Eye on Safety

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National Institutes of Health
Office of Research Services
Division of Occupational Health and Safety

Providing a safe and healthy environment for employees, patients and visitors.

"Safe science and good science go hand-in-hand."

Safe lifting means fewer injuries

Injuries caused by overexertion during manual lifting activities continue to be a leading occupational health and safety issue. Although no approach totally eliminates injuries caused by lifting, an effective training program, along with ergonomically designed work tasks and equipment, will help to prevent injuries.

No specific OSHA standards address safe manual lifting practices. However, OSHA is able to cite employers under its general duty clause requiring employers to provide a workplace that is free of recognized hazards (Section 5(a) of the Occupational Safety and Health Act of 1970). OSHA can reference a lifting guide issued by the National Institute for Occupational Safety and Health (NIOSH) to enforce the general duty clause. The NIOSH guide provides a formula for determining the recommended maximum weight that may be lifted under specific lift conditions. Employers can then take measures to adjust the weight, provide lifting aids, or amend the workflow so that a given lift remains within the guidelines.

Number of work-related injuries due to lifting

It's pretty common to have to lift items at work. Manual lifting, however, is a source of many injuries. Overexertion while lifting can result in strains, sprains, torn ligaments or muscles, and ruptured or slipped disks. The Bureau of Labor Statistics reports that 94,420 workers in private industry suffered injuries due to overexertion while lifting during 2015. These injuries were serious enough to require days away from work.

In comparison, falls to a lower level (which many people consider to be more hazardous than lifting) caused 50,490 injuries during 2015.

Factors that contribute to the risk of injury

The weight of the load is obviously a factor in whether or not material can be lifted safely. Other factors include:

- The force needed to perform the lift;
- The frequency of lifting;
- The duration of lifting activities; and
- Postures and body motions during the lift.

Concerning the force needed to perform the lift, there may be increased risk for injury if:

- The lift involves pinching to hold the object;
- Heavy lifting is done with one hand;
- Very heavy items are lifted without the assistance of a mechanical device; or

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- Heavy items are lifted while bending over, reaching above shoulder height, or twisting.

The following postures and motions can contribute to the risk:

- Bending or twisting the back while lifting or holding heavy items;
- Lifting objects out of, or putting them into, cramped spaces;
- Leaning, bending forward, kneeling, or squatting during lifting activities;
- Lifting or carrying materials with the hands below the waist, above the shoulders, or to the sides of the body; or
- Carrying or holding lifted materials with the arms or hands in the same position for long periods of time without changing positions or resting.

Repetitive lifting for an extended period of time without a break can add to the risk. Individual variables such as age, sex, body size, state of health, and general physical fitness also influence your risk of injury.

Engineering controls reduce the risk

The most effective way to prevent injury is to redesign the work environment and work tasks to reduce lifting hazards. These engineering, administrative, and workplace controls take a close look at lifting jobs and redesign them so they are safer.

Engineering controls are used to redesign a job so employees do less strenuous manual lifting. These controls often involve the use of mechanical lifting equipment.

Engineering controls include:

- Reducing load weight or size;
- Adding handles to material packaging so that workers can get a strong, comfortable grip;
- Adjusting the work environment so workers can keep loads close to the body and between shoulder and knee height, without having to twist; and
- Installing mechanical lifting aids and material handling equipment (conveyors, slides, chutes, hoists, adjustable lift tables, and hand trucks).

NIOSH lifting equation helps determine safe lifting tasks

Employers can analyze the hazards of a lifting job. In 1994, NIOSH issued a revised lifting equation to help determine a recommended weight limit for specific lifting conditions.

The NIOSH lifting equation is:

RWL = LC x HM x VM x DM x AM x FM x CM

The recommended weight limit (RWL) is determined by the load constant (LC) and the six multipliers. The RWL value is the maximum weight that should be lifted under the six conditions of the lift. If the RWL is exceeded, the risk of injury should be reduced by changing work practices or job design. The LC, load constant, is equal to 51 pounds.

The other multipliers in the equation consider other lifting factors such as the horizontal distance and vertical height the object is moved, the total distance moved, the amount of twisting involved, the number of lifts, and the strength of the grip on the load. When one if these factors is less than ideal, the value of the multiplier for that factor in the equation is equal to a number less than one.

Depending on these multipliers, the RWL may decrease to less than 51 pounds. In other words, when conditions are less than optimal, the amount of weight that can safely be lifted is reduced. The RWL value will never exceed 51 pounds.

Plan ahead when you lift

Whether you're at work or at home, you know you're going to have jobs that involve manual lifting. It's easy to remember safe lifting rules when the load is heavy, but any load can cause an injury. Pay careful attention to how you lift, every time you lift. Follow these guidelines:

- **Size up the load before you lift.** If you don't know the load's weight, test it by moving one of the corners. Split up large loads into smaller units. If it's heavy, an awkward shape, or if you can't get a good grip, use a mechanical lifting aid; or get help from another worker. When in doubt, don't lift alone!
- **Plan ahead.** Make sure you have a clear path to carry the load, and a place to set it down, before you begin the lift.
- **Place your feet close to the object and center yourself in front of the load.**
- **Bend your knees to allow your stronger leg muscles to lift the load.**
- **Get a good grip.**
- **Lift straight up, keeping the load close to your body.** Let your legs do the work. If you are lifting with a partner, use a signal so you both lift at the same time.
- **Do not twist or turn your body once you have made the lift.** Initiate turns by moving your feet, not by twisting your shoulders and hips.
- **If you start to lose your grip, set down the load.**
- **Set the load down properly.** Lower the load into place by bending your knees. Again, if you are working with a partner, set down the load at the same time.

Safety focus: Air contaminants

An air contaminant is any substance that is accidentally or unwillingly introduced into the air, having the effect of rendering the air toxic or harmful to some degree. The greatest concern when dealing with hazardous materials is with air contamination.

There are several types of air contaminants:

- **Dusts** are tiny particles that are dispersed into the air (i.e., silica, flour, sawdust, etc.);
- **Mists** are tiny droplets of a liquid that has been atomized and dispersed into the air (i.e., paint sprays);
- **Fumes** are tiny particles that become suspended in the air, especially during welding or cutting operations (i.e., zinc fumes);
- **Vapors** are created when volatile liquids evaporate into the air (i.e., gasoline vapor); and
- **Gases** are elements or compounds that are normally in the gaseous state at ambient temperatures and pressures (i.e., chlorine, carbon monoxide).

Every exposure to air that's contaminated by dusts, fumes, mists, vapors, or gases isn't necessarily hazardous. Certain levels of exposure can be safe. The hazardous properties of a given chemical, the concentration in the air, and the length of time a person is exposed are all considered to determine how much of the chemical a person may be safely exposed to. Air monitoring test equipment is used to measure the concentration of the contaminant in the air. OSHA sets limits on how much of an air contaminant can be in the air while you work.

What do the Limits Mean?

OSHA's permissible exposure limits (PELs) for various chemicals are listed in the air contaminants standard (1910.1000), Tables Z-1, Z-2, and Z-3, and in the regulations for specific chemicals. PELs are the highest amount of an air contaminant that you can safely be exposed to for a certain amount of time. PELs are typically based on eight-hour time-weighted average (TWA) concentrations. In general, it's safe to work an eight-hour shift when the air contains the contaminant at a level that's at or below its PEL.

PELs are important because they:

- Help identify harmful conditions in the workplace;
- Identify the need to conduct additional exposure monitoring;
- Help identify when control measures are needed and when their use is effective;
- Help determine when respirators are needed; and
- Can be used to trigger medical surveillance, regulated areas, and other requirements in chemical-specific standards.

As a rule of thumb, the lower the value of the PEL, the more harmful the chemical. For example, if a very small exposure to a chemical is hazardous to your health, that chemical will have a small value listed as its PEL. So, in general, a chemical that has 10 ppm listed as its PEL is more toxic than another chemical that has 500 ppm listed as its PEL. You can find exposure limit information on a chemical's safety data sheet (SDS).

In many of the chemical-specific standards, OSHA establishes action levels that are lower than the stated PEL. When air concentrations have reached the action level, employers must comply with most provisions of the standard (e.g., medical surveillance, designation of regulated areas, control measures, employee training, etc.). For most chemical-specific regulations, OSHA requires monitoring to be done at specific intervals.

Engineering, administrative, or work practice control methods are used to keep exposures at or below the PELs. Examples of engineering controls are exhaust ventilation equipment or substituting a less toxic chemical. Administrative and work practice controls could be limiting the amount of a chemical allowed in the workplace or making sure containers are closed when they're not in use. If these control methods don't provide enough protection, employees have to wear respirators and/or other types of personal protective equipment (PPE).

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Opioid misuse is a national crisis

"What you do speaks so loudly that I cannot hear what you say."

By
Ralph Waldo Emerson

1803-1882

Opioid abuse has become a nation-wide epidemic.

The drug overdose death rate in the United States has risen significantly over the past decade and a half, driven by heroin use and the misuse of prescription opioids.

About two-thirds of drug overdose deaths involve heroin and prescription opioids, according to the Centers for Disease Control and Prevention (CDC). The number of overdose deaths involving opioids was five times higher in 2016 than it was in 1999.

The increase in opioid misuse and addiction has led to the National Institute on Drug Abuse to call the situation a national crisis. About 115 Americans die every day from an opioid overdose.

In light of the crisis, the U.S. Department of Health and Human Services is focusing on improving access to treatment and recovery services, promoting the use of overdose-reversing drugs, and advancing better pain management practices.

The CDC points out that it can be difficult to recognize an opioid overdose. Signs can include small "pinpoint" eye pupils, falling asleep or loss of consciousness, slow and shallow breathing, choking or gurgling sounds, a limp body, and pale, cold skin.

If signs are seen, it is important to call 911 or seek medical care and stay with the person until help arrives.

The use of heroin has increased dramatically over the past 15 years, a trend that's tied to the misuse of prescription drugs.

Use of the highly addictive opioid is up among both men and women, in most age groups, and across all income levels, according to the CDC. Three of four people who report using heroin have previously abused prescription opioids, the CDC says.

The CDC points to several possible reasons for the increase in heroin use:

- Greater availability of the drug;
- Its relatively low price when compared to prescription opioids; and
- The purity of heroin in the United States.

The rise in heroin-related deaths is part of a nationwide opioid crisis, which has its roots in a significant increase in opioid prescriptions that began in the 1990s.

The CDC notes that the number of prescription opioids sold to pharmacies, hospitals, and doctors' offices nearly quadrupled from 1999 to 2010, yet there was no corresponding increase in the amount of pain reported by patients.

In 2015, it was estimated that 2 million people in the United States had a substance use disorder related to prescription opioid pain relievers. An additional 591,000 suffered from a heroin use disorder.

Heroin use rate increasing

Sex	2002-2004*	2011-2013*	% Change
Male	2.4	3.6	50
Female	.08	1.6	100

*Annual average rate of heroin use (per 1,000 people in each group)