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## Material Handling and Storing

### Overview

#### Introduction

Handling and storing material involves diverse operations such as hoisting tons of steel with a crane, driving a truck loaded with concrete blocks, manually carrying bags or material, and stacking drums, barrels, kegs, lumber, or loose bricks.

The efficient handling and storing of material is vital. These operations provide continuous flow of raw material, parts, and assemblies through the workplace, and ensure that materials are available when needed. Yet, the improper handling and storing of material can cause costly injuries.

#### In this module

In this module we will discuss the following:

- Material handling and storage hazards
- Moving, handling, and storing safety practices
- Equipment including conveyors, cranes, slings, and powered industrial trucks



Balance your load or get squished like a toad.

## **Potential Hazards**

### **Introduction**

Since numerous injuries can result from improperly handling and storing material, it is important to be aware of accidents that may occur from unsafe or improperly handled equipment and improper work practices, and to recognize the methods for eliminating—or at least minimizing—the occurrence of those accidents. Consequently, employers and employees can and should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment, and take the necessary steps to correct them.

### **Common hazards**

Some of the most common hazards associated with material handling and storage arise from

- manually moving the material
- mechanically moving the material
- the stored material itself, and
- using material handling equipment.

### **Common injuries**

Common injuries associated with material handling and storage include

- back injuries
- strains and sprains from improperly lifting loads or from carrying loads that are either too large or too heavy
- fractures and bruises caused by being struck by material or by being caught in pinch points, and
- cuts and bruises caused by falling materials that have been improperly stored or by incorrectly cutting ties or other securing devices.

### **Back injuries**

Back injuries accounted for more than 20 percent of all occupational illnesses, according to data from the National Safety Council. Workers frequently cite the weight and bulkiness of objects being lifted as major contributing factors to their injuries. Workers also frequently cited body movement as contributing to their injuries. Bending, followed by twisting and turning, were the more commonly cited movements that caused back injuries.

By 1994, the U.S. Bureau of Labor Statistics reported there were 613,251 over-exertion cases with lost workdays. The majority of those cases were due to lifting (367,424), pushing/pulling (93,325), and carrying (68,992). Those cases represent 27 percent of all lost-workday cases.

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## Moving Material

### Introduction

General safety principles can help reduce workplace accidents. Whether moving material manually or mechanically, employees should be aware of the potential hazards associated with the task at hand and know how to control their workplaces to minimize the danger.

### Safety guidelines for manually moving material

Manually moving material presents a variety of hazards to employees. Following safe work practices will prevent many injuries associated with manual movement of material.

Recommended safe work practices include the following:

- When manually moving material, employees should seek help when a load is so bulky it cannot be properly grasped or lifted, when they cannot see around or over it, or when they cannot safely handle the load.
- Handles or holders should be attached to loads to reduce the chances of getting fingers pinched or smashed.
- Workers also should use appropriate protective equipment.
- For loads with sharp or rough edges, wear gloves or other hand and forearm protection. In addition, to avoid injuries to the eyes, use eye protection.
- When the loads are heavy or bulky, the mover also should wear steel-toed safety shoes or boots to prevent foot injuries in case he or she slips or accidentally drops a load.



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## Moving Material, Continued

### Safety guidelines for mechanically moving material

Mechanical movement of material presents its own unique set of hazards. Not only are there the hazards of working with bulky, heavy, or odd shaped items, but also there are the hazards associated with using mechanical equipment. Recommended safe work practices include the following:

- Avoid overloading the equipment by letting the weight, size, and shape of the material being moved dictate the type of equipment used for transporting it.
- All material handling equipment has rated capacities that determine the maximum weight the equipment can safely handle and the conditions under which it can handle that weight.
- The equipment-rated capacity must be displayed on each piece of equipment and must not be exceeded except for load testing.
- When picking up items with a powered industrial truck, the load must be centered on the forks and as close to the mast as possible to minimize the potential for the truck tipping or the load falling.
- Never overload a lift truck since it would be hard to control and could easily tip over.
- Do not place extra weight on the rear of a counterbalanced forklift to allow an overload.
- The load must be at the lowest position for traveling and the truck manufacturer's operational requirements must be followed.
- All stacked loads must be correctly piled and cross-tied, where possible.



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## Storing Material

### Safety guidelines

Stored material must not create a hazard. Safety practices to prevent these hazards include the following guidelines:

- Storage areas must be kept free from accumulated materials that cause tripping, fires, or explosions, or that may contribute to the harboring of rats and other pests.
- When stacking and piling material, it is important to be aware of such factors as the materials' height and weight, how accessible the stored materials are to the user, and the condition of the containers where the materials are being stored.
- Non-compatible material must be separated in storage.
- Employees who work on stored materials in silos, hoppers, or tanks must be equipped with lifelines and safety belts.
- All bound material should be stacked, placed on racks, blocked, interlocked, or otherwise secured to prevent it from sliding, falling, or collapsing.
- A load greater than that approved by a building official may not be placed on any floor of a building or other structure. Where applicable, load limits approved by the building inspector should be conspicuously posted in all storage areas.
- When stacking material, height limitations should be observed.
- Bags and bundles must be stacked in interlocking rows to remain secure.
- Bagged material must be stacked by stepping back the layers and cross-keying the bags at least every ten layers.
- Boxed material must be banded or held in place using cross-ties or shrink plastic fiber.
- Drums, barrels, and kegs must be stacked symmetrically. If stored on their sides, the bottom tiers must be blocked to keep them from rolling. When stacked on end, put planks, sheets of plywood dunnage, or pallets between each tier to make a firm, flat, stacking surface.



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## Conveyors

### Introduction

To reduce potential accidents associated with workplace equipment, employees need to be trained in the proper use and limitations of the equipment they operate. This includes knowing how to effectively use equipment such as conveyors, cranes, and slings.



### Conveyor hazards

When using conveyors

- workers' hands may be caught in nip points where the conveyor medium runs near the frame or over support members or rollers
- workers may be struck by material falling off the conveyor, and/or
- workers may become caught on or in the conveyor, being drawn into the conveyor path as a result.

### Safety guidelines

To reduce the severity of an injury, follow these guidelines:

- An emergency button or pull cord designed to stop the conveyor must be installed at the employee's workstation.
- Continuously accessible conveyor belts should have an emergency stop cable that extends the entire length of the conveyor belt so that the cable can be accessed from any location along the belt.
- The emergency stop switch must be designed to be reset before the conveyor can be restarted.
- Before restarting a conveyor that has stopped due to an overload, appropriate personnel must inspect the conveyor and clear the stoppage before restarting.
- Employees must never ride on a material handling conveyor.
- Where a conveyor passes over work areas or aisles, guards must be provided to keep employees from being struck by falling material.
- If the crossover is low enough for workers to run into it, the guard must be either marked with a warning sign or painted a bright color to warn employees.

## Using Cranes

### Safety guidelines

Employers must permit only thoroughly trained and competent persons to operate cranes. Operators should know what they are lifting and what it weighs. For example, the rated capacity of mobile cranes varies with the length of the boom and the boom radius. When a crane has a telescoping boom, a load may be safe to lift at a short boom length and/or a short boom radius, but may overload the crane when the boom is extended and the radius increases.

Other guidelines for safe use of cranes include the following:

- All movable cranes must have boom angle indicators; those cranes with telescoping booms must have some means to determine boom lengths, unless the load rating is independent of the boom length. Load rating charts must be posted in the cab of cab-operated cranes.
- Always check the crane's load chart to ensure that the crane will not be overloaded for the conditions under which it will operate.
- Plan lifts before starting them to ensure that they are safe. Take additional precautions and exercise extra care when operating around powerlines.
- When used, the outriggers must rest on firm ground, on timbers, or be sufficiently cribbed to spread the weight of the crane and the load over a large enough area. This will prevent the crane from tipping during use.
- Hoisting chains and ropes must always be free of kinks or twists and must never be wrapped around a load. Loads should be attached to the load hook by slings, fixtures, and other devices that have the capacity to support the load on the hook.
- Persons thoroughly familiar with the crane and the methods of inspecting the crane, must inspect all cranes frequently, checking what ever could make the crane unserviceable.
- Critical parts—such as crane operating mechanisms, hooks, air or hydraulic system components, and other load-carrying components—should be inspected daily for any maladjustment, deterioration, leakage, deformation, or other damage.



## Using Slings

### Safety guidelines

When working with slings, employers must ensure that the following guidelines are enforced:

- Slings are visually inspected before use and during operation, especially if used under heavy stress.
- Riggers or other knowledgeable employees should conduct or assist in the inspection because they are aware of how the sling is used and what makes it unserviceable.
- A damaged or defective sling is removed from service.
- Slings are not shortened with knots or bolts or other makeshift devices.
- Slings are not loaded beyond their rated capacity.
- Suspended loads are kept clear of all obstructions, and crane operators should avoid sudden starts and stops when moving suspended loads.
- Employees remain clear of loads about to be lifted and suspended.

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## Powered Industrial Trucks

### Introduction

Workers who must handle and store material often use fork trucks, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines. Affected workers, therefore, should be aware of the safety requirements pertaining to fire protection, and the design, maintenance, and use of these trucks.



### Definition: Powered industrial trucks

The American Society of Mechanical Engineers (ASME) defines a powered industrial truck as a mobile, power-propelled truck used to carry, push, pull, lift, stack, or tier material. Powered industrial trucks, often called forklifts or lift trucks, can be ridden or controlled by a walking operator. Excluded from the OSHA standard are vehicles used for earth moving or over-the-road haulage.

### Modifications

An owner or user must not make modifications and additions affecting capacity and safe operation of the trucks without the manufacturer's prior written approval. In these cases, capacity, operation, and maintenance instruction plates and tags or decals must be changed to reflect the new information. If the truck is equipped with front-end attachments that are not factory installed, the user should request that the truck be marked to identify these attachments and show the truck's approximate weight, including the installed attachment, when it is at maximum elevation with its load laterally centered.

### Designated uses

There are 11 different types of industrial trucks, some having greater safeguards than others. There are also designated conditions and locations under which the vast range of industrial-powered trucks can be used. In some instances, powered industrial trucks cannot be used, and in others, they can only be used if approved by a nationally recognized testing laboratory for fire safety.

There are powered industrial trucks that are designed, constructed, and assembled for use in atmospheres containing flammable vapors or dusts. These include industrial-powered trucks equipped with additional safeguards to their exhaust, fuel, and electrical systems; with no electrical equipment, including the ignition; with temperature limitation features; and with electric motors and all other electrical equipment completely enclosed.

Some other conditions and/or locations in which specifically designed powered industrial trucks may be used include the following:

- Only powered industrial trucks without any electrical equipment, including the ignition, or those that have their electric motors or other electrical equipment completely enclosed should be used in atmospheres containing flammable vapors or dust.
- Powered industrial trucks that are either powered electrically by liquefied petroleum gas or by a gasoline or diesel engine are used on piers and wharves that handle general cargo.

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**Powered Industrial Trucks, Continued****Safety guidelines**

Safety precautions the user can observe when operating or maintaining powered industrial trucks include the following:

- High lift rider trucks are fitted with an overhead guard, unless operating conditions do not permit.
- Fork trucks are equipped with a vertical load backrest extension according to manufacturers' specifications, if the load presents a hazard.
- Battery-charging installations should be located in areas designated for that purpose.
- Facilities are provided for flushing and neutralizing spilled electrolytes when changing or recharging a battery, to prevent fires, to protect the charging apparatus from being damaged by the trucks, and to adequately ventilate fumes in the charging area from gassing batteries.
- Conveyor, overhead hoist, or equivalent material handling equipment should be provided for handling batteries.
- Auxiliary directional lighting is provided on the truck when general lighting is less than 2 lumens per square foot.
- Arms and legs are not placed between the uprights of the mast or outside the running lines of the truck.
- Brakes are set and wheel blocks or other adequate protection must be in place to prevent movement of trucks, trailers, or railroad cars when using trucks to load or unload material onto train boxcars.
- Sufficient headroom is provided under overhead installations, lights, pipes, and sprinkler systems.
- Personnel on the loading platform have the means to shut off power to the truck.
- Dockboards or bridgeplates should be properly secured, so they won't move when equipment moves over them.
- Only stable or safely arranged loads are handled, and caution is exercised when handling tools.
- Trucks whose electrical systems are in need of repair have the battery disconnected prior to such repairs.
- Replacement parts of any industrial truck are equivalent in safety to the original ones.



The brake is set; the forks are down before your feet touch the ground.

## Powered Industrial Truck Training

### Training requirement

OSHA requirements for powered industrial truck operator training as found at 29 CFR 1910.178(l). The requirements improve the training of these operators. The requirements also are intended to reduce the number of injuries and deaths that occur as a result of inadequate operator training. They apply to all industries in which the trucks are being used, except agricultural operations.

### Amount and type of training

The provisions mandate a training program that bases the amount and type of training required on the

- operator's prior knowledge and skill
- types of powered industrial trucks the operator will operate in the workplace
- hazards present in the workplace, and
- operator's demonstrated ability to operate a powered industrial truck safely.

### Certification

The employer shall certify that each operator has been trained and evaluated as required under 29 CFR 1910.187 (l). The certification will include the:

- name of the operator
- date of the training
- date of the evaluation, and
- identity of the person(s) performing the training or evaluation.

### Refresher training

Refresher training is required if the operator

- is involved in an accident or a near-miss incident
- is observed operating the vehicle in an unsafe manner
- is determined during an evaluation to need additional training
- is assigned to operate a different type of truck, or
- there are changes in the workplace that could affect safe operation of the truck.

Evaluations of each operator's performance are required as part of the initial and refresher training, and at least once every 3 years.

### Compliance dates

The dates by which powered industrial truck operators must be trained are shown on the following table.

<b>IF</b> the employee was hired . . .	<b>THEN</b> the initial training and evaluation of that employee must be completed . . .
before December 1, 1999	by December 1, 1999.
after December 1, 1999	before the employee is assigned to operate a powered industrial truck.