li>Handle is too close to the cart; inadequate clearance for the legs when walking</li> </ul> 	94. Provide appropriate handles <ul style="list-style-type: none"> <li>modify current handles or add a handle; handle height should be between 36-44”(91-112cm) above the floor, fixed handles should be extended at least 8”(20cm) from the cart.</li> </ul>	✓		low	low	low
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Repeated pumping of pallet jack to raise pallet off the floor for transport</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a powered scissors jack</li> <li>use a fork lift to transport load</li> </ul>	✓	✓	high low	low 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
	<ul style="list-style-type: none"> <li>Manual pushing/pulling loads</li> </ul> 	67. Provide a powered cart <ul style="list-style-type: none"> <li>contact vendor to consider providing powered vehicles</li> </ul>		✓	med to high	low	med
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Emergency stopping of carts can create excessive force on the shoulders</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>contact supplier to investigate equipping pallet jack or other carts with a hand brake</li> </ul>		✓	med	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Viewing around loads</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>investigate the use of convex mirrors mounted on ceiling to see work area (particularly at intersections)</li> </ul>	✓		low to med	low	med
		147. Provide an alternative container <ul style="list-style-type: none"> <li>reduce high/size of load</li> </ul>		✓	low to med	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	<ul style="list-style-type: none"> <li>Repeated pumping of pallet jack to raise pallet off the floor for transport</li> <li>Handle on cart too low</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a powered scissors jack</li> <li>use a fork lift to transport load</li> </ul>	✓	✓	high low	low low	med med
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>replace horizontal handle with two vertical handles, shoulder width apart</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>reposition horizontal handle at between 36-44 inches (91-112cm) above the floor</li> </ul>	✓		low	low	low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	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	<ul style="list-style-type: none"> <li>Repeated pumping of pallet jack to raise pallet off the floor for transport</li> <li>Pushing/pulling loads</li> <li>Inappropriate wheel material (e.g., steel/too hard for floor type) or poor wheel maintenance (e.g., stuck or shaking wheels)</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a portable pneumatic scissors jack</li> <li>use a fork lift to transport load</li> </ul>	✓	✓	high	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>use a powered cart if forces exceed guidance</li> </ul>		✓	low	low	med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>replace worn wheels when necessary; carts with damaged wheels can jam suddenly</li> </ul>		✓	med to high	low	med
		119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels which roll easily on floor surface</li> </ul>		✓	med	low	med
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Repeated pushing of carts over rough or damaged floor surfaces</li> <li>Inappropriate wheel material (e.g., steel/too hard for floor type) or poor wheel maintenance (e.g., stuck or shaking wheels)</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓	✓	low med	low low	low med
		119. Provide wheels <ul style="list-style-type: none"> <li>replace worn wheels when necessary; carts with flattened wheels are harder to push than those whose wheels are rounded</li> </ul>		✓	med	low	med
		<ul style="list-style-type: none"> <li>replace steel wheels with softer material (when appropriate for the work environment)</li> </ul>		✓	med	low	med

**Hands/Wrists/Arms (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On		
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Handle shape creates a pressure point in the hand</li> </ul> 	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>wrap square tubular handles with padding to cushion the hand</li> <li>replace blunt edge handles with a rounded design</li> </ul>	✓ ✓		low low	low low	low low	
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	23. Increase room temperature <ul style="list-style-type: none"> <li>encourage employees to keep doors shut</li> </ul> 93. Provide appropriate gloves 12. Encourage appropriate seasonal clothing	✓ ✓ ✓		low low low	low low low	low low 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"> <li>Placing loose stock or other items on lower shelves on cart or on flat bed cart</li> <li>Handle on cart is too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>avoid use of the bottom shelf on carts whenever possible; load carts to maintain load stability</li> </ul> 94. Provide appropriate handles <ul style="list-style-type: none"> <li>replace horizontal handle with two vertical handles, shoulder width apart</li> <li>reposition horizontal handle at between 36-44”(91-112cm) above the floor</li> </ul>	✓		low	low	low
			✓		low	low	low
			✓		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
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Carts drift or are difficult to control, especially when turning corners</li> <li>Maneuvering through narrow aisles or around obstructions</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	119. Provide wheels <ul style="list-style-type: none"> <li>place swivel wheels on only the “handle side” of the cart for optimum control (push carts)</li> <li>if all wheels swivel, “lock” the wheel position into “straight” on the side opposite the handle</li> </ul>		✓	med	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>do not overload trucks; the height of the load should be no higher than 55”(140cm) if the load is to be pushed</li> </ul>	✓		low	low	low
		82. Provide adequate work space <ul style="list-style-type: none"> <li>increase the width of the aisles to at least 11 feet (assuming a one-way flow) and maintain appropriate width by painting guidelines or pallet position spaces on the floor</li> </ul>		✓	high	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and materials handling techniques</li> <li>encourage person to use legs and pivot while transferring loads or loading/unloading carts</li> </ul>	✓		low	low	low
			✓		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
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Emergency stopping of carts can create excessive force on the shoulders</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>contact supplier to investigate equipping pallet jack or other carts with a hand brake</li> </ul>		✓	med	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Handle on cart is too low</li> </ul>	94. Provide appropriate handles	✓		low	low	low
		<ul style="list-style-type: none"> <li>replace horizontal handle with two vertical handles, shoulder width apart</li> <li>reposition horizontal handle at between 36-44”(91-112cm) above the floor</li> </ul>	✓		low	low	low
16. Lifting forces	<ul style="list-style-type: none"> <li>Item(s) being lifted onto/off cart is too heavy</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a hoist to perform the lift</li> <li>use a portable pneumatic scissors jack; position the height of the jack so the operator can slide rather than lift the item</li> </ul>		✓ ✓	high high	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
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling or sliding resistance of cart causes high forces</li> <li>Worn wheels increase forces</li> <li>Cart/load is too heavy to be moved manually (maximum forces: start - 50 pounds force, maintain travel - 25 pounds force, emergency stop (within 3 feet) - 80 pounds force)</li> <li>Poor floor surface/condition</li> </ul>	119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>		✓	med	low	med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>replace worn wheels</li> </ul>			med	low	med
		151. Reduce weight of load on cart	✓		low	low	low
		67. Provide a powered cart <ul style="list-style-type: none"> <li>provide a motorized cart</li> </ul>			high	low	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓ ✓		low med	low low	low med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	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"> <li>Rarely occurs</li> </ul>	N/A					
20. Standing on hard surfaces or exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> <li>Continuous walking while transporting loads can increase the potential for fatigue in the legs and feet</li> </ul>	20. Incorporate rest pauses 96. Provide appropriate shoe inserts	✓	✓	low low	low low	low low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	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	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Increase visual access to work <ul style="list-style-type: none"> <li>Light level should be 10fc to 20fc for the work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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