

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

1.0 Introduction

Material handling accounts for approximately 25% of all occupational injuries. Common injuries include strains, sprains, fractures, and bruises. The largest number of injuries occur to the fingers, hands, and back. These injuries are caused by poor equipment design, unsafe work practices, and failure to wear personal protective equipment. To reduce injuries associated with material handling, and to increase efficiency, manual material handling should be minimized and ergonomic principles should be introduced into the job design.

The purpose of this Guide is to provide information on safely handling materials both manually and mechanically. This Guide is based upon Occupational Safety and Health Administration's Industry Guide (OSHA) 2236 entitled Materials Handling and Storage.

2.0 Scope

This Guide applies to all Radford University employees that may handle or store materials. It explains the proper procedures and techniques required for safely handling materials both manually and mechanically.

The information contained in this Guide is not inclusive of all OSHA regulations. Please contact Environmental Health and Safety (EHS) at (540) 831-7790 or by email at ehs@radford.edu for more information regarding workplace hazards, safety precautions, and regulations.

3.0 Responsibilities

- Supervisors are responsible for ensuring employees are aware of proper lifting techniques.
- Supervisors are responsible for ensuring that hand trucks, dollies, and other lifting equipment are maintained in a safe condition.
- Supervisors are responsible for ensuring employees have available and use any equipment necessary to safely handle materials.
- Employees are responsible for following the guidelines stated in this Guide and using the appropriate equipment to handle materials.

4.0 Handling Materials

General

Before an employee is assigned to a job requiring heavy and/or frequent lifting supervisors should ensure that the employee is physical suited for the job. If the load is more than one person can handle, two employees should be assigned to the operation or mechanical handling

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

equipment should be used. The route over which the object is moved should be inspected to reduce slip and trip hazards.

The following procedures will be used when moving objects:

1. Inspect materials for splinters, jagged edges, burrs, rough or slippery edges.
2. Keep hands free of oil and grease. Wear gloves if necessary. Grasp the object firmly.
3. Keep fingers away from pinch points, especially when setting objects down.
4. When handling long objects such as pipes or lumber, keep hands away from the ends to prevent them from being pinched.

Lifting Techniques

Keep feet parted with one foot alongside the object and one behind. Squat down keeping the back straight and nearly vertical. Grip the object with the whole hand not just the fingers. Draw the load close to the body. Keep elbows and arms in. Tuck chin in to maintain a straight back line. Keep body weight directly over feet. Start upward thrust from the rear foot. Keep back reasonably straight. Let the arms and thighs take the strain, not the back. Do not twist your body. Turn your entire body including the feet as you turn with the load. If the load is too heavy to allow this, find someone to help you with the lift.

Carrying Techniques

Do not twist or turn the body; instead, move your feet to turn. Your hips, shoulders, toes, and knees should stay facing the same direction. Keep the load as close to your body as possible with your elbows close to your sides. If you feel fatigued, set the load down and rest for a few minutes. Don't let yourself get so fatigued that you cannot perform proper setting down and lifting technique for your rest.

Setting-Down Techniques

Set the load down in the same way you picked it up, but in the reverse order. Bend at the knees, not the hips. Keep your head up, your stomach muscles tight, and do not twist your body. Keep the load as close to the body as possible. Wait until the load is secure to release your handhold.

Important Things to Remember

- Use mechanical means (i.e. hand trucks, pushcarts) when possible for heavier or awkward loads. Remember to obtain training and authorization before using a forklift.
- It is easier and safer to push than to pull.

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

- Keep loads as close to the body as possible and do not twist while lifting, carrying, or setting down a load. Nose, shoulders, hips, and toes should all be facing the same direction.
- Minimize reaching.
- As a general rule, bend at the knees, not the hips.
- Get help when needed. Do not lift or carry things you don't feel comfortable with, no matter how light the load.
- Plan ahead for all parts of the lift: lifting, carrying, and setting down.
- Try to utilize proper handholds while lifting. If an item does not have a good handhold, think of ways to remedy this, such as placing the item in a container with good handholds, creating a safe and proper handhold with an appropriate tool, etc.
- Use personal protective equipment where needed, such as gloves with good grip and safety-toed shoes or boots where appropriate.
- Implement rest breaks and job rotation for frequent and/or heavy lifting.
- Place items to be lifted within the power zone. The power zone is close to the body, between the mid-thigh and mid-chest of the person doing the lifting. This is the area where the arms and back can lift the most with the least amount of effort.

Weight of Objects

Heavier loads place greater stress on muscles, discs and vertebrae.

Where possible, use mechanical means such as forklifts or hand trucks to transport heavy items. Ramps can be helpful in moving heavy items from one level to another. Materials that must be manually lifted should be placed at power zone height. Ensure that proper lifting principles (see above) are used. Try to order supplies in smaller quantities and/or break loads up into smaller, lighter quantities where possible. Is the container itself heavy? Perhaps a smaller or lighter container is available. Limit weight you lift to no more than 50 pounds. When lifting loads heavier than 50 pounds, you should use two or more people to lift the load.

Awkward Postures

Bending while lifting causes several problems for the back. It adds the weight of the upper body to the weight of the object being lifted. Bending and/or reaching moves the load away from the body and allows leverage to significantly increase the effective load on the back, leading to stress on the lower spine and muscle fatigue. Carrying loads on one shoulder, under an arm, or in one hand creates uneven pressure on the spine.

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

Move items close to the body and use the legs when lifting from a low location to minimize bending and reaching. Ensure proper housekeeping is taking place so that you may get as close to your lifting load as possible. Store and place materials that need to be manually lifted at the power zone. This can be accomplished by placing objects on shelves, tables, racks, or stacked pallets; or by using ladders or aerial lifts where necessary to elevate you and minimize overhead reaching. Roll-out decks in truck beds can be utilized to bring materials closer to the employee and eliminate the need to crawl into the back of a truck. Ensure that proper lifting principles (see above) are used, including avoiding twisting and hold the load close to the body.

High-Frequency and Long-Duration Lifting

Holding items for long periods, even if loads are light, increases the risk of back and shoulder injury since muscles can be starved of nutrients and wasted products can build up. Repeatedly exerting, such as when pulling wire, can fatigue muscles by limiting recuperation times. Inadequate rest periods do not allow the body time to recover.

Plan ahead when beginning work that will require high-frequency and long-duration lifting. This way, the work can be organized in such a way so as to minimize the time workers spend holding loads. Adequate rest breaks can be planned in, as well as job rotation between employees. This includes both rotating tasks (employees trade off on differing tasks) and team work (two or more employees work together doing different parts of the same activity to reduce strain). Planning can also include the pre-assembly of work items to minimize the time spent handling them during the actual work.

Inadequate Handholds

Inadequate handholds, such as boxes without handles or oddly-shaped loads, make lifting more difficult, move the load away from the body, lower lift heights, and increase the risk of contact stress and of dropping the load.

Where possible, utilize handholds such as handles, slots, or holes that provide enough room for gloved hands. Try to use materials that are packaged with proper handholds (your supplier may be able to provide different containers), or move materials into containers with good handholds. Wear protective equipment to avoid finger injuries and contact stress. Ensure that gloves fit properly and provide adequate grip. Suction devices are helpful in lifting junction boxes and other materials with smooth, flat surfaces. Other tools may be available that can create temporary handles.

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

Environmental Factors

Be aware of extreme temperatures that can affect lifting and material handling. For example, muscle flexibility decreases in cold temperatures, and hot temperatures can lead to heat stress. Low visibility or poor lighting increases the chance of trips and falls.

Do what you can to adjust work schedules to minimize exposure to extreme temperatures or low visibility. Wear appropriate clothing for the temperature in which you will be working. Drink lot of water to avoid dehydration in excessive heat. Provide proper lighting for areas with low light and try to perform work during daylight hours when possible.

Vibration

Using hand-held vibrating tools increases your risk of developing neural, vascular, and musculoskeletal disorders. Vibrations from impact with the work surface, the motion of a piston (e.g. a jackhammer) and the tool's engine, or unbalanced rotating mass are attenuated primarily through the musculoskeletal system (National Institute for Occupational Safety and Health, 1989).

Factors influencing how vibration affects the body include:

- Tool type and maintenance
- The duration of tool use and work conditions
- Grip force on the tool handle
- Muscular force applied to the tool
- Body position
- Clothing and gloves
- Skill level
- Noise
- Your physical condition
- Whether you use tobacco or drugs

To prevent vibration-related injuries, the National Institute for Occupational Safety and Health recommends the following measures:

- Decrease the level of vibration:
 - Use only the amount of power necessary to complete the job. Many tools don't need to be operating at full throttle to complete a task.

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

- Follow proper tool maintenance. Tuned engines can reduce vibration levels. Sharpened blades and newer grinding surfaces reduce the duration of exposure.
- Use special grip handles, dampened engine mounts, and shock-absorbing exhaust mechanisms (if possible) to reduce the transmission of vibration.
- Determine if vibrating tools are necessary to complete the job. Used automated techniques if possible.
- Alternate work tasks to avoid prolonged use of vibrating tools, by:
 - Limiting their use (especially high-acceleration tools) to one or two days per week.
 - Taking frequent breaks.
- Protect your hands from exposure to cold temperatures.
- Participate in training to learn how to properly use and maintain the tool. Schedule work and rest, and learn to recognize the early symptoms of a vibration-related disorder.
- Undergo periodic medical examinations.

Hand trucks

If the load is too heavy to move or pick up, use a hand truck. Hand trucks should not be overloaded or stacked above eye level. To ensure safety and reduce strain on the back, hand trucks should be pushed not pulled. Feet should be kept away from the wheels, and hands should be kept inside the handle.

Powered Industrial Trucks

Employees operating powered industrial trucks, which include forklift trucks, pallet trucks, and motorized hand trucks, must be trained and authorized by Environmental Health and Safety (EHS). Training programs shall include safe operating practices, OSHA regulations, and a driving test. All new operators, regardless of previous experience, must be trained. Refer to [OCS-101 Forklifts and Powered Industrial Trucks](#) for further information on this safety program.

5.0 Personal Protective Equipment (PPE)

All personal involved in materials handling and storage shall wear appropriate personnel protective equipment when performing tasks where the possibility of injury could be reduced by the use of PPE. The need for PPE will be determined by the EHS Specialist and the employee’s supervisor.

Hard hats shall be worn if there is a possibility of a head injury from falling objects. Safety gloves shall be worn to protect the hands from jagged edges and strapping wire and other

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

material handling accidents. In most cases gloves should be worn to protect the hand from injuries when moving materials. Safety glasses or goggles must be worn if there is a possibility of injury to the eyes. To protect the eyes, workers should wear eye protection when opening wire-bound bales and boxes.

To protect hearing, earplugs or earmuffs should be worn in areas of high noise. Injuries to the feet are common when moving materials. Workers shall wear safety shoes with steel toe protection if there is a possibility of injury to the toes from a falling object. Respiratory protection must be worn in areas of excessive dust or to protect workers from solvent vapors.

6.0 Storage

Warehouse Storage

Storage areas will contain adequate clearance for aisles, loading docks, and doorways. Signs should be posted to warn of clearance limits. Storage of materials will not create a hazard. Bags, containers, bundles, etc, stored in tiers shall be stacked, blocked, interlocked and limited in height so that they are stable and secure against sliding or collapse. In no case will piles exceed 20 feet. Storage areas will be kept free from the accumulation of materials that constitute hazards from tripping, fire, explosion or pests. Vegetation will be controlled around buildings and in open storage areas.

Covers and or guard rails will be provided for open pits, tanks, vats, ditches, etc. Sprinkler systems should be provided in warehouses with combustible roofs or floors. Small fire hose water systems sufficient to reach every part of the storage area shall be provided. Heating, lighting, refrigeration equipment, steam lines, and service equipment will be protected from contact with stored items. Smoking will be strictly prohibited in storage areas. No Smoking signs shall be prominently posted.

Materials shall not obstruct fire alarm boxes, sprinkler systems, fire extinguishers, first-aid equipment, lights, and electrical switches. All exits and aisles must be kept clear at all times and shall be appropriately marked. Maximum safe load limits of floors within buildings and structures, in pounds per square foot, shall be conspicuously posted in all storage areas, except for floors or slabs on grade. Maximum safe load limits shall not be exceeded.

Signs

Red color coded signs will be used to warn of dangers and to indicate the location of fire equipment. Yellow signs will indicate areas and procedures where caution should be used. White, and green signs will convey general safety information.

Title: Materials Handling and Storage Guide	Document No.: OCS-905
	Revision No.: 01 Date: July 17, 2017
	Approved By: Avraham Boruchowitz, CSP, CHMM

Open Yard Storage

Open yard storage should have driveways between and around combustible storage piles at least 15 feet wide and maintained free from accumulated rubbish, equipment, or other materials. Combustible materials must be piled with due regard to the stability of piles and in no case higher than 20 feet.

Bagged Materials

Bagged materials should be cross-tied with the mouths of the bags toward the inside of the pile. When the pile is 5 feet high, it should be stepped back one row for each additional 3 feet height. A pile of sacks must never be undermined by the removal of sacks from lower rows.

Brick and Masonry Blocks

Brick stacks should not be more than 7 feet in height. When a loose brick stack reaches a height of 4 feet, it should be tapered back 2 inches in every foot of height above the 4 foot level. Bricks must never be stacked for storage purposes on scaffolds or runways. This does not prohibit normal supplies on scaffolds during actual bricklaying operations. Masonry blocks should be limited to a stacked pile height of 6 feet. If blocks are stacked higher than 6 feet, the stack shall be tapered back one-half block per tier above the 6-foot level.

7.0 Document Revision History

Revision	Section(s) Changed	Change(s) Made:	Date
00	All	Initial Draft	Unknown
01	All	Draft overhaul, extensive rewrite	7/17/17

8.0 Document Author(s): John Crocker, CSP and Nathan Tripp, EHS Specialist