



**Continuing Care
Safety Association**

Recognizing Manual Materials Handling Hazards



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Continuing Care Safety Association

VISION

Incident free workplaces

MISSION

To create safe workplaces through the provision of education, leadership & collaboration.

VALUES

- *Value safe work, and safe work behaviours*
- *Value the right of each worker to have a safe, healthy and incident free work environment*
- *Value members input, feedback and direction*



Table of Contents

Topic	Page
Introduction	1
What is ergonomics?	2
What is Manual Materials Handling?	3
MMH and Injuries	3
Recognizing MMH-Related Hazards	4
Key hazards associated with MMH tasks	4
- Force	5
- Posture	5
- Repetition	6
- Time / Duration	6
- Other Hazards	6
Common MMH-related Hazards	7
- Lifting / Lowering	7
- Pushing / Pulling	9
- Carrying / Holding	11
- Other Hazards	12
- Work Organization	13
Good MMH Techniques	15
General Design Guidelines for MMH Tasks	16
Notes:	17
Manual Materials Handling Hazard Identification Checklist	Pull-out from middle of booklet

Recognizing MMH-Related Hazards

Introduction

Today's workplace is very different than it was only a few short years ago, and it is dramatically different when compared to 20 years past. New automated systems have been created to store, transfer, raise and lower, stack, palletize and package all types and sizes of materials. Mechanized equipment has eliminated many heavy and demanding materials handling tasks that were once so common. Hoists, manipulators, patient lifts, adjustable height pallet stands, and electric pallet jacks are widely available and, in many workplaces, widely used. But even so, almost all workers regularly do some type of manual materials handling every day, And for some workers, manual handling is the job task that they perform for a majority of their work day, day in and day out.

This booklet has been created to provide you with some basic information about design-related hazards that are associated with manual materials handling tasks and are found in most workplaces. Design-related hazards can be due to:

- the physical design, set-up or layout of the work area, workstation and/or the equipment needed to perform the manual materials handling task(s)
- the design of the workplace environment including lighting, temperature, noise, layout, etc
- the design of the organization including such things as workload, postural variety, opportunities for recovery, and work methods

Use this booklet, and the Manual Materials Handling Hazard Identification Checklist that is included, to help you identify hazards in your workplace that can contribute to pain and discomfort, time away from work, errors, reduced performance, and increased costs for your organization.

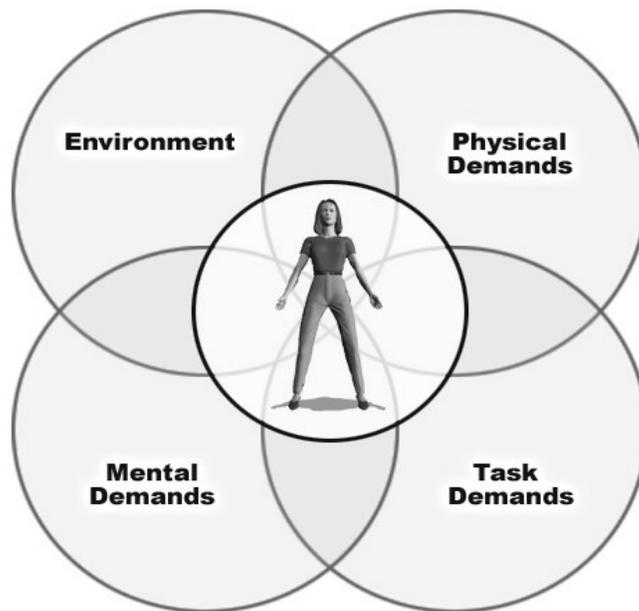
Recognizing MMH-Related Hazards

What is ergonomics?

Ergonomics is the systematic process of designing the workplace for people through the application of our knowledge of humans to:

- the equipment they use
- the environments in which they work
- the tasks they perform and
- the management systems in which they work

The key to good ergonomics is taking a human-centered view. That is, when any workplace or job is being designed, the person or people who will be performing the job or working in the workplace should be the first thing that is considered in the design process. Only by understanding who will be working in the workplace, and taking into account their capabilities and needs can we design workplaces that will minimize the risk of pain and discomfort, while maximizing performance.



Recognizing MMH-Related Hazards

What is Manual Materials Handling?

Manual materials handling (MMH) tasks are those activities that require you to use your muscle power to move things from one place to another. Lifting, lowering, pushing, pulling, carrying, and holding, are all types of MMH.

All of us perform MMH tasks on a day to day basis. We might lift a box of paper at a photocopier or push a fully loaded cart at the grocery store. For some workers, however, material handling is a main component of their job. Restaurant workers, warehouse stock pickers, construction workers, shippers and couriers, nurses, housekeepers, maintenance staff and cleaning personnel . All of these workers and many more perform MMH tasks and are exposed to hazards that can lead to injury.

MMH and injuries

While it is true that there are many automated and mechanical material handling methods, we all still perform MMH tasks. And, if the MMH tasks are not designed properly, or we use poor material handling techniques the risk of injury is increased.

When most people think about materials handling and injuries they typically only think about back injuries. It is true that lifting, lowering, pushing, pulling and carrying can all contribute to the development of back pain. MMH tasks can also lead to injuries in the neck, shoulders, arms, elbows, hands and legs. It is not uncommon to find out that people were performing MMH tasks when they were involved in slip, trip and fall accidents, or when they report cuts, bruises or crush type injuries.

Well-designed workplaces and MMH tasks allow people to not only work more safely, with less chance of experiencing a MMH-related injury, but they also allow work to be performed more

Recognizing MMH-Related Hazards

effectively, efficiently, and productively.

When looking to solve problems related to manual materials handling and prevent MMH-related injuries, involve everyone in a creative and open process. This will result in the development of effective and, often, low cost solutions that will help to improve the health and well-being of all workers and the overall organization.

Recognizing MMH-Related Hazards

In order to eliminate design-related hazards associated with manual materials handling tasks managers and employees must know how to recognize them. This booklet has been designed for just this purpose. On the next few pages, you will learn about some of the most common design problems that are commonly found whenever people perform MMH tasks and get to know how they can lead to Musculoskeletal Disorders (MSD's) and other performance issues.

Key hazards associated with MMH tasks

It is important to understand that workplace design factors can directly contribute to the development of MMH-related injuries. Studies show that more than 30% of all compensable work injuries are due to MMH tasks. A majority of these injuries are musculoskeletal disorders (MSDs) such as muscle and tendon strains, back pain, and spinal disc and ligament related disorders. Whether they happen suddenly or gradually over time, MMH-related injuries typically occur when the task demand exceed the individual's capabilities. Research has identified three key MMH-related hazards that can increase the likelihood of injury. These hazards include:

Recognizing MMH-Related Hazards

Force

MMH tasks that require a high level of force to be exerted, or tasks that require lower levels of force but require a person to handle /carry items for a long period of time or over long distances can lead to muscle fatigue, muscle strain, pain and discomfort. Some examples of MMH tasks that involve force include:

- lifting and lowering of boxes and crates
- pushing carts and wagons
- pulling loaded pallet jacks
- carrying boxes, bags and packages



Posture

When workers use poor MMH techniques that put them into awkward postures the risk of injury goes up. Workers often adopt these awkward postures because the set-up and design of their work area forces them into these postures. Or, workers may not have been trained on how to use good MMH techniques.

Examples of awkward postures seen when performing MMH tasks include:

- bending at the waist when lifting or lowering
- twisting the back / spine when exerting forces
- reaching out to get or put down an item
- Reaching to get items above shoulder height



Recognizing MMH-Related Hazards

Repetition

When employees perform the MMH tasks repeatedly over the day, the risk of MMH-related injuries increases. MMH-tasks that are often performed repetitively include:

- removing bags of soiled laundry and linen from laundry carts
- removing garbage bags from housekeeping carts
- lifting and lowering racks of dishes
- moving furniture



Time / Duration

All three hazards, force, posture, and repetition are influenced by how long a person performs one or many MMH tasks. Generally speaking, the longer a person performs MMH tasks before they have a significant change in task demands the greater the risk of injury.

Other Hazards

Other hazards that can also reduce performance and increase the risk of MMH-related injuries include:

- type of grip used
- handles or no handles
- size, shape and stability of the load
- space to move
- presence of stairs / ramps
- floor surface conditions / traction
- lighting and temperature



Recognizing MMH-Related Hazards

Common MMH-Related Hazards

Lifting / Lowering

Lifting and lowering are two of the most commonly performed MMH tasks and are frequently associated with low back injuries. While the actual technique used is important, the design of the workplace and task can create hazards that can significantly increase the risk of injury.

From above the shoulders

Handling objects from above the shoulders is hazardous because of the awkward neck, shoulder and back postures required. Only very lightweight items can be handled safely when they are above the shoulders.



From below the knees

Research tells us that when workers must handle items below knee height that the number of lower back injuries goes up. There is a much greater likelihood of people bending at the waist when lifting items below knee height.



While reaching out in front

One of the basic principles is 'keeping the load close' because as the load is moved away from the body the force on the back muscles and spine increases. So workers need to be able to get and stay close to what they're moving.



Recognizing MMH-Related Hazards

Lifting / Lowering continued

Over an obstruction

Lifting and placing items over an obstruction will force workers to reach out with loads. One of the basic principles is 'keeping the load close' because as the load is moved away from the body the force on the back muscles and spine increases.



While reaching out to the side/on an angle

Ideally all items and loads should be handled so that they are directly in front of the body. Reaching out to the side, bending to the side, or twisting while doing MMH tasks increases the strain on muscles, spinal discs and joints.



Items that are too heavy

Items that workers consider to be heavy should not be lifted or lowered. What is 'heavy' depends not only on the capabilities of the person doing the job, but also on how far the item is away from the worker, how high off the ground/floor the item is when it is picked up/put down, how far the item has to be moved, how often the items is moved, and whether or not the work area allows the worker to use a good technique for the entire lift /lower. To keep most



Recognizing MMH-Related Hazards

workers safe, no items weighing more than 23 kg should be lifted or lowered and that is only when the conditions for MMH are perfect.

Lifting / Lowering continued

Placing items in or getting items from deep bins

When workers have to place items into or get items from deep bins very hazardous back postures are almost always required. Even if loads are light this should be avoided.

Items that are large, slippery, or unstable

Very large items, even light ones, for workers to adopt hazardous postures to lift and handle them. Slippery loads are difficult to hold onto and unstable loads can shift as they are being handled and this can increase the risk of injury.

Pushing / Pulling

Carts, etc. with small wheels

Carts, bins and other devices with small wheels are harder to push or pull than those with larger wheels. Also small wheels are more likely to get stuck in holes and cracks, and make it harder to get an item over any bumps or ridges.



Carts, etc. with damaged wheels

If carts, bins or other devices have damaged wheels, tires that are cracked or worn, or bearings that need replacing or greasing then the force required to push or pull these devices may be too high to be safe.



Manual Materials Handling Hazard Identification Checklist

Manual Materials Handling Hazard Identification Checklist

This checklist will help you identify design-related hazards associated with manual materials handling tasks that may increase the risk of employees developing musculoskeletal pain / discomfort, decrease performance and increase an organization's operational costs.

This checklist identifies whether certain, common hazards exist. It does not assess the level of risk, and this checklist alone should not be used to determine if changes should be implemented.

This checklist should be used with the full participation and input of the employees who perform the job/task in question. Observations alone are not enough, and it is not appropriate for the person(s) using the checklist to base decisions only on what they see or think about a job. When using the checklist you should always:

- Understand the task(s) the employee performs during the day, how long they perform the task for and/or how often
- Ask employees what concerns they have about the design, set-up and organization of their workstation and work areas
- Ask workers if they find specific MMH tasks to be physically demanding or if they have experienced pain or discomfort that they relate to performing MMH tasks
- Consider individual needs based on body size, previous injury, etc.
- Observe tasks being done when practical
- Ask the employee if you are unsure

Manual Materials Handling Hazard Identification Checklist

Analyst's Name:	
Date:	Time:
Company:	Department:
Job Name	
Brief Description of Specific MMH Task:	

If the answer to any of the following questions is "YES" further assessment may be required in order to better identify and prioritize hazards that need to be controlled to reduce the risk of a MMH-related injury!

Red Flag Issues:	Yes	No
Does this task have a history of MMH-related injuries?		
Are any of the weights handled at this job more than 23 kg?		

Manual Materials Handling Hazard Identification Checklist

MMH Task Demands:	Yes	No
1. repetitive lifting / lowering (>2 per minute)		
2. forceful and / or repetitive pulling / pushing tasks		
3. throwing or catching of objects		
4. lifting object by two or more people		
5. frequent carrying of objects for >3 meters		
6. lifting / placing objects from under shelves or other obstructions		
7. lifting / placing objects over an obstruction or barrier		
8. carrying of objects up / down stairs or ladders		
9. very accurate placement of objects		
10. handling of fragile objects		

MMH Task Postures	Yes	No
1. lifting / lowering from or to below knee height		
2. handling objects above shoulder height		
3. lifting / lowering with arms fully extended		
4. bending and twisting while lifting, lowering, pushing, or pulling		
5. lifting / lowering objects with a pinch grip		
6. lifting / lowering while continuously bent over		
7. other awkward or difficult postures, i.e. lying on back or side, crouching in a small space, etc.		

Manual Materials Handling Hazard Identification Checklist

For lifting, lowering, carrying or holding is the load: **Yes** **No**

1. hard to hold onto (no handles, sharp edges, slippery, vibrating, etc.)		
2. large or bulky		
3. unbalanced or unstable		
4. hard or impossible to see over		
5. do workers handle heavy loads with one hand		
6. do workers have to carry loads up or down stairs		

For pushing or pulling carts, wagons etc. does: **Yes** **No**

1. the device have small or damaged wheels or wheel bearings in need of replacement / greasing		
2. it take a lot of effort to get the device moving		
3. it take a lot of effort to keep the device moving		
4. the load on the device prevent the worker from easily seeing the path of travel, resulting in awkward postures		
5. the worker have to pull or push the device up or down stairs or ramps		

Environmental Conditions: **Yes** **No**

1. is the task performed in cold conditions		
2. is the task performed in hot and/or humid conditions		
3. is the lighting in the work area poor		
4. are the surfaces slippery, uneven or cluttered		
5. are workers exposed to whole body vibration		

Manual Materials Handling Hazard Identification Checklist

Work organization factors	Yes	No
1. employees have not been trained to use good MMH techniques		
2. employees are unable to get assistance for MMH tasks if required		
3. are MMH tasks performed for extended periods (i.e. overtime)		
4. is the pace of MMH tasks machine controlled		
5. does the pace of MMH tasks vary greatly over a shift		
6. does the weight of objects handled vary during the shift		
7. are hoists or other material handling devices provided but not used		

Other factors:	Yes	No
1. have employees expressed concerns about the demands associated with the MMH tasks performed on this job		
2. are MMH tasks performed by older employees		
3. are MMH tasks performed by employees who have had recurring musculoskeletal injuries (e.g. back or shoulder)		
4. do MMH tasks require high levels of strength		
5. have workers reported pain or discomfort that they associate with performing MMH tasks		
6. do some workers avoid performing certain MMH tasks		
7. is it difficult to find workers who are capable of performing these MMH tasks		

Manual Materials Handling Hazard Identification Checklist

Remember if the answer to any of the checklist questions is "YES", further discussion should take place to determine whether the identified hazards are of concern.

What prompted you to conduct this analysis:

- Proactive review of task related MMH hazards:
- Response to worker concerns/comments:
- Frequency/number of accidents/injuries at this job:
- Other (please explain):
-
-

Does this job have a history of accidents/injuries related to MMH tasks: Y N

If yes, over the past three years, how many accidents/injuries related to MMH tasks were recorded for this job?

Total # of MMH related accidents/injuries: _____

Which parts of the body have been affected:

- shoulder region: arm: upper back:
- lower back: neck region knee/leg:
- ankle/foot:

As with any checklist, this MMH Hazard Identification Checklist **does not measure the level of the risk to employees**, it simply indicates that a hazard is present, even if the hazard presents a very small risk to workers

Manual Materials Handling Hazard Identification Checklist

Use this list of possible solutions as a starting point when trying to identify changes that will reduce or eliminate MMH hazards.

Weights greater than 23 kg?

Can the work area be redesigned to eliminate the need to lift the load (conveyor systems, drop chutes, surface for sliding, etc.)?

Can the load(s) being lifted be repacked to reduce the weight?

Can the container be redesigned to make it easier to lift (handles, smaller container, etc.)?

Can the load be lifted with a mechanical aid (hoist, lift table, etc.)?

MMH Task Demands

Can the frequency of lifting/lowering, pushing or pulling be reduced?

Can the work be reorganized to eliminate the need to throw/catch items?

Can the work place be reorganized to eliminate the need to carry items up or down stairs (elevator, move work area to different level)?

Can manual handling of fragile items be eliminated?

Can the location where the item is placed be changed to increase space or improve guides to reduce the need to accurately place objects?

Postures

Can the lift height be raised/lowered to above knee height or below shoulder height (platforms, adjustable height tables, shelving, etc.)?

Can parts, equipment, controls, tools, or materials be moved closer to the worker to reduce reaching while lifting?

Manual Materials Handling Hazard Identification Checklist

Postures continued

Can the work area be reorganized or carts/bins be redesigned to eliminate twisting (work area layout, route used when pushing/pulling, improved cart/bin design)?

If items are lifted with a pinch grip, can the handles be placed on the container?

Can work surfaces be modified to eliminate the need to maintain a bent over posture (platforms, adjustable height tables, etc.)?

Can the work area size & space be increased to eliminate the need to lift while in other awkward postures (lying on back or side, crouching)?

Lifting, lowering, carrying, holding

Can the work area be redesigned to eliminate the need to carry the load(s) (conveyor systems, drop chutes, etc.)?

Can the container be redesigned to make it easier to carry (handles, smaller container, etc.)?

Can the work area be redesigned to reduce the distance of carry?

Pushing / Pulling

If pushing/pulling a cart/bin with wheels, are the wheels well-maintained (do they have flat spots or cracks, are they well greased)?

Can small wheels be replaced with larger wheels to reduce forces?

If floors are rough, cracked or have ridges can they be repaired or modified to make them smooth and easier to push/pull on?

Is there a need to use a motorized device to do the push/pull task?

Can the push/pull task be eliminated by better job or workplace organization?

Recognizing MMH-Related Hazards

Pushing / Pulling continued

Carts, etc. that are too low or too high

Workers should be able to keep their spine aligned when pushing or pulling. Carts, etc. need to be high enough or have handles so that workers don't have to bend to push or pull a cart. Also, handles should not be too high as shoulder postures can become awkward.

Loads that are too high

When loads are so high that workers can't see over the top of the load, they begin to use more hazardous MMH techniques, like leaning to one side when pushing, push/pulling the load from the side, or pulling the load and twisting the spine.



Equipment or loads that are unstable

When workers have to push or pull unstable equipment or when loads on the equipment are unstable they may need to exert more force to balance and control the device and / or load



High force pushing / pulling

High force pushing and pulling can significantly increase the risk of worker injury. When workers must exert very high levels of effort and use their entire body weight to get something moving then the forces are likely to exceed recommended guidelines.



Recognizing MMH-Related Hazards

Pushing / Pulling continued

Up inclines / stairs

Pushing carts up an incline can require workers to exert very high forces and adopt awkward back and shoulder postures. Pulling loaded dollies up stairs is also a hazardous task that should be avoided.

Pulling while twisting / reaching behind

Pulling can be a hazard because workers often adopt awkward back, neck and / arm postures so that they can see where they are going.



Carrying / Holding

Carrying heavy items

Carrying heavy items places high force loads on the lower back, upper back, shoulders, arms and hands. Even carrying short distances can lead to injury, especially if done frequently. Carrying heavy items a long way can result in both local muscle fatigue and whole body cardiovascular fatigue.



Carrying large / bulky items

When items being carried are large or bulky, the centre of gravity of the item is often far away from the worker's spine. This means that the force generated by the low back muscles will increase. Also large and bulky items are often hard to hold onto and difficult to control.



Recognizing MMH-Related Hazards

Carrying / Holding continued

Carrying items far away from the body

As with carrying large items, when workers carry anything and hold it far away from their body the forces that need to be generated by the low back muscles go up. This increases the strain on the muscles as well as the spinal discs and ligaments. Holding loads away from the body also increases the risk of shoulder injury.



Carrying items up or down stairs or ladder

If workers need two hands to hold onto an item while carrying it, they should not be carrying these items up or down stairs. Workers should never have to carry an item when climbing or descending ladders.

Other Hazards

MMH tasks with more than one person

Performing MMH tasks with more than one person can greatly reduce the risk to workers. It may also increase the risk if workers are not properly trained on how to handle items with one or more co-workers.



Lack of space / room

When workers perform MMH tasks in tight or confined spaces they are often forced to adopt awkward postures, such as crouching, reaching, kneeling or bending. Workers need the space and room to use good MMH techniques.



Recognizing MMH-Related Hazards

Housekeeping

MMH tasks are more hazardous when workers have to move around obstructions, step over cables, and avoid other items in their path of travel. Good housekeeping can help prevent slips, trips and falls while workers are performing MMH tasks.



Surface conditions

Poor surface conditions can also make MMH tasks more hazardous. Ice, snow, and water can lead to slips and falls and reduce traction. Holes, ridges and cracks will increase the chance of tripping while also making pushing and pulling tasks more difficult. More effort can also be required for pushing and pulling when surface conditions are soft.

Temperature

Very hot and humid working conditions can increase the risk of heat stress related problems and put more strain on a worker's cardiovascular system, especially when performing heavy and/or repetitive manual materials handling. Cold temperatures make it more difficult to grasp items being handled and cold muscles may be prone to injury.

Work Organization

Research has shown that many different organizational design factors can influence an employee's risk of injury when performing MMH tasks, and impact their effectiveness and performance. Some of these factors include:

- Lack of training in good MMH techniques
- Lack of convenient access to MMH equipment
- Lack of assistance if and when required
- Lack of rest / recovery time

Recognizing MMH-Related Hazards

- Lack of physical and mental variety during the day
- Lack of control over work pace

The first three organizational design factors are briefly discussed below.

Lack of training in good MMH techniques

All employees should be trained on how to perform good MMH techniques. This training needs to be specific to the type of MMH workers perform on the job and it should include both a class room and practical session where workers learn not only what they should do, but are provided with the opportunity to practice and receive feedback on their performance. Remember that training employees to use good MMH techniques is not enough. Their workplace also needs to be designed so that they can use these techniques.

Lack of convenient access to MMH equipment

Many organizations provide well-designed MMH equipment with the expectation that these devices will reduce the number of MMH-related injuries being reported. If, however, this equipment is not readily available and convenient for workers to use then there is a strong likelihood that workers will not take the time to use it.

Lack of assistance if and when required

Workers are often told to request help if they feel that MMH tasks are too demanding. But if assistance is not available or if workers receive negative comments when assistance is requested then they will soon stop asking, but will perform tasks that may exceed their capabilities.

Recognizing MMH-Related Hazards

Good MMH Techniques

Here are some general guidelines for good MMH techniques.

For lifting / lowering / carrying

Get as close as possible to an item before lifting

- keep it as close as possible to the body when lifting, when carrying / holding, and when lowering
- keep the 'centre of gravity' of the object as close to your 'spine' as possible

Keep the curves of your spine normal and 'neutral'

- keep the 'back straight' by maintaining the natural curves of the spine while you bend at the hips.
- keeping the normal curve in your lower back helps to protect your back.
- think ... Stick your butt out ... when lifting / lowering

Do not twist the trunk while lifting, lowering, or carrying:

Only use one hand to lift an item if it is small, relatively light and has good handles

For pushing / pulling

Pushing is always better than pulling

- get behind the object you want to move and use good pushing technique

Keep the curves of the spine neutral when pushing

Push with the hands at or just above waist height to minimize the load on the low back

Use your body weight and arms to start the object moving

- lean into the load, use your body weight to get it moving

Recognizing MMH-Related Hazards

General Design Guidelines for MMH Tasks

Some general design guidelines that can be used when looking at jobs and workstations where MMH tasks are performed are presented below:

- 1) Design all work areas and workstations to reduce the possibility of twisting. Twisting occurs whenever the shoulders and/or the trunk rotates with the feet in a fixed position.
- 2) Keep all lifts between knee and shoulder height of the employees. Use adjustable height platforms/tables to ensure that a very large percentage of the population can be accommodated.
- 3) Ensure that all items are presented to the employee so that they are able to pick them up close to the body. Do not require employees to lift over obstructions or out of bins on a regular basis.
- 4) If bins are required, provide equipment that can lift and tilt the bin to reduce the amount of bending. Also, provide the bins with large diameter wheels to reduce forces required when pushing/pulling. If no lift/tilt equipment is available, ensure that bins have drop-down sides.
- 5) When manual materials handling can not be eliminated in a job, use **well designed mechanical lifting aids** to reduce the chance of injury to the employee. Lifting devices should be designed with input from the employees doing the task so that the hoist operates in a manner conducive to the operators work method.
- 6) Always **look for ways to reduce or eliminate manual materials handling in any job**. This is especially important when the frequency of lifting is high.
- 7) Look for handles or proper hand holds on items that are lifted and carried.
- 8) Ensure that all items that need to be pushed/pulled are pushed and not pulled. Keep the wheel bearings on these items in good repair and use large diameter wheels to reduce required push forces.



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