

# Ergonomic Hazards in Construction



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# OSHAcademy Course 152 Study Guide

## Ergonomic Hazards in Construction

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Contact OSHAcademy to arrange for use as a training document.

This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 152.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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## Modules and Learning Objectives

### Module 1: Ergonomic Risk Factors

Learning objectives in this module include:

- ) Define ergonomics and the risks inherent in the worker, task, and environment.
- ) Discuss risk factors in the worker including: age, gender, physical activity, strength and anthropometry (scientific study of the measurements & proportions of the human body).
- ) Discuss risk factors in the task including: force, vibration, repetition, recovery time, duration twisting, and posture.
- ) Discuss risk factors in the environment including: illumination, sound, temperature, and psychosocial.
- ) Define and give examples of work-related musculoskeletal disorders (MDSs).

### Module 2: Solutions to Ergonomic Hazards

Learning objectives in this module include:

- ) Describe the "Hierarchy of Controls" and how it relates to ergonomics improvement.
- ) Define and give examples of ergonomics "engineering controls."
- ) Define and give examples of ergonomics "administrative controls."
- ) Define and give examples of ergonomics "personal protective equipment."
- ) Describe safe lifting techniques.
- ) Describe the steps in prioritizing making ergonomic improvements.

## Course Introduction

There are many types of musculoskeletal disorders (MSDs), including back pain, carpal tunnel syndrome, tendinitis, rotator cuff syndrome, sprains, and strains. These illnesses and injuries affect one or more parts of the musculoskeletal system. They include sprains, strains, inflammation, degeneration, tears, pinched nerves or blood vessels, bone splintering and stress fractures. Symptoms include discomfort, pain, fatigue, swelling, stiffness, or numbness and tingling.

### The High Cost of MSDs

- ) MSDs account for 34 percent of all lost-workday injuries and illnesses.
- ) Employers report nearly 600,000 MSDs requiring time away from work every year.
- ) MSDs account for \$1 of every \$3 spent for workers' compensation.
- ) MSDs each year account for more than \$15 billion to \$20 billion in workers' compensation costs. Total direct costs add up to as much as \$50 billion annually.
- ) On average, it takes workers 28 days to recover from carpal tunnel syndrome, longer than the time needed to recover from amputation or fractures.
- ) Workers with severe injuries can face permanent disability that prevents them from returning to their jobs or handling simple, everyday tasks.

In this course, we'll look at practical ideas to help reduce the risk of repetitive stress injury in common construction tasks. While some solutions may need the involvement of the building owner or general contractor, there are also many ideas individual workers and supervisors can adopt.



## Module 1: Ergonomic Risk Factors

### What is Ergonomics?

Ergonomics means finding ways to work easier and just as productive. The goal of the science of ergonomics is to find a best fit between the worker and job conditions. Ergonomics tries to come up with solutions to make sure workers stay safe, comfortable and productive.

Ergonomics also means working smarter, not harder. It looks at the following risk factor categories to see how the job can best fit the worker:

- ) **Risk factors inherent in the worker.** Physical, psychological and non-work-related activities may present unique risk factors.
- ) **Risk factors inherent in the task.** Work procedures, equipment, workstation design may introduce risk factors.
- ) **Risk factors inherent in the environment.** Physical and psychosocial "climate" may introduce risk factors.

Ergonomic hazards can cause painful and disabling injuries to joints and muscles on a construction site. According to the Occupational Safety and Health Administration (OSHA), ergonomic hazards are the most frequently occurring health hazards in construction and the cause of most injuries.

In a recent survey, 40 percent of construction workers said "working hurt" is a major problem. Working hurt reduces productivity, but continuing to work hurt can result in disabling injuries that end a career. Many laborers retire by age 55 because they just can't do the work anymore. Many can't enjoy their retirement because of their disabilities.

## Quiz Instructions

Read the material in each section to discover the correct answer to questions. Circle the correct answers. When you're finished with the course and all quiz questions, go online to take the final exam. The exam is open book, so you can use the study guide while taking the exam.

### 1. Which of the following is NOT one of the general risk factor categories?

- a. Factors inherent in the worker
- b. Factors inherent in regulations
- c. Factors inherent in the task
- d. Factors inherent in the environment

## Risk Factors Inherent in the Worker

Each worker's ability to respond to external demands of a task is different and unique. Studies show that stereotyping or making general assumptions about an employee's ability based on any one of the factors listed below is not correct. The studies described below emphasize the fact that you can't group workers into broad categories. Everyone is unique and work needs to be designed to match each employee's unique abilities. The only way to really know what employees can do is to interview and evaluate them based on the inherent factors listed below:

**Age:** By the age of 35, most people have had their first episode of back pain. The prevalence of ergonomic injuries increases as people enter their working years. Musculoskeletal impairments are among the most prevalent and symptomatic health problems of middle and old age. However, remember, don't assume all middle- and old-age workers have the same health problems.

**Gender:** Whether the gender difference seen with some musculoskeletal disorders (MSDs) in some studies is due to physiological differences or differences in exposure is unclear. One study concluded that the lack of workplace accommodation to the range of workers' height and reach may, in part, account for the apparent gender differences.

**Physical activity:** Physical activity may cause injury. However, the lack of physical activity may increase susceptibility to injury. We can define "fitness" as combinations of strength, endurance, flexibility, musculoskeletal timing, and coordination. There is clear evidence that stretching exercises do have a positive effect on the reduction of MSDs.

**Strength:** A worker's strength is important, but not necessarily the key. "Heavy work" stresses the heart and lungs which may result in rapid fatigue - general or localized. The probability of

injury increases as muscles weaken. Consequently, demanding repetitive or static muscular work requires energy, not necessarily strength. You may be strong, but not have sufficient energy to do the task.

**Anthropometry:** Designing for only the "average" person causes problems for everyone else. Anthropometry is the science of studying the difference in body size and proportions by measuring various body characteristics, including weight, physical range of mobility, and body dimensions. This information is then used by designers to engineer tools, equipment, furniture and workstations for maximum efficiency for each individual worker.

The basic ergonomic strategy is to design work based on each worker's unique abilities and not their membership in a general group. Judgment should not be based solely on any one of the above factors. For instance, don't assume that all "old" workers have the same abilities or ergonomic issues. It is important to design work based on the unique factors inherent in each individual, rather than designing work based on generalities.

**2. By what age do most people have their first episode of back pain?**

- a. 35
- b. 40
- c. 45
- d. 50

**Risk Factors Inherent in the Task**

In addition to considering the worker attributes that may increase the risk of injury, we must also analyze the risk factors the work task itself brings to the job. We look at the task variables in the workplace that may increase or decrease the risk of cumulative trauma disorders (CTDs) depending on its design and location.

In large measure, work processes are determined by the factors below:

**Force:** Forcefulness is the amount of physical effort required by the person to do a task and/or maintain control of tools and equipment. Examples of work activities that exert force on the body include any job that requires: lifting, lowering, pushing, pulling, pinching, pounding, hitting, and jumping.

**Vibration:** Duration of exposure to vibration plays a large role in the effects of vibration forces. There are two basic types of vibration that can result in MSDs:

- **Segmental vibration:** When handling vibrating tools for a prolonged duration, vascular insufficiency in the hand and fingers can also result in interference with sensory receptor feedback. If a worker can't "feel" the grip properly, he or she may compensate by applying more force than is necessary to hold and handle an object. Segmental vibration has also been linked to carpal tunnel syndrome.
- **Whole body vibration:** When the whole body is subjected to vibration, as most commonly experienced by truck drivers, there is an enhanced risk of injury, especially to the lower back.

**3. Which disorder had been linked to segmental vibration?**

- a. Carpal tunnel syndrome
- b. Low back injury
- c. Neck injuries
- d. Benoid's syndrome

**Repetition:** Repetition is a measure of how frequently we complete the same motion or exertion during a task. Construction workers nailing shingles, sheetrock, and lumber can suffer from repetitive motion injuries, especially at the wrist. The severity repetitive motion injuries depend on:

- ) The frequency of repetition,
- ) speed of the movement or action,
- ) the number of muscle groups involved, and
- ) the required force during movement.

**Recovery time:** Recovery time is a measure of the rest (or low stress activity) period available to the muscle group between similar exertions. Recovery time is important in preventing muscle fatigue because oxygen and metabolites can rejuvenate while uric acid and other waste products are removed from the muscle group. Recovery time needed will lengthen as the duration of the task increases.

**Duration:** Duration is a measure of length of time of exposure to a risk factor. Of course, the assumption is that the longer the duration of exposure, the greater the risk of injury. Duration may be measured in seconds, minutes, hours, days, weeks, months, and even years.

As with most individual risk factors, duration must be considered along with other people, tasks, and environmental risk factors such as the physical conditioning of the worker, posture, force, weight, temperature, stress, etc.

**4. Which of the following is NOT a factor influencing the risk from repetition during a task?**

- a. Frequency
- b. Speed of movement
- c. Force required during movement
- d. The length of the muscle group

**Twisting:** Twisting in the middle of a lift greatly amplifies the forces on the lower back. The point at which twisting is most likely to cause an injury when lifting objects is in the middle of the lift. Material handling and brickwork are good examples of tasks that require twisting.

**Posture:** Posture is the position of the body while performing work activities. Awkward posture is a deviation from the ideal working posture of arms at the side of the torso, elbows bent, with the wrists straight. Awkward postures typically include reaching behind, twisting, working overhead, kneeling, forward or backward bending, and squatting. If the posture is awkward during work, there is an increased risk for injury. The more the joint departs from the neutral position, the greater the likelihood of injury.

Listed below are some specific postures that may be associated with increased risk of injury:

- ) Extending or flexing the wrist, up and down, regularly is associated with a greater risk of carpal tunnel syndrome.
- ) Bending the hand toward the little finger regularly greater than 20 degrees increases the risk of pain and other issues.
- ) Raising the arms which flexes the shoulders greater than 60 degrees for more than one hour a day increases the risk of acute neck and shoulder pain.
- ) Hands working at or above shoulder level can result in increased risk of tendinitis and various shoulder problems.
- ) The greater the angle of the neck moves forward, backward or side to side, the more quickly neck and shoulder pain results.
- ) Bending at the lower back while working increases the likelihood of low back disorders.

**5. When does twisting greatly amplify the forces on the lower back during a lift?**

- a. During the start of the lift
- b. During the middle of the lift
- c. At the end of the lift
- d. At all points of the lift

**Risk Factors Inherent in the Environment**

Environmental risk factors refer to the physical and psychosocial climate in the workplace include:

- ) **Illumination** - Inadequate light can increase the number of attempts in completing a task.
- ) **Sound** - Sound can be an irritant to increase stress.
- ) **Humidity** - Humidity has an impact on worker endurance which affects the duration with which work can be conducted safely.
- ) **Temperature** - Be it too hot or too cold, in combination with any one of the above risk factors may also increase the potential for MSDs to develop.
- ) **Psychosocial** - Psychosocial work demands in terms of job control, psychological demands, social support and job dissatisfaction all can influence the rate at which employees are injured. If your employer forces employees to work fast, not safe, the likelihood of MSDs increases.

**6. How can the psychosocial environment influence ergonomic hazards?**

- a. MSDs increase when employees are happy
- b. It can cause poor attitudes and low morale
- c. Causes employees to work in cold environments
- d. Demands to work fast can increase MSDs

**Work-Related Musculoskeletal Disorders (MSDs)**

MSDs occur when the physical capabilities of the worker do not match the physical requirements of the job. They are caused by job activities and conditions, like lifting heavy objects, repetitive motions, and work in confined areas.

- J MSDs are injuries and disorders of the soft tissues (muscles, tendons, ligaments, joints, and cartilage) and nervous system.
- J They can affect nearly all tissues, including the nerves and tendon sheaths, and most frequently involve the arms and back.
- J MSDs are the leading cause of disability for people in their working years.
- J Complaints about back, knee and shoulder/upper arm are the most prevalent among construction workers.

Studies indicate upper limb and shoulder MSDs were related to manual handling, work repetitiveness, psychosocial demands, job dissatisfaction, gender and physical unfitnes.

Construction workers have an increased risk of these injuries in the following instances:

- J when carrying heavy loads
- J twisting hands or wrist
- J stretching to work overhead
- J using certain types of tools
- J using vibrating tools or equipment

**7. MSDs are injuries and disorders of the following, except \_\_\_\_\_.**

- a. bones
- b. joints
- c. tendons
- d. muscles

### Lower Back

When you bend forward, your back muscles work harder and the ligaments flex and stretch. The discs get squeezed. As they are squeezed, they can press on different parts of the spine, including nerves. This can cause back pain. If you bend forward over and over for months or years, the discs are weakened, which may lead to disc rupture (or “herniation”).

Twisting your body while bending puts even more pressure on the discs, and more stress on the cartilage and ligaments, especially when you are exerting force to lift, push, or pull objects.

## Knee

The muscles in your knees are connected to your leg by tendons. Between the tendons and bones are small sacs of fluid called bursa. They lubricate the knee so it moves easily.

Continual stress on your knee can cause the bursa to get squeezed, swollen, stiff, and inflamed (bursitis). This stress can also cause the knee tendons to become inflamed, resulting in pain (tendinitis).

If you work in a kneeled, stooped position, there is stress on your lower back as well as your knees, possibly leading to back pain and even a serious back injury.

### **8. Which movement will greatly increase stress to the discs in your back while lifting?**

- a. Pushing
- b. Lowering
- c. Pulling
- d. Twisting

## Shoulder

Shoulder pains and injuries are usually the result of overworking the shoulder. When you keep your arm raised above your shoulder (or keep your arm stretched out), your shoulder begins to ache after a short time. It tires easily.

Continual stress on your shoulder can lead to suffering from bursitis and tendinitis. Another shoulder injury is the rotator cuff tear which can make routine activities difficult and painful.

## Neck

The neck is a complicated structure composed of seven bones called cervical vertebrae, one below another. It also has cartilage, nerves, muscles, and ligaments. When you keep your neck bent forward or backward, or bend it frequently, the muscles work harder and the ligaments flex and stretch. Eventually the ligaments can partially tear, resulting in neck sprain.



**9. Which of the following is NOT an injury that may occur if you continually stress the shoulders?**

- a. Wolf-Biederman syndrome
- b. Rotator cuff tear
- c. Tendinitis
- d. Bursitis

### **Arms, Hands, and Wrists**

If you carry heavy objects with hard sharp edges, they can dig into your skin and injure the soft tissues in your hands. Or, if you carry objects that are hard to grip and hold, they may force your hand or wrist into awkward, stressful positions and cause disorders like tendinitis or carpal tunnel syndrome.

#### **Tendinitis**

Most of the muscles that move your hand and fingers are actually in your forearm. These muscles are connected to the hand and fingers by tendons, which are like cords passing through your wrist.

You can strain the tendons in your wrist if you frequently exert strong force with your hand, bend your wrist while working, or repeat the same wrist movements over and over. If this strain continues over time, you may develop tendinitis. Tendinitis makes it painful to use your hand, especially to grasp things.

#### **Carpal Tunnel Syndrome**

The carpal tunnel is an area in your wrist that is surrounded by bone and tissue. A nerve and several tendons pass through this tunnel. If you have tendinitis and your tendons swell, there is less room in the tunnel for the nerve. When the nerve is squeezed this way, the condition is called carpal tunnel syndrome. It often leads to pain, tingling, or numbness in your hand, wrist, or arm. These symptoms are often felt at night.

If left untreated, carpal tunnel syndrome can weaken the hand and make it very difficult to grasp things or even use that hand at all.

## Epicondylitis

Forceful twisting motions may cause strain on your elbow tendons, causing discomfort or pain. This condition is called epicondylitis, also known as tennis elbow.

## Hand-Arm Vibration Syndrome (HAVS)

This condition is also called Renault's Syndrome and White-Finger Syndrome. Operating vibrating tools like needle guns, chipping hammers, and rotary hammer drills may lead to finger discoloration, tingling, and numbness. Gangrene is possible in the most severe cases.

For more information on general ergonomic factors in the workplace, please see OSHAcademy course [711 Introduction to Ergonomics](#).

**10. Injury to the elbow is called \_\_\_\_\_.**

- a. spinal stenosis
- b. epicondylitis
- c. tennis elbow
- d. b or c

## Module 2: Solutions to Ergonomic Hazards

### Solutions to Ergonomic Hazards

Ergonomic improvements are changes made to improve the "fit" between a job and the capabilities of the employees performing it. Making ergonomic improvements reduce physical demands, eliminate unnecessary movements, lower injury rates and their associated workers' compensation costs, and reduce employee turnover. When making improvements to ergonomics problems, use OSHA's "Hierarchy of Controls," which are listed below.

There are three prioritized solution strategies in the hierarchy of controls:

- ) **Engineering Controls** - implement physical change to the workplace, which eliminates/reduces the hazard on the job/task. Engineering controls are the most desirable, where possible.
- ) **Administrative and Work Practice Controls** - establish efficient processes or procedures. Administrative or work practice controls may be appropriate in some cases where engineering controls cannot be implemented or when different procedures are needed after implementation of the new engineering controls.
- ) **Personal Protective Equipment** - use protection to reduce exposure to ergonomics-related risk factors. Personal protection solutions have only limited effectiveness when dealing with ergonomic hazard.

**1. Which of the following has only limited effectiveness when dealing with ergonomic hazards?**

- a. Engineering control strategies
- b. Administrative control strategies
- c. Work practice control strategies
- d. Using personal protective equipment

### Engineering Controls

The most effective way to control ergonomic hazards is to eliminate the risk factors altogether. Sometimes you can change the tools, equipment, job design, or work area to remove the hazard completely.

Engineering improvements include rearranging, modifying, redesigning, or replacing tools, equipment, workstations, packaging, parts, or products. These improvements can be very effective because they may reduce or eliminate the underlying reasons for contributing factors.

Here are some examples of how engineering controls can be used to reduce ergonomic injuries:

- ) Use a device to lift and reposition heavy objects to limit force exertion.
- ) Reduce the weight of a load to limit force exertion.
- ) Reposition a work table to eliminate a long/excessive reach and enable working in neutral postures.
- ) Use diverging conveyors off a main line so tasks are less repetitive.
- ) Install diverters on conveyors to direct materials toward the worker to eliminate excessive leaning or reaching.
- ) Redesign tools to enable neutral postures.

**2. Which of the following hazard control strategies is considered most effective?**

- a. Engineering controls
- b. Administrative controls
- c. Work practice controls
- d. Personal protective equipment

## Engineering Control Improvement Options

### Workstations

- ) Raise or lower the work surface or the employee. This reduces bending, reaching, and awkward postures. A rule of thumb is to try to keep your hands at about elbow height when working.
- ) Use cut-out work surfaces to get closer to the work. this reduces visual effort and awkward postures.
- ) Reposition the work to reduce bending and reaching.

- J Reconfigure the workstation so that sliding and rolling replaces lifting and carrying.
- J Use adjustable equipment that allows for a comfortable, upright working posture.
- J Provide close, convenient storage for frequently used materials, parts, or tools to reduce reaching and awkward postures.
- J Provide comfort - foot rests, padding, and good lighting, all make work more comfortable.

### Material Handling

- J Use lifting aids to reduce force, repetition, and awkward postures in lifting or handling tasks. Examples of assist devices include vacuum lifts, manipulators, mechanical lifts, workstation cranes, scissors lift, and automatic feed systems.
- J Use mechanical aids reduce force, repetition, and awkward postures in transporting materials and products around the workplace. Examples include: adjustable carts, conveyors, and powered transport for longer distances.

### Storage and Retrieval of Materials

- J Provide adequate, well-lit storage with easy access to reduce repetitive reaching, bending, twisting, and forceful exertions. Use mobile, lightweight storage carts with adjustable trays. Tilted containers make access easier.
- J Increase the efficient use of storage space by grouping stored items by container size or shape.

**3. Mechanical and lifting aids can be used to reduce each of the following risk factors, except \_\_\_\_\_.**

- a. forceful exertions
- b. biological infection
- c. repetition
- d. awkward postures

## Tools and Equipment Selection

Good design and proper maintenance can help reduce pressure points on the hands, awkward postures (e.g., bent wrists), forceful exertions, and other contributing factors.

Workers should not have to use their hands or bodies as a vise to hold objects; mechanical devices do this much better. Tooling fixtures and jigs should be set up to avoid awkward postures and excessive forces.

Hand tools should fit the employee's hand; employees with small hands or who are left-handed may need tools designed specifically for these situations. When selecting and purchasing hand tools, the guidelines listed below should be followed.

- ) Select tools that allow the wrist to be held straight and that minimize twisting of the arm and wrist. Good working posture can be maintained when properly designed tools are used.
- ) Select tools that allow the operator to use a power grip (uses all fingers to grip), not a pinch grip (uses only thumb and forefinger). Minimal muscle force is required to hold objects in a power grip posture. The pinch grip requires excessive fingertip pressure, and can lead to a cumulative trauma disorder (CTD).
- ) Avoid tools that put excessive pressure on any one spot of the hand (i.e., sides of fingers, palm of the hand).
- ) For power or pneumatic tools, select tools with vibration dampening built in whenever possible. Provide personal protective equipment such as gel-padded gloves to reduce exposure to vibration.
- ) Use better, ergonomically-designed tools which may be lighter weight, require less force to operate, fit the hand better and are more comfortable to use.

#### 4. Which of the following is NOT an ergonomic recommendation when using hand tools?

- a. Select tools that allow for a power grip
- b. Use tools that minimize twisting of the arm
- c. Use tools that require the pinch grip to operate properly
- d. Use gel-padded gloves for tools that vibrate

**Handles:** Consider the following when choosing tools:

- )] Handles that are rounded, soft, and padded, and do not have any sharp edges or deep grooves reduce pressure points on fingers and hands.
- )] Handles should be at least 1 to 2.5 inches in diameter to allow a "power grip" (using thumb and all fingers to grip) and 5 inches long so they do not dig into your palms.
- )] Handles with high-friction surfaces or moldable substances improve the grip.
- )] Padded handles can reduce pinch grip (using only thumb and forefinger) and pressure points on the fingers.
- )] Look for tools with two handles to help improve control.

**Triggers:** Tools without triggers use contact switches to replace the triggers. Multi-finger triggers reduce forces on any one finger. Trigger bars can be used to reduce activation forces.

**Fixtures:** Fixtures can help by reducing forceful exertions by supporting the weight of the tool.

### Vibration Hazards

Ways to reduce hand-arm and whole-body vibration include:

- )] routine maintenance
- )] vibration-dampening wraps on handles
- )] isolating the tool from the operator
- )] properly fitting vibration-dampening gloves
- )] good design of an alternate or low-vibration tool
- )] suspending or supporting tools (e.g., by a fixture)
- )] providing vibration isolators (e.g., springs or pads) for seated work tasks
- )] providing cushioned floor mats for standing work tasks
- )] mounting equipment and work platforms on vibration-dampening pads or springs
- )] altering the speed or motion of tools and equipment

**5. Why should tool handles be at least 1 to 2.5 inches in diameter?**

- a. To allow a pinch grip
- b. To allow a power grip
- c. To make sure the palm digs into the handle
- d. To prevent white finger syndrome

**Administrative Controls**

Administrative improvements include changing work practices or the way work is organized. They may not address the reasons for the contributing factors or other problems.

Administrative improvements usually require continual management and employee feedback to ensure that the new practices and policies are effective. Below are some best practices for the workplace:

- )] Alternate heavy tasks with light tasks.
- )] Provide variety in jobs to eliminate or reduce repetition using two primary strategies:
  - o Job rotation - rotating employees through different jobs.
  - o Job enlargement - increasing the variety by combining two or more jobs or adding tasks to a job.
- )] Adjust work schedules, work pace, or work practices. Limit the amount of time any employee must spend performing a “problem job.” Job hardening suggests new workers who are not used to the physical demands of the job should be gradually introduced to a normal work pace.
- )] Provide recovery time - recovery periods (i.e., muscle relaxation periods) can help prevent fatigue and injury to muscles.
- )] Modify work practices so that workers perform work within their midrange or power zone (i.e., above the knees, below the shoulders, and close to the body).
- )] Require that heavy loads are only lifted by two people to limit force exertion.
- )] Establish systems so workers are rotated away from tasks to minimize the duration of continual exertion, repetitive motions, and awkward postures. Design a job rotation system in which employees rotate between jobs that use different muscle groups.



- ) Staff "floaters" to provide periodic breaks between scheduled breaks.
- ) Properly use and maintain pneumatic and power tools.

**6. Each of the following is considered an ergonomic administrative control, except \_\_\_\_.**

- a. a grinder with two handles
- b. job rotation and job enlargement
- c. modified work practices
- d. rules for lifting, pulling, pushing, and lowering

**Good Housekeeping:** Regular housekeeping to eliminate clutter can reduce reaching, bending, or twisting when handling materials, tools, or objects. Keep floor surfaces dry and free of obstructions help eliminate slipping and tripping hazards.

**Maintenance:** Regular maintenance of tools and equipment can help reduce or prevent problems in work tasks. For example, keeping cutting or drilling tools sharpened and in good condition can reduce the amount of force and repetition required when using the tools.

**Exercise and stretching:** Long-term, sensible exercise and stretching have many benefits, which may include better health and reduced injuries. New, returning, or injured employees should gradually increase their physical activity.

**Cooperation:** Get help when needed to handle heavy loads. Some companies set weight limits (like 50 pounds) above which a helper is required.

**7. Which of the following would be considered an ergonomic administrative control measure?**

- a. Anti-vibration gloves
- b. Adequate layered clothing during cold days
- c. Padded handles on electric drills
- d. Stretching prior to the start of work

### Safe Lifting Techniques

Lifting can put a great strain on your back. Lifting from the floor can be particularly risky. For example, lifting a 25-pound box from the floor requires about 700 pounds of back muscle force, even when you bend your knees. Below are some tips that can help protect your back when you need to lift heavy objects.

- ) Try out the load first. If it is too bulky or heavy, get help.
- ) Avoid lifts that require stretching or bending to reach the load. Redesign the work area so objects you lift are close to the body and at waist height.
- ) Don't lift awkward objects such as long pipes or large boxes by yourself. Get help or use mechanical assists.
- ) When lifting, keep your back straight and lift with your legs.
- ) Lift slowly and carefully and don't jerk the load around.
- ) Keep the load as close to your body as possible while lifting it.
- ) Don't twist or turn your spine while carrying the load.
- ) Make sure your path is clear while carrying the object. Remove obstacles that could cause you to trip.

A program to teach workers how to lift properly should be used in combination with workplace redesign that reduces the amount of lifting needed. Remember, if materials are too heavy or awkward to lift and carry safely, get help, redesign the materials to be lighter and easier to handle, or use mechanical assists such as hoists, carts, or conveyors.

**8. Where should the load be placed while lifting?**

- a. At arm's length, away from body
- b. Close to the body
- c. It doesn't matter where the load is
- d. At shoulder level or higher

**Personal Protective Equipment**

Safety gear, or personal protective equipment (PPE), includes gloves, knee and elbow pads, footwear, and other items that employees wear.

- ) Gloves can protect hands from cold or injury. However, gloves may decrease manual dexterity and make it harder to grip if they do not fit correctly. Wear good fitting thermal gloves to help with cold conditions while maintaining the ability to grasp items easily

- )] Proper footwear and anti-fatigue soles can prevent employees from slipping and prevent fatigue from long hours of standing on hard surfaces.
- )] Knee and elbow pads can protect the body from pressure points when pressing against hard or sharp surfaces.

**Back belts:** Back belts are not typically considered to be personal protective equipment. They may help maintain the proper curvature of the spine during lifting or physical exertion and may also provide comfort and confidence while performing work tasks. However, you can't lift heavier loads just because you're wearing a back belt. If you use them all-day-every-day, your back muscles may get weaker.

**9. Back belts are considered personal protective equipment and may be used with personal fall arrest systems (PFAS).**

- a. True
- b. False

### Prioritize Your Work

You may want to choose some specific improvement options to try in your workplace. Setting your priorities will help you sort out which tasks you want to work on first. To do that, conduct ergonomics job hazard analyses (JHA) of hazardous tasks. JHAs focus on:

- )] worker variables (fitness, age)
- )] types of work (e.g., roofing, sheetrock, framing), and
- )] the work environment (e.g., lighting, cold exposures).

To determine which tasks you want to address first, consider the following:

- )] frequency and severity of complaints, symptoms, and injuries
- )] contributing factors or other problems you have identified in a particular task
- )] ideas your employees have for improvements
- )] difficulty of implementing various improvements

- ) your time frame for making improvements
- ) potential effects on productivity, efficiency, and product or service quality
- ) technical and financial resources at your disposal

For more information on general ergonomic factors in the workplace, please see OSHAcademy courses [711 Introduction to Ergonomics](#) and [722 Ergonomics Program Management](#).

**10. An ergonomic JHA will focus primarily on each of the following areas, except \_\_\_\_.**

- a. non-compliance with rules
- b. worker variables
- c. types of work
- d. the work environment

## **Additional Resources**

- ) [Construction Safety and Health, NIOSH](#)
- ) [Simple Solutions - Construction, NIOSH](#)
- ) [Workplace Use of Back Belts, NIOSH](#)
- ) [Ergonomic Guidelines for Manual Material Handling, NIOSH](#)
- ) [Construction Topics, Health & Safety Executive](#)
- ) [Occupational Safety and Health Administration Homepage](#)