Preventing Sprains, Strains and Repetitive Motion Injuries

Train-the-Trainer Course
Instructor's resource guide

Produced by:

State Building and Construction Trades Council of California, AFL-CIO

and

Labor Occupational Health Program, University of California, Berkeley

2012

(#SH-22310-11-60-F-6)

Acknowledgements

The State Building and Construction Trades Council of California (SBCTC) acknowledges the following organizations that provided information and/or photos for this course:

- Cal/OSHA
- Worker Occupational Safety and Health Training Program, The Commission on Health and Safety and Workers' Compensation, California, Department of industrial Relations
- The Center for Construction Research and Training (CPWR)
- U.S. Bureau of Labor Statistics, 2003-2009 Survey of Occupational Injuries and Illnesses and Current Population Survey (Calculations by The CPWR Data Center.)
- Sue Dong, DrPH, CPWR.
- NIOSH
- eLCOSH
- Oregon OSHA Online Course 1201: Introduction to Ergonomics
- Washington OSHA (WISHA)
- Liberty Mutual, Workplace Safety Index, 2010
- Canadian Centre for Occupational Health and Safety (CCOHS)

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This training is supported under grant number SH-22310-11-60-F-6 from the Occupational Safety and Health Administration, U.S. Department of Labor. It does not necessarily reflect the views or policies of the U.S. Department of Labor, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Preventing Sprains, Strains, and Repetitive Motion Injuries
State Building & Construction Trades Council of California

Course Objectives

After this course, participants will be able to:

- Define and explain the terms *Musculoskeletal Disorders (MSDs)* and ergonomics.
- Identify 3-5 risk factors for MSD injuries.
- Analyze a job task for risk factors.
- Identify 3-5 solutions to eliminate or reduce MSDs.
- Recognize the elements of a comprehensive ergonomics program.

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How The Binder Is Organized

This training program consists of this course binder, a PowerPoint (PPT) CD, five plastic laminated trigger photos, and a body chart template. All of these are located in the inside pocket of the binder.

CD. The PowerPoint presentation on the CD addresses sprains, strains and repetitive motion injuries specifically for construction workers. A paper copy of the PowerPoint presentation (including the Instructor's Notes) appears in section 3 of this binder. This PPT can be presented at one time in approximately 2 hours, or it can be presented over a few separate sessions. For example, you can do the body mapping activity on one day, the "ouch" activity on another day, and risk factors and solutions on a third day. Each activity will take approximately 15-20 minutes.

Trigger Photos and OSHA v-Tools. There are five trigger photos in the pocket of the binder. They are used in the small group activity on solutions. There are also two optional OSHA v-Tools for you to use. One is "Sprains and Strains in Construction/Pulling Cables," the other is "Sprains and Strains in Construction/Laying Stone." Both of these v-tools are described in section 4 of the binder.

Factsheets and Worksheet. The factsheets referred to in the Instructor's Notes of the PPT and the worksheet that is needed for the Small Group Activity on Solutions appears in section 5 of this binder. The factsheets come from reputable sources and are provided for training purposes only. The SBCTC is not responsible for the accuracy of these materials or for changes that may have occurred after the original publication date. Any reliance you place on such information is therefore strictly at your own risk. We suggest you contact Cal/OSHA for current regulatory compliance information.

Training Tips. Section 6 of the binder has information on training techniques that you may find helpful when presenting this program to others. These factsheets are from the Worker Occupational Safety and Health Training and Education Program (WOSHTEP), funded by the California Commission on Health and Safety and Workers' Compensation.

Resources. There is an extensive resource guide in section 7 of the binder. It has four sections: Part A: Selected Organizations, Part B: Training Materials (organized by trade), Part C: Glossary, and Part D: Selected Musculoskeletal Conditions.

Section 1: Agenda/Evaluation

Preventing Sprains, Strains, and Repetitive Motion Injuries

State Building & Construction Trades Council of California

Train the Trainer

Agenda — Day One

8:00-9:00am	**Introductions and Overview** • Course Overview • SBCTC Ergonomics Study • Pretest Quiz
9:00-9:30	**Preventing Sprains, Strains, and Repetitive Motion Injuries (PPT) Training** • How to use the PPT and course materials
9:30-10:00	**What Do You Know About Cal/OSHA - QUIZ** • Discuss answers to the quiz
10:00-10:15	**Break**
10:15-12:15	**Teach / Model PPT**
12:15-1:00	**Lunch**
1:00-2:30	**Understanding MSDs** Guest speaker
2:30-2:45	**Break**
2:45-3:30	**Demonstrating New Equipment**
3:30-4:00	**Review Day 1** Evaluation

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Train the Trainer

Agenda — Day Two

8:00-8:15am **Welcome Back**
- Questions from Day One
- Overview of Day Two
- Post Test

8:15-9:30 **How To Address Costs of MSDs**
- Guest Speaker: Jeff C. Tiedeman, SCIF

9:30-10:00 **How Adults Learn Best**
- Elements of good and bad training
- Effective Training Methods
- Aim for the Bull's Eye

10:00-10:15 **Break**

10:15-11:15 **Design and Prepare 15 Minute Workshop**
- Select pairs for the training activity
- Work in pairs to design a 15-minute workshop

11:15-12:15 **Practice Teaching Your Topic (Two Groups)**
- Each pair teaches a focus four topic for 15 minutes
- Small group gives feedback
- Each small group takes their own afternoon break

12:15-1:00 **Lunch**

1:00-3:00 **Practice Teaching Your Topic (Two Groups) cont'd**

3:00-4:00 **Post Test, Evaluation, and SBCTC Paperwork**
- Post Test
- Course Evaluation
- Review sign-in sheet that has to be returned to the SBCTC
- Next Steps

Preventing Sprains, Strains, and Repetitive Motion Injuries

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Pre Test

1. In 2010 how many injuries in construction resulted from Musculoskeletal Disorders (MSDs)?
    a. 10%
    b. 15%
    c. 25%
    d. 35%

2. What body parts are affected by Musculoskeletal Disorders (MSDs)? (Check all that apply)
    a. Muscles
    b. Nerves
    c. Tendons and cartilage
    d. Joints
    e. Spinal discs.

3. Name one Musculoskeletal Disorder (MSD):

    a. _____

4. According to Liberty Mutual, what accounts for 25% of all workers' compensation costs?
    a. Overexertion
    b. Falls
    c. Assaults
    d. Struck by an object.

5. What does "ergonomics" mean?
    a. Fitting the job to the worker.
    b. Fitting the worker to the job.

Preventing Sprains, Strains, and Repetitive Motion Injuries

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Pre Test (cont'd)

6. List 4 risk factors that can cause MSDs:
    a. _____
    b. _____
    c. _____
    d. _____

7. List 4 ways to prevent strains, sprains, and Musculoskeletal Disorders (MSDs):
    a. _____
    b. _____
    c. _____
    d. _____

8. Cal/OSHA has a standard on ergonomics that applies to construction.
    a. True ____
    b. False ____

9. What are the components of a workplace Ergonomics program? (Check all that apply)
    a. Management commitment and worker involvement
    b. Hazard Information and Reporting
    c. Job Hazard Analysis and Control
    d. Training
    e. MSD Medical Management
    f. Program Evaluation

10. Name one thing a contractor/employer can do to reduce MSDs on the job?

_____
_____
_____
_____
_____

What Do You Know About Cal/OSHA?

True	False	
☐	☐	**1.** The employer, the workers, and the union are all legally responsible for providing a safe and healthful workplace.
☐	☐	**2.** Only a worker directly affected by a hazardous situation may file a complaint with Cal/OSHA.
☐	☐	**3.** You must be a U.S. citizen to file a complaint with Cal/OSHA.
☐	☐	**4.** Employers will know when an inspector is coming and who filed the complaint.
☐	☐	**5.** During an inspection, Cal/OSHA inspectors must talk to workers.
☐	☐	**6.** Workers in California may refuse to do work that poses a substantial probability that death or serious physical harm could result.
☐	☐	**7.** It is illegal for a California employer to fire a worker because he/she complains about unsafe or unhealthful working conditions on the job.
☐	☐	**8.** If you suspect that something is hazardous in your workplace, the best course of action is always to call Cal/OSHA right away.

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Post Test

1. In 2010 how many injuries in construction resulted from Musculoskeletal Disorders (MSDs)?
    a. 10%
    b. 15%
    c. 25%
    d. 35%

2. What body parts are affected by Musculoskeletal Disorders (MSDs)? (Check all that apply)
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    b. Nerves
    c. Tendons and cartilage
    d. Joints
    e. Spinal discs.

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Post Test (cont'd)

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    c. Job Hazard Analysis and Control
    d. Training
    e. MSD Medical Management
    f. Program Evaluation

10. Name one thing a contractor/employer can do to reduce MSDs on the job?

_____
_____
_____
_____
_____

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Train the Trainer Course Evaluation

Thank you for taking the time to complete this evaluation. Your feedback is important and will be used to improve the program.

Overall Training Elements

Please rate the following aspects of the training, using the scale below:

	Poor	Fair	Good	Excellent
Content of Training/Materials	1	2	3	4
Organization of Training	1	2	3	4
Quality of Presenters	1	2	3	4
Relevance to Your Work	1	2	3	4
Opportunity for Participation	1	2	3	4
Rating Training Overall	1	2	3	4

Comments

_____
_____
_____
_____
_____

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Train the Trainer Course Evaluation

Please evaluate each training topic below. Circle the best answer.

	Not Useful	Useful	Very Useful
Overview/Definition of MSDs	1	2	3
Body Mapping	1	2	3
Ouch activity	1	2	3
Overview of risk factors & solutions	1	2	3
Small group activity - Solutions	1	2	3
Practice Teaching Session	1	2	3

How confident are you teaching co-workers or students about health and safety using the activities from this course?

___ Not confident ___ Somewhat confident ___ Confident

Other Comments

_____
_____
_____
_____
_____
_____
_____
_____

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Train the Trainer Course Evaluation (cont'd)

1) What did you like most about the training today?

_____
_____
_____
_____
_____

2) How could the training be improved?

_____
_____
_____
_____
_____

3) What additional training would you like on health & safety at your job?

_____
_____
_____
_____
_____

4) Other comments?

_____
_____
_____
_____

Section 2: Instructor's Guide

Preventing Sprains, Strains, and Repetitive Motion Injuries

State Building & Construction Trades Council of California

Instructor's Guide

State Building and Construction Trades Council of California
and the
Labor Occupational Health Program
University of California, Berkeley
2012

Overview and Course Outline

The goal of this course is to give workers in the construction trades the information they need to help reduce Musculoskeletal Disorders (MSDs). The information in this course focuses on risk factors, prevention strategies and solutions. The course is designed as a model worker training program based on best practices that are feasible for the construction industry. The course is intended to be presented to rank-and-file construction workers at the job site or union and/or students in apprenticeship instruction.

This *Instructor's Guide* and the accompanying PowerPoint slide presentation provide an overview of the leading causes of Musculoskeletal Disorders (MSDs) in the construction industry and ways to prevent them.

The course emphasizes participatory training methods. It includes class discussion, interactive group activities, and small group activities. These activities encourage participants to relate the material they are learning to their own jobs and experiences.

Specialized technical knowledge is not necessary to teach this course. With some preparation, foremen, union staff, apprenticeship instructors and others can present the material. The "training of trainers" (TOT) classes we offer will allow trainers from a variety of backgrounds to become familiar with the course and later present it to workers.

The course is flexible and can be presented in different ways. Feel free to adapt it to your own situation. Most commonly, trainers who have completed the TOT class will give one 20-40 minute session at the job site or apprentice classroom on a section of the course they think is most relevant at the time. Another option is to present the entire course in one 2-3 hour class.

Preparation and Materials Needed

Specific instructions for conducting the activities in this course appear in the Notes section of the PowerPoint presentation (accompanying each slide). Questions for the class are in a **bold blue** font. Make sure you give the class time to respond to the questions before giving the information in the slide.

What the instructor tells the class is in *italics* on the Notes section. Additional information in the Notes section is provided for the instructor. Review the entire PowerPoint, including the Notes section, before you do your training and decide what information is important for you to share with your audience.

Prior to the course, make sure you have any handouts, equipment, and materials necessary to teach the course.

For the course, you will need:

- PowerPoint presentation (DVD, located in the pocket of your course binder)
- Computer and LCD projector for the PowerPoint presentation
- Extension cord for equipment
- Flipchart, paper and flipchart markers
- Body Map
- Red dot stickers (for body mapping exercise)
- Ouch stickers (stickers/labels with "ouch" on them)
- Laminated 5 trigger photos (located in the pocket of your course binder):
    1. Screeding
    2. Handling Drywall
    3. Rebar Tying
    4. Overhead Drilling
    5. Caulking
- Handouts (enough for all participants)
    - Trigger photos (one for each small group, five total)
    - Handouts for each of the five trigger photos:
        1. Screeding: Simple Solutions TIP SHEET #2, Motorized Concrete Screeds, NIOSH
        2. Handling Drywall: Simple Solutions for Lifting, Holding, and Handling Materials, NIOSH
        3. Rebar Tying: Simple Solutions TIP SHEET #3, Rebar-Tying Tools, NIOSH
        4. Overhead drilling: Drilling Overhead. Occupational Health Branch, California Department of Public Health.
        5. Caulking: Simple Solutions, TIP SHEET 16, Power Caulking Guns, CPWR
    - Solutions Worksheet
    - Workshop evaluation form

Conducting Class Activities

There are three interactive activities used in this class. Two activities are conducted with the entire class (Body Mapping and the Ouch Activity) and one is a small group activity (Trigger Photos). The instructions for these activities are in the Notes section of the PowerPoint.

Optional Small Group Activity: Show the OSHA v-Tools on Page 6, (1) Cable Pulling and 2) Laying Stone (see description on page 6).

Body Mapping Activity

Specific instructions for conducting the body mapping activity appear in the Notes section of the PowerPoint presentation (accompanying each slide).

Description

The class uses a "body map" to show where workers might feel pain after a day's work. The class discusses common pain patterns and the cumulative nature of musculoskeletal disorders.

You Need:

- PowerPoint presentation
- Computer and projector for the PowerPoint presentation
- Body map (you can draw a body map on a flipchart or use the laminated version in this binder)
- Red Dots (be sure to use removable dots if you are using the laminated body map)

Ouch Activity

Specific instructions for conducting the Ouch Activity appear in the Notes section of the PowerPoint presentation (accompanying each slide).

Description

The class brainstorms a list of job tasks that may cause pain. A volunteer goes through the motions of one selected task and class members put "ouch" stickers on the volunteer's body where they think it may hurt. The class then discusses risk factors.

You Need:

- PowerPoint presentation
- Computer and projector for the PowerPoint presentation
- Ouch stickers

Small Group Activity: Trigger Photos

Specific instructions for conducting the small group activity appear in the Notes section of the PowerPoint presentation (accompanying each slide).

Description

Five small groups are each assigned a different job task, these include: screeding, handling drywall, rebar tying, overhead drilling and caulking. Each small group identifies risk factors and solutions for the task assigned to them. Groups report back to the class. There are factsheets (handouts) for each of these job tasks. They are located in section 5 of the binder.

You Need:

- PowerPoint presentation
- Computer and projector for the PowerPoint presentation
- Laminated 5 trigger photos (located in the pocket of your course binder):
    1. Screeding
    2. Handling Drywall
    3. Rebar Tying
    4. Overhead Drilling
    5. Caulking
- Handouts for each trigger photo (located in section 5 of the course binder):
    1. Screeding: Simple Solutions TIP SHEET #2, Motorized Concrete Screeds, NIOSH
    2. Handling Drywall: Simple Solutions for Lifting, Holding, and Handling Materials, NIOSH
    3. Rebar Tying: Simple Solutions TIP SHEET #3, Rebar-Tying Tools, NIOSH
    4. Overhead Drilling: Drilling Overhead. Occupational Health Branch, California Department of Public Health.
    5. Caulking: Simple Solutions, TIP SHEET 16, Power Caulking Guns, CPWR

Optional Small Group Activity: OSHA v-Tools

Federal OSHA developed 12 videos to show how quickly workers can be injured or killed on the job. These videos are intended to assist those in the construction industry to identify, reduce, and eliminate construction-related hazards. Most of the videos are 2 to 4 minutes long, presented in clear, easily accessible vocabulary, and show common construction worksite activities. The videos may be used for employer and worker training. Each video presents:

- A worksite incident based on true stories that resulted in worker injury or death.
- Corrective actions for preventing these types of accidents.

There are two videos on Sprains and Strains in Construction: 1) Pulling Cables; and, 2) Laying Stone. These two OSHA v-Tools are on the DVD that contain the course materials. They can also be found on OSHA's website. See the Resource Guide for the website link.

If you use these v-Tools view them first. You can stop the video after the incident and lead a discussion on solutions. Write what students say on the flipchart. Then continue showing the video. You can compare what the class said to OSHA's recommendations at the end of the video.

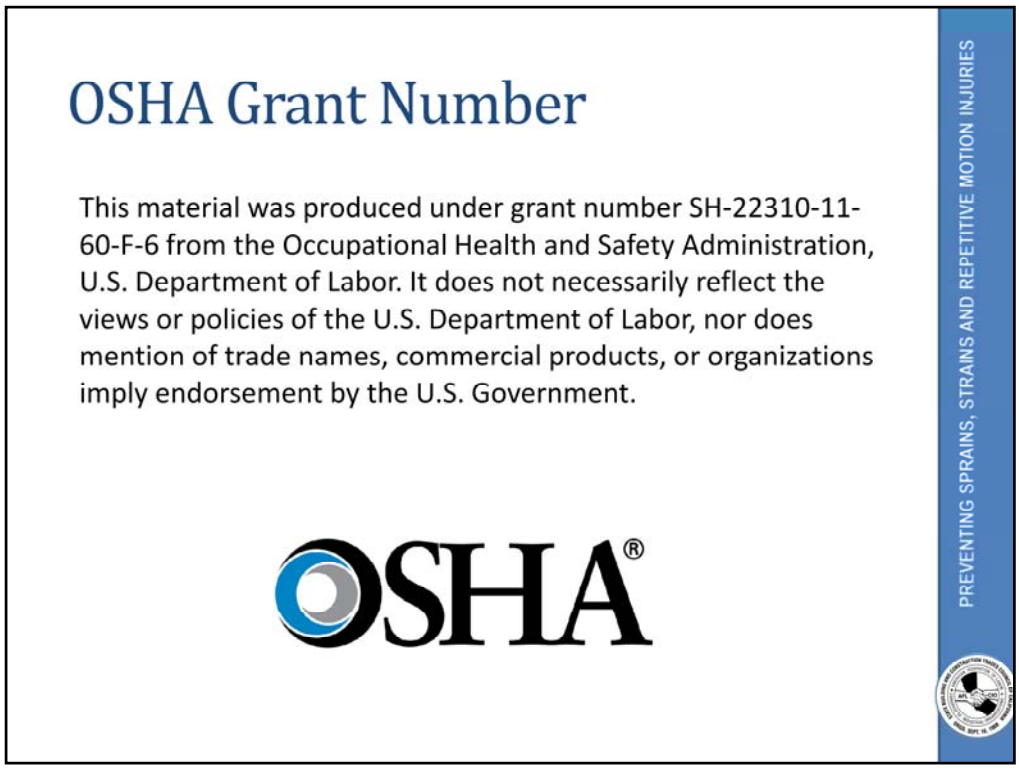
Factsheets

The factsheets are located in Section 5. They are produced by Cal/OSHA, federal OSHA, The Center for Construction Research and Training, formerly known as The Center to Protect Workers' Rights (CPWR), and other organizations. You can use them as needed.

Section 3: PowerPoint Slides

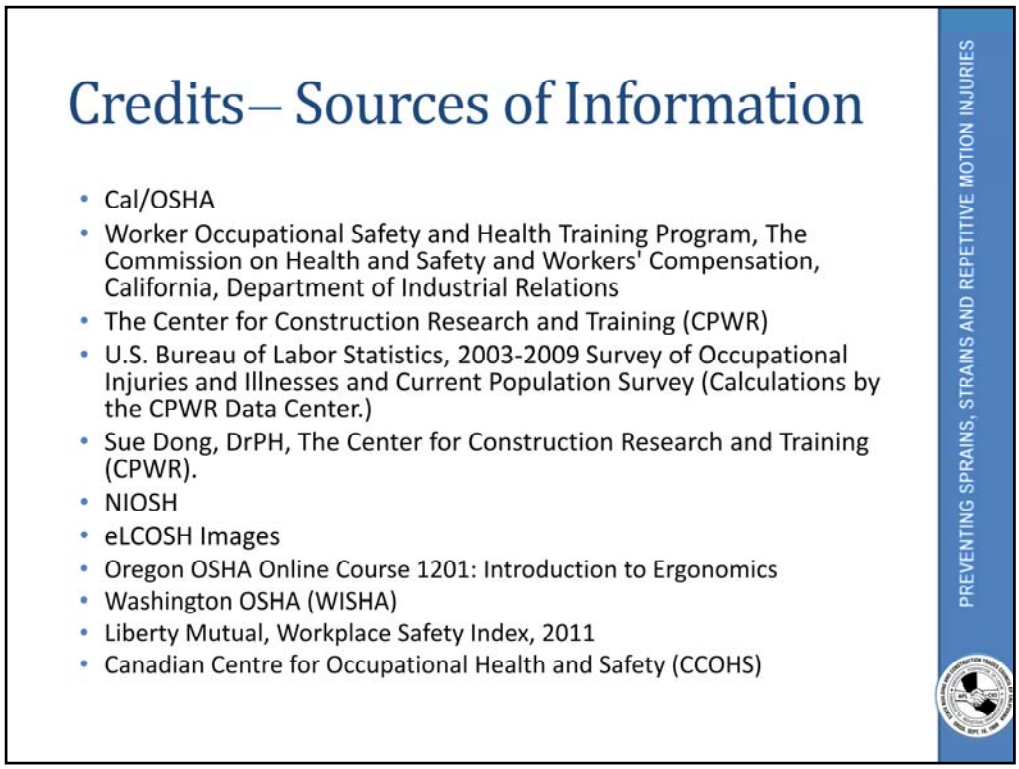
Preventing Sprains, Strains, and Repetitive Motion Injuries

State Building & Construction Trades Council of California, AFL-CIO, 2012



Tell the class: *This is a training on job site health and safety for construction workers, unions, and employers. It was produced by the Labor Occupational Health Program at UC Berkeley for the State Building and Construction Trades Council of California, AFL-CIO. The program is funded by federal OSHA.*

The focus of this training is on Musculoskeletal Disorders (MSDs) and ergonomics. We will define these terms in this course.



Tell the class: *Information from the sources listed on the slide were used to develop this program.*

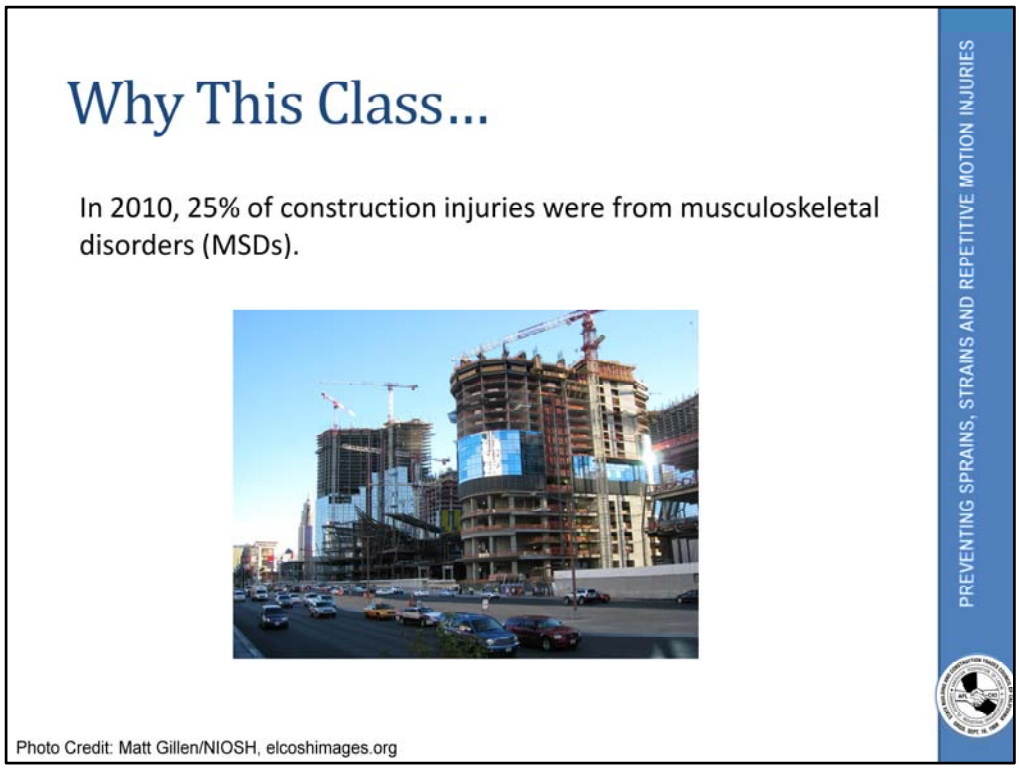
Workshop Objectives

After completing this workshop, you will be able to:

- Define and explain the terms *Musculoskeletal Disorders (MSDs)* and ergonomics.
- Identify 3-5 risk factors for MSD injuries.
- Analyze a job task for risk factors.
- Identify 3-5 solutions to eliminate or reduce MSDs.
- Recognize the elements of a comprehensive ergonomics program.

PREVENTING SPRAINS, STRAINS AND REPETITIVE MOTION INJURIES

Ask the class: **Do you have any questions about the course and its purpose?**

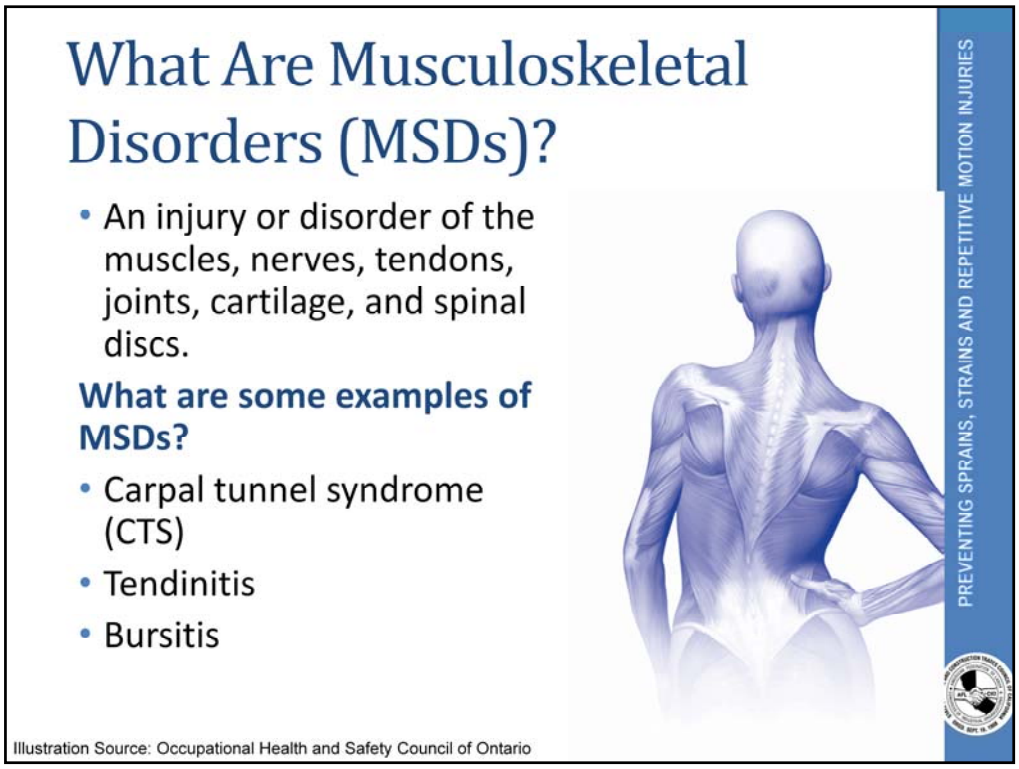


Tell the class: *According to the Bureau of Labor Statistics (BLS), in 2010 Musculoskeletal Disorders (MSDs) accounted for 25% of all workplace injuries in construction. This is a big source of injury and disability for construction workers which is why the State Building & Construction Trades Council of California (AFL-CIO) is focusing on this issue. We will describe the term "MSDs" in the next slide.*

(Note: The total number of nonfatal occupational injuries and illnesses involving days away from work for construction in 2010 was 74,950 days. The lost days from musculoskeletal disorders in construction in 2010 was 19,120 days, which is 25.5%.)

Note: The photo is of the Las Vegas Strip construction, 2008. CPWR conducted a site safety assessment of two construction sites in Las Vegas and coordinated OSHA 10-hour training for workers on those sites as a result of an agreement between the Perini Building Company and the Southern Nevada Building and Construction Trades Council. The agreement, signed on June 3, 2008, put an end to a day-long walk-out of construction workers concerned about safety issues on the site where six workers were killed in an 18-month period.

Source: Bureau of Labor Statistics (BLS) and CPWR.

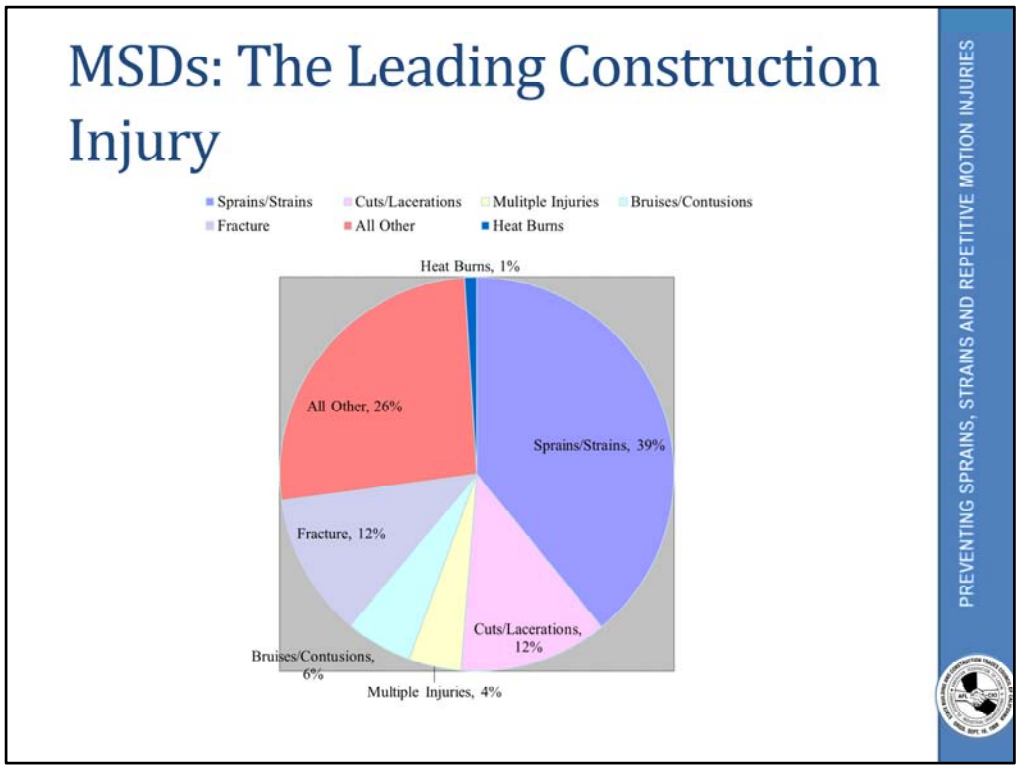


Ask the class: What are examples of MSDs? (Instructor writes what students say on the flipchart).

Tell the class:

- *Carpal tunnel syndrome (CTS) - Carpal tunnel syndrome is pressure on the median nerve -- the nerve in the wrist that supplies feeling and movement to parts of the hand. It can lead to numbness, tingling, weakness, or muscle damage in the hand and fingers. Using tools that don't fit your hand properly can cause this type of injury.*
- *Tendinitis – this occurs when tendons rub against the bone and get swollen. Tendinitis refers to inflammation of the tendon. For example, swinging a sledge hammer repeatedly can cause tendinitis in the elbow.*
- *Bursitis – this occurs when the fluid-filled sac (bursa) that lies between a tendon and skin, or between a tendon and bone, gets inflamed. Bursae are found in the knee, elbow, shoulder and wrist. The main symptom of bursitis is pain. In some cases, especially for shoulder bursitis, people may experience some restriction of movement and stiffness. For example, working in an awkward overhead position for extended periods of time can cause bursitis in the shoulder.*

See handout: What are MSI's? Constructive Ideas, Worksafe BC.

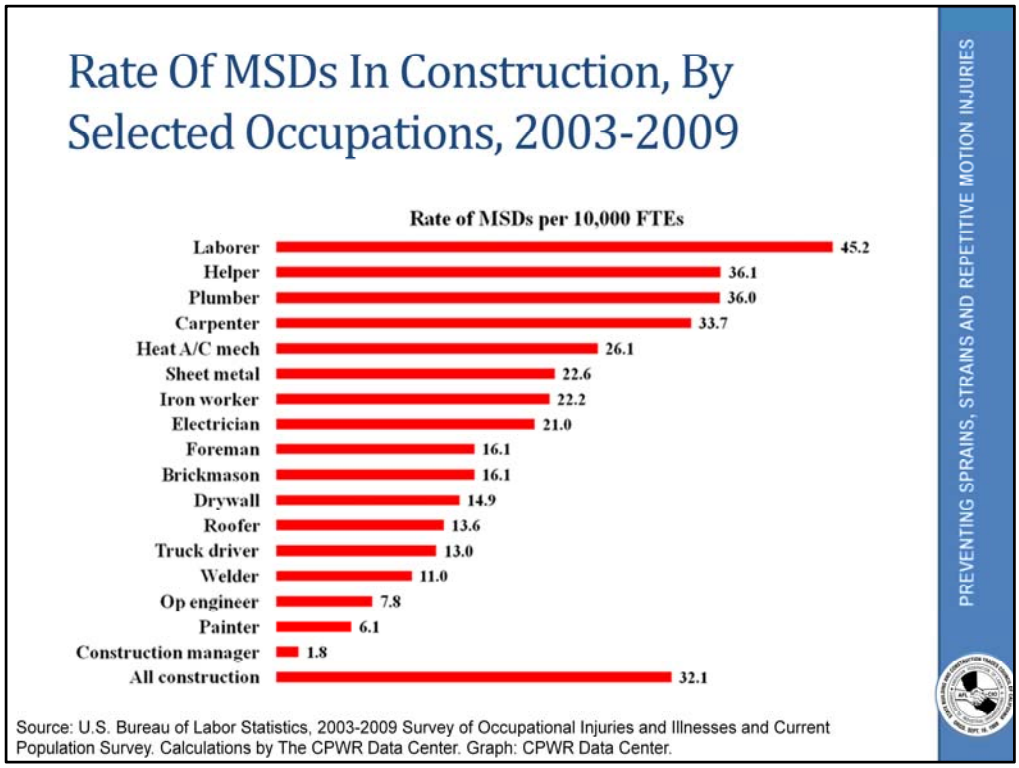


Tell the class:

1. The sprains/strains category in this slide includes other MSDs: carpal tunnel syndrome, tendinitis, and back pain.

2. The "All Other" category includes chemical burns, amputations, general soreness/pain (except when it's back pain only), crushing injuries, suffocation, eye disorders such as welder's flash, respiratory diseases, hernias, and seizures, among others.

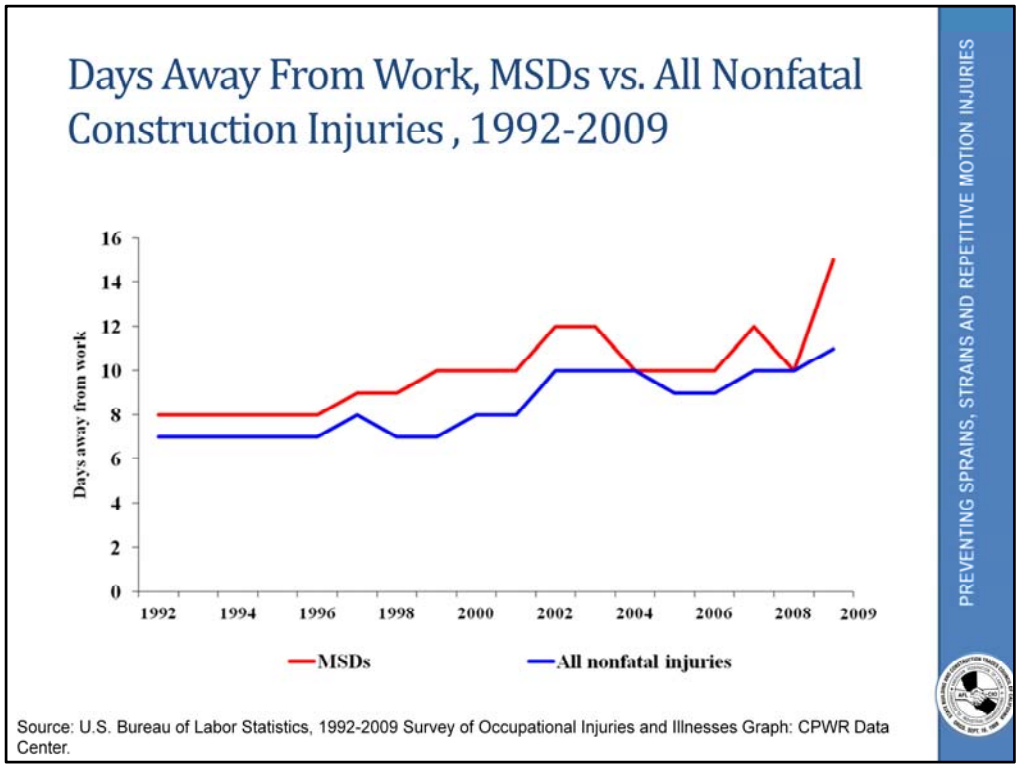
Source: Bureau of Labor Statistics (BLS).



Tell the class: *In this slide you see the rate of MSDs. The rate of injury is calculated based on 10,000 workers. For example, looking at the graph, 45.2 laborers out of 10,000 suffered a lost time injury from an MSD. This means that 4.5 workers out of 1,000 were hurt badly enough that they had to take time off work for their MSD injury.*

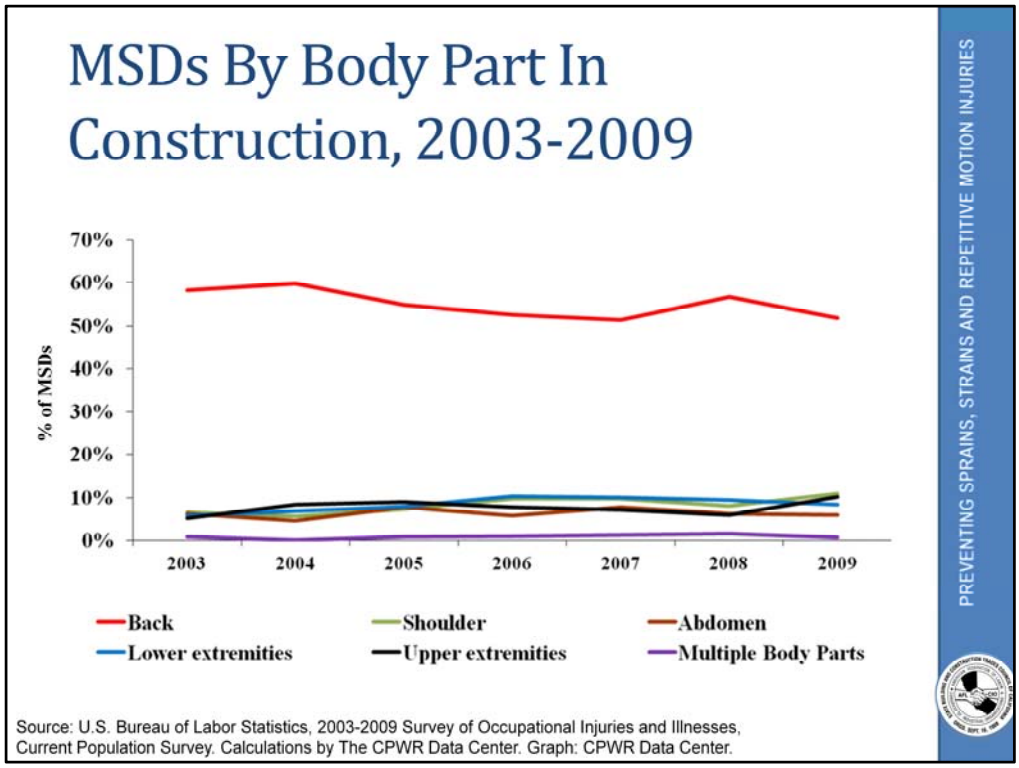
In comparison, the overall incidence rate for musculoskeletal disorders with days away from work was 32 cases per 10,000 full-time workers in 2010. So laborers got hurt at a higher rate than the average worker (45.2 v.s 32).

Source: U.S. Bureau of Labor Statistics, 2003-2009 Survey of Occupational Injuries and Illnesses, 2003-2009 Current Population Survey, CPWR.



Tell the class: *MSDs continue to be the biggest cause of non-fatal injuries for construction workers.*

Source: U.S. Bureau of Labor Statistics, 2003-2009 Survey of Occupational Injuries and Illnesses, CPWR.



Review the information on the slide. Note that back injuries are the most common MSD.

Source: U.S. Bureau of Labor Statistics, 2003-2009 Survey of Occupational Injuries and Illnesses, CPWR.

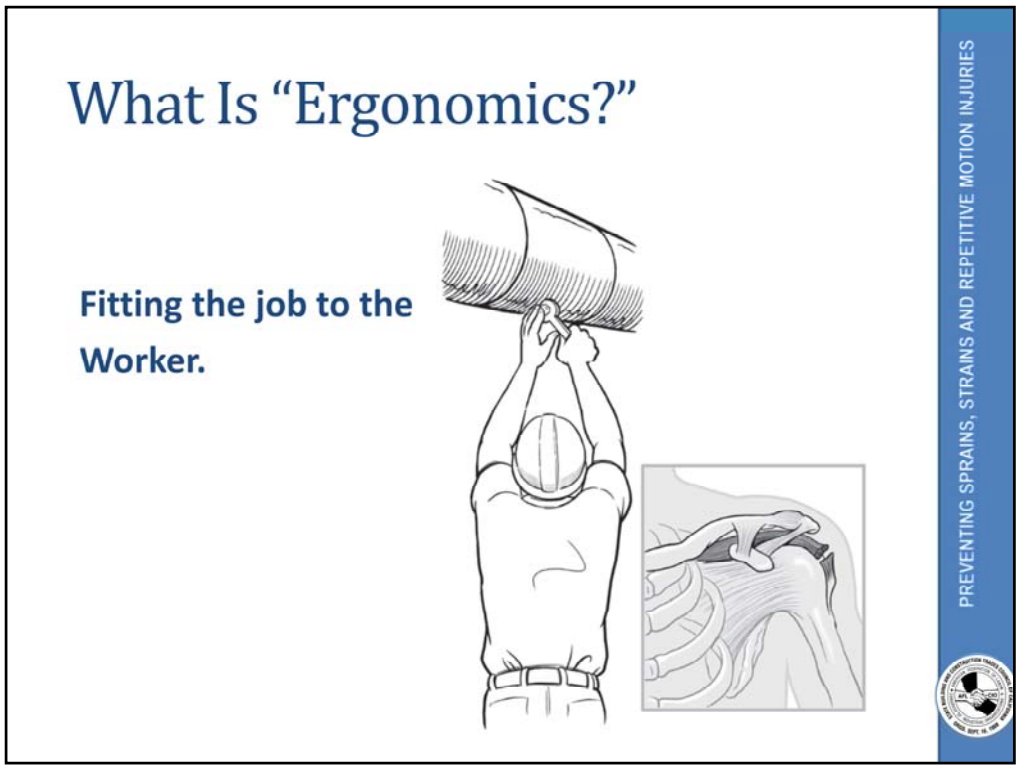
Tell the class: *As you can see from this slide, overexertion by excessive lifting, pushing, pulling, is a major cause of MSDs and accounts for 25% of all workers' compensation costs.*

Our task is to find out what the problem is and how to fix it. The first step is to identify symptoms which are often the first indicator there is a problem.

According to the 2011 Liberty Mutual Workplace Safety Index, the most disabling workplace injuries and illnesses in 2009 amounted to $50.1 billion in direct U.S. workers compensation costs. The top five injury causes – overexertion, fall on same level, fall to lower level, bodily reaction, and struck by object – accounted for 71.7 percent of the costs in 2009.

Overexertion was first-place. This category includes injuries related to lifting, pushing, pulling, holding, carrying, or throwing. These type of injuries cost businesses $12.75 billion in direct costs and accounted for more than a quarter of the overall national burden.

Source: 2011 Liberty Mutual Workplace Safety Index.

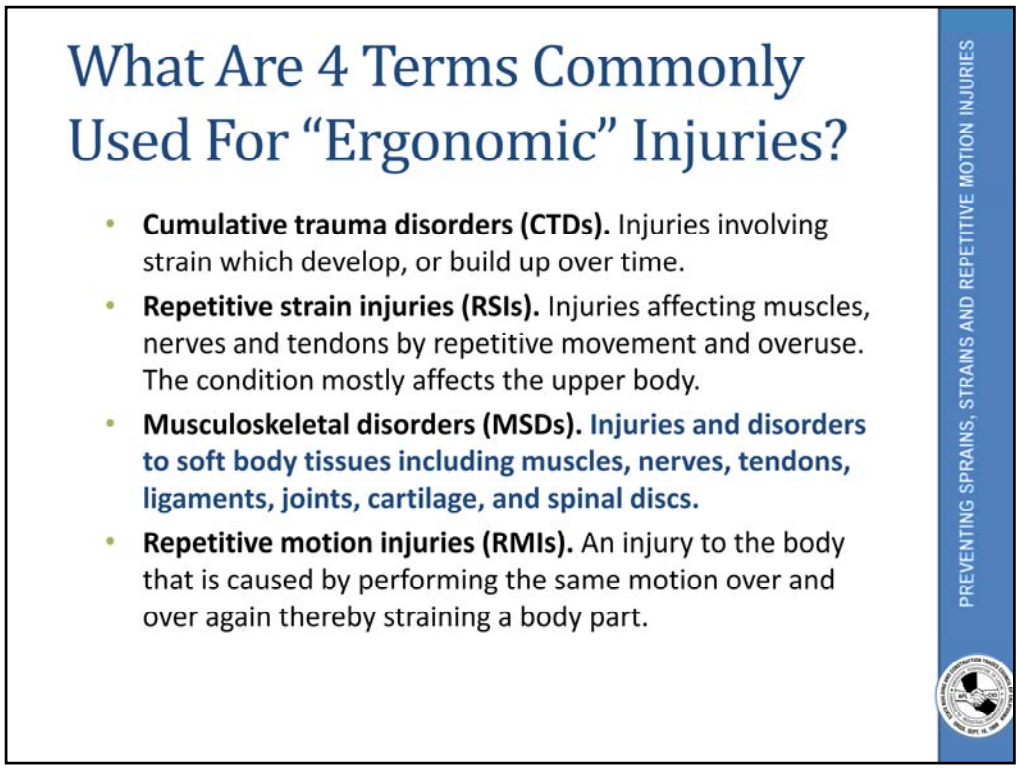


Ask the class: **What does the term "ergonomics" mean? Is it a hazard, injury or solution?**

Tell the class: *The word is used to describe the science of fitting the job to the worker, not the worker to the job. MSDs are the problem and ergonomics is the solution.*

The term "ergonomics" comes from the Greek words "ergon," meaning work and "nomoi," meaning natural laws. Ergonomists study the relationship of the human body to the demands of a work environment.

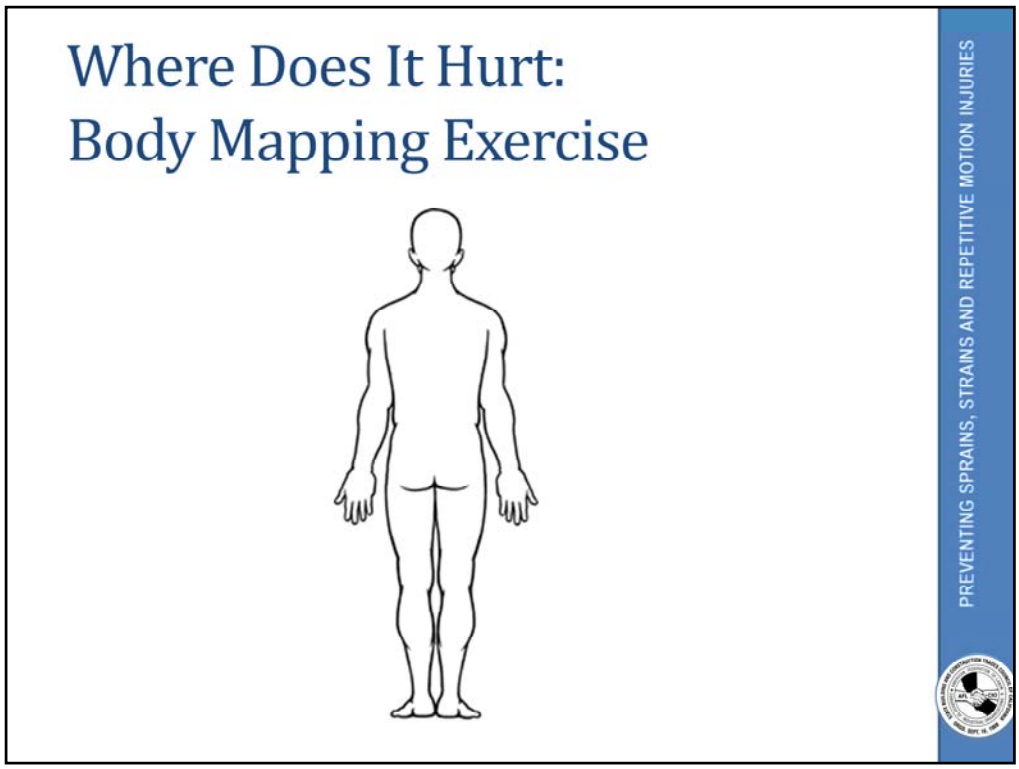
Serious injuries can occur if tools, tasks, and equipment are poorly designed and don't fit workers properly. This can put workers at increased risk of musculoskeletal disorders. Musculoskeletal disorders are among the most common job injuries, and are very costly for both workers and employers.



Tell the class: *These terms do not refer to different conditions. Many of these types of injuries can be described in all four ways. We will mainly use the term* ***musculoskeletal disorders or MSDs*** *in this training. "Ergonomics" is a general term that has different meanings to different audiences. Most often, this term is applied to work-related musculoskeletal disorders (MSDs). The U. S. Department of Labor defines an MSD as an injury or disorder of the muscles, nerves, tendons, joints, cartilage, and spinal discs. MSDs do not include disorders caused by slips, trips, falls, motor vehicle accidents, or similar accidents.*

Background Information:
-You have more than 600 muscles in your body. They do everything from pumping blood throughout your body to helping you lift heavy objects at work.
-Nerves tell the muscle when to relax and when to contract.
-Tendons attach from bone to muscle.
-Ligaments attach from bone to bone.
-A joint is where two bones come together allowing for movement of the skeleton.
-Cartilage is the smooth covering over the ends of bones in a joint.
-Discs are actually composed of two parts: a tough outer portion and a soft inner core, and the configuration has been likened to that of a jelly doughnut. There are 23 discs in your spine.

See handout: What Are Musculoskeletal Disorders? WOSH Specialist Training.



Tell the class: *There are many ways to illustrate the types of physical problems people have on the job. One way is to create "body maps" that show where workers are experiencing discomfort or pain. Creating body maps involves drawing a simple outline of the body, and then showing visually where on the body someone has pain.*

Instructions for the activity:

1. **Post the body map on the flipchart.**
2. **Give each participant a set of red dot stickers.**
3. **Ask people to come up and post dots on the body map to mark where they feel pain or discomfort during or after a day's work.**
3. **Tell them to place dots even if others have already posted them in the same place.**
4. **After everyone has posted their dots, ask the group to look at the map. Draw attention to the areas of the body where the most dots appear.**

Tell the class: *The areas on the body map where the stickers are grouped are places where workers commonly experience pain and discomfort – the neck, back, shoulders, and wrists. These pains can be symptoms of various MSDs.*

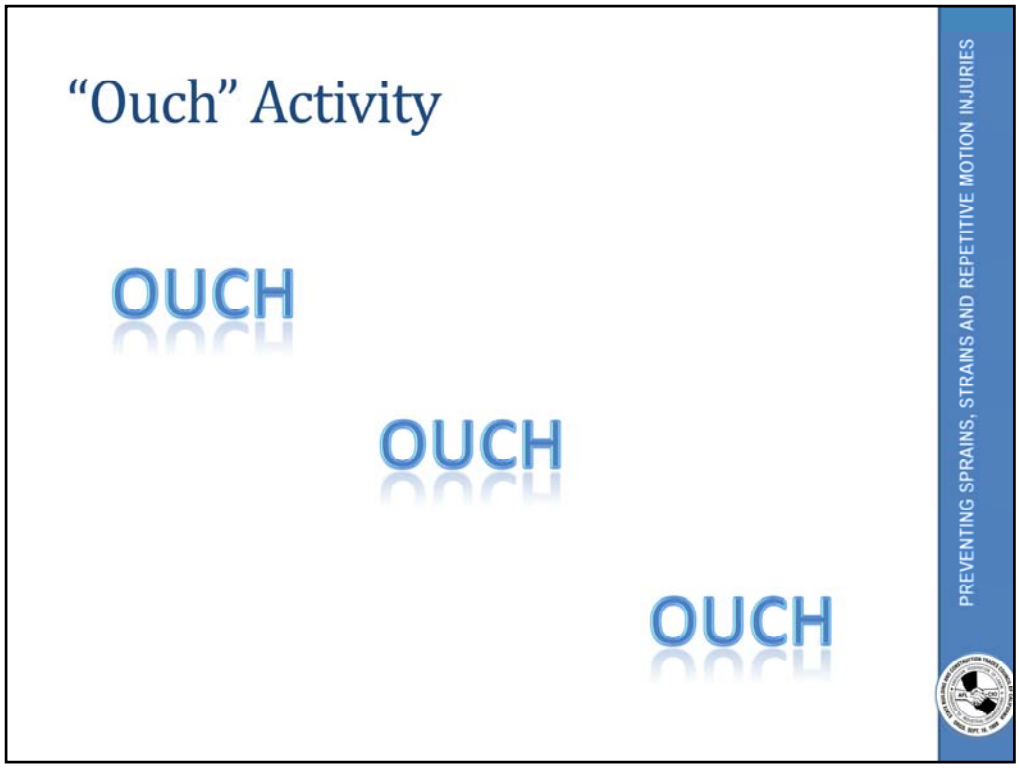
Create a new flipchart page, and label it ***Job Tasks That May Cause Pain***.

Ask the class: **What construction jobs can cause pain? What specific tasks put workers at risk?** List what people say on the flipchart. Save this flipchart page for use in the next activity.

Job Tasks That May Cause Pain (Your flipchart list might look like this:)

- Drilling overhead
- Installing carpet
- Lifting heavy sheetrock
- Hammering
- Lifting mason bricks
- Roofing.

Tell the class: *Once you identify jobs that cause pain, the next step is to look at a job more closely to identify what puts a worker at risk of injury. This is called conducting an ergonomic job analysis. To demonstrate this, we will now analyze a job task together.*



Post the flipchart from the last activity and pick one activity (task) to be demonstrated. Ask for a volunteer to demonstrate the job task. Give everyone in the class some ouch stickers.

Ask the class: **Will someone demonstrate this job task in front of the class?**

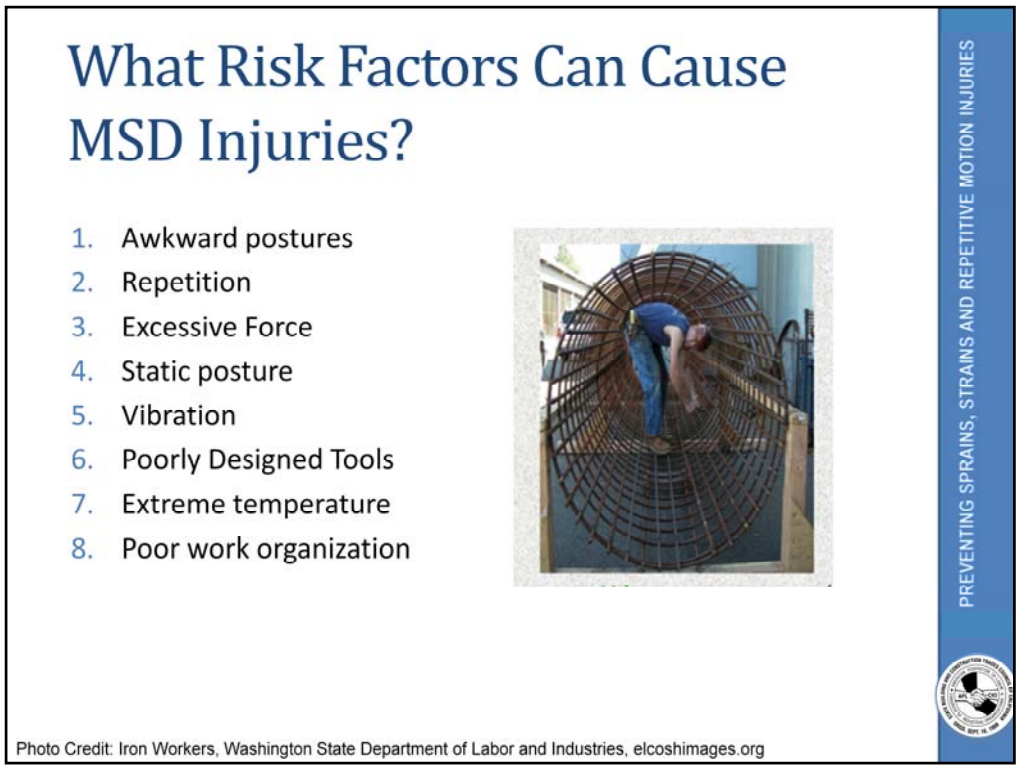
Tell the class: *While our volunteer is demonstrating the task, please come up and place an ouch sticker on the parts of the work's body where he/she might be experiencing pain.*

Ask the class: **Why did you place stickers on these parts of the volunteer's body – what movements or positions did you see that might cause pain?** Record people's answers on a flipchart labeled **Risk Factors**. Save this flipchart page to compare to the next slide.

Depending on the task, examples of harmful movements might include:

- Bending the back or neck
- Reaching overhead
- Lifting something heavy
- Pulling or pushing
- Repetitive movements.

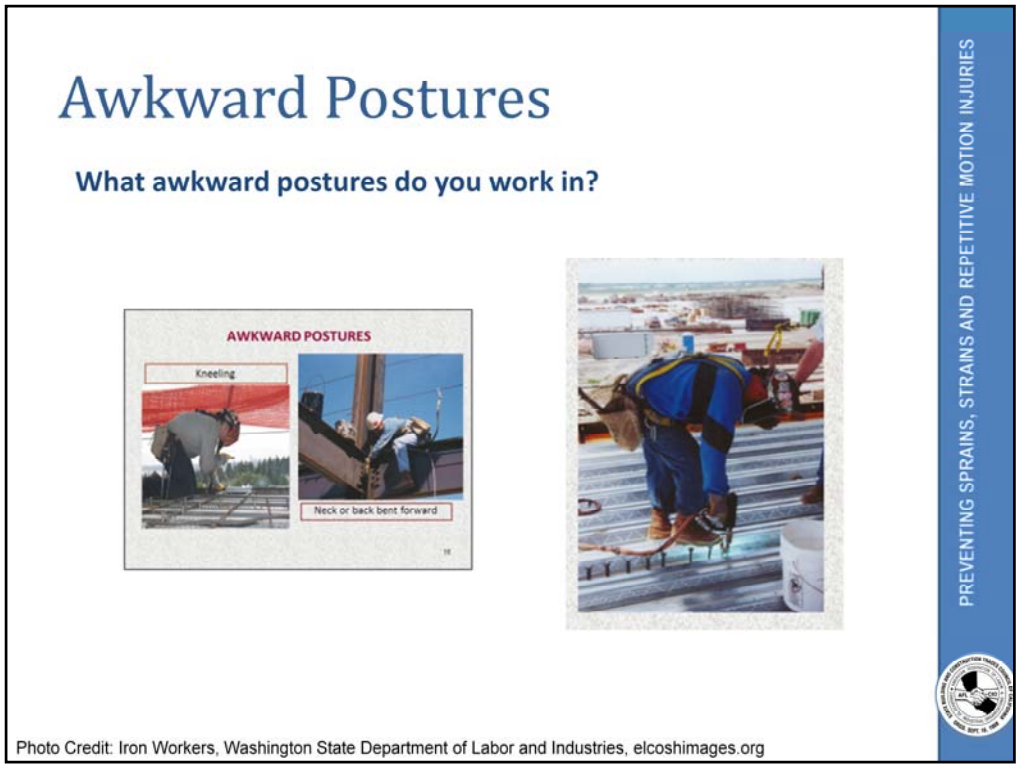
Tell the class: *What you've just done is a kind of ergonomic job evaluation. You watched someone perform a work task and then identified ergonomic-related risk factors.*



Tell the class: *A risk factor is anything that can increase your risk of injury. The more risk factors you have, the more likely you will be injured.*

We are going to look at examples of each of these risk factors in the next slides.

See handout: Risk Factors for Ergonomic Injuries, WOSH Specialist Training.



Ask the class: **What awkward postures do you work in?**

Awkward postures can include:

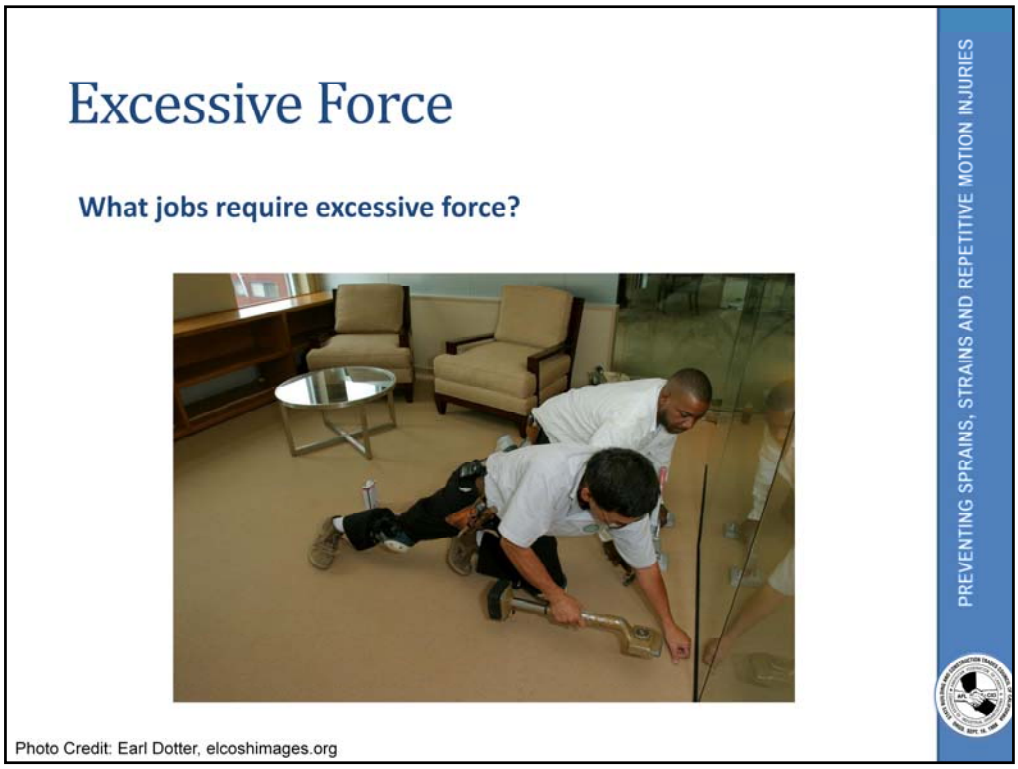
- Bending
- Working overhead
- Kneeling
- Twisting
- Reaching far in front of you to pick up something
- Working with a bent wrist.

Tell the class: *The term awkward postures refers to any posture where the body parts are away from their comfortable, neutral position (e.g., a bent back, a bent wrist or arms raised above the head). Awkward postures are not always harmful. It is only when they are repeated frequently or performed for a long time.*

Ask the class: **What jobs require you to repeat the same movement over and over? What physical symptoms do you have from doing this kind of work (e.g., waking up at night with pain in arm, numbness in fingers, swelling in hands or arms, etc.)?**

Tell the class: *Repeating the same motion over and over places stress on your muscles and joints. The amount of stress depends on these factors:*

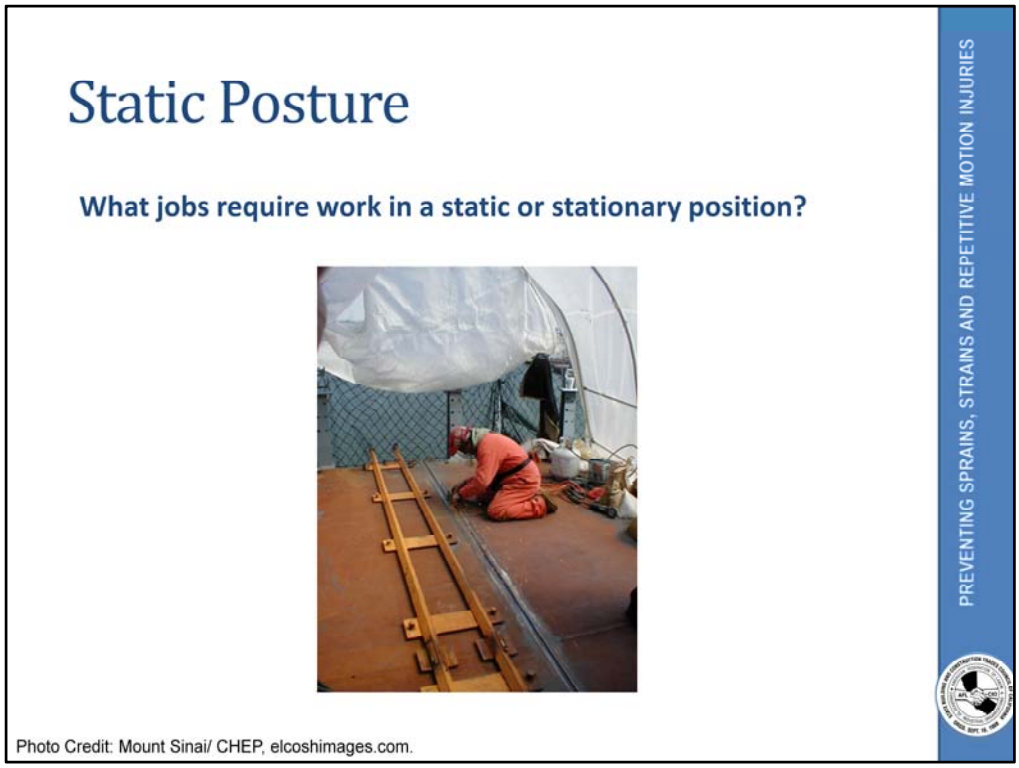
- *How quickly the job is done*
- *How long the job is done*
- *How much force the job requires, and*
- *How much recovery time there is between motions.*



Ask the class: **What jobs require you to use a lot of force? How do you know when it's too much force?**

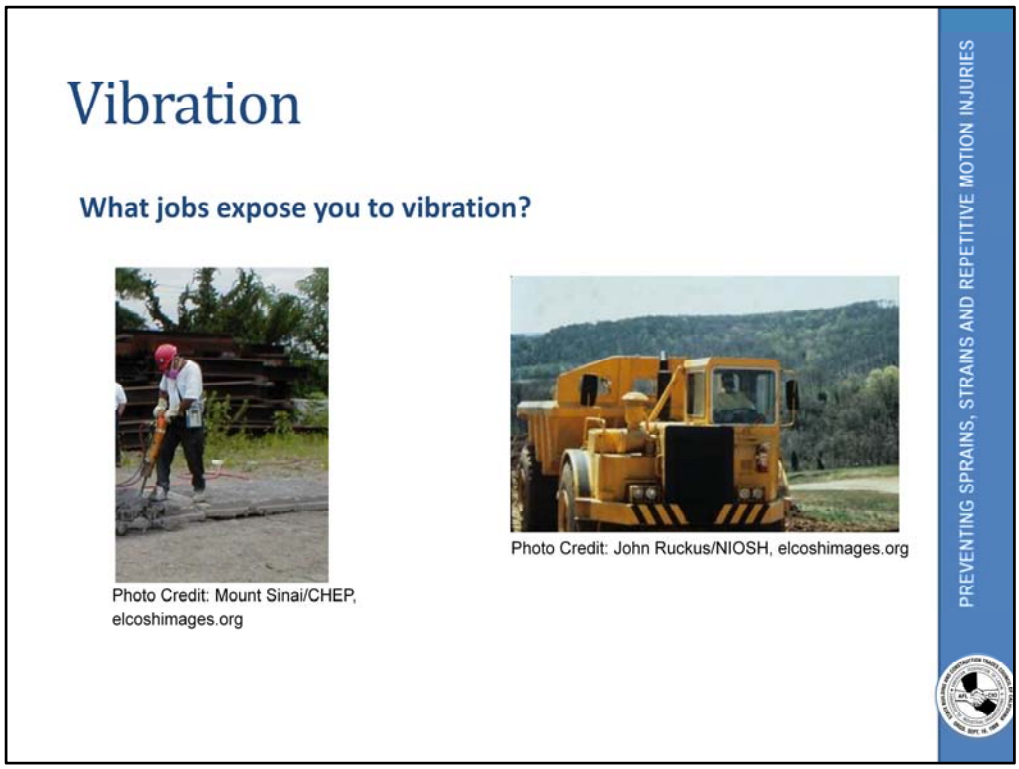
Tell the class: *Some common jobs that require a lot of force include:*

- *Lifting something heavy and carrying it*
- *Pushing or pulling heavy objects*
- *Using a tool handle that is too small. This may result in pinching, squeezing or griping the handle, which can tire the hand*
- *Using a glove that is too large and doesn't fit properly. This will require more force to hold onto a tool. This can affect women and other workers who may have smaller hands*
- *Using a heavy tool that is not balanced may require a lot of force to control.*



Ask the class: **What jobs require work in a static or stationary position?**

Tell the class: *Stationary/static postures, or positions that a worker must hold for long periods of time, can restrict blood flow and damage muscles. Long periods of standing can also cause foot pain.*



Ask the class: What jobs expose you to vibration?

Tell the class: The two main types of vibration that can lead to musculoskeletal injuries are: 1) hand/arm vibration: and, 2) whole body vibration.

Background information:

Hand/arm vibration

Exposure to hand/arm vibration occurs when working with air-operated, pneumatic, electric, or power tools. Exposure to hand/arm vibration primarily damages vascular and nerve tissue, typically of the hand and fingers. Too much vibration can damage the blood vessels in your hand and can cause Raynaud's syndrome or "white finger."

Raynaud's syndrome occurs when blood vessels and nerves in the hands constrict from conditions such as cold temperature or vibration. The skin can become pale, waxy-white or purple. The disorder is sometimes called "white finger," "wax finger" or "dead finger." In the workplace it is most commonly associated with "hand-arm vibration syndrome."

Whole body vibration

Exposure to whole body vibration occurs when your body comes into contact with a vibrating surface, like a seat, pedal or floor, of heavy vehicles or machinery. Whole body vibration exposure has been shown to be a strong contributor to lower back injuries.

Ask the class: **What is the problem with these tools?**

Do you use tools that are poorly designed? If so, what are they?

Tell the class: *If you use a tool that does not fit your hand or use the tool in a way it was not intended, you might develop an injury, such as carpal tunnel syndrome, tendinitis, or muscle strain.*

Problems with the tools in this slide include the following:

- The small screw driver in the top left photo requires a pinch grip and will require more work to do the job.
- The screw driver in the bottom left photo has too long of a handle for the work space. The worker has to work in an awkward position.
- The cutters in the top right photo don't fit the hand properly, putting pressure against the palm of the hand which may cause an injury.
- The long nose pliers in the bottom right photo have the wrong handle, requiring the worker to bend his wrist.
- In addition, tools may not be designed to fit smaller hands, like a woman's hand.
- Power tools should be used whenever possible to avoid repetition.

Source: Easy Ergonomics: A Guide to Selecting Non-Powered Hand Tools. Authors: CDC, Cal/OSHA, NIOSH.

Ask the class: **Do you work in cold or hot conditions for extended periods of time?**

Tell the class: *Working in cold temperatures for extended periods of time can reduce the blood flow to your hands and fingers creating numbness. This can cause loss of grip and may damage your hands and wrists.*

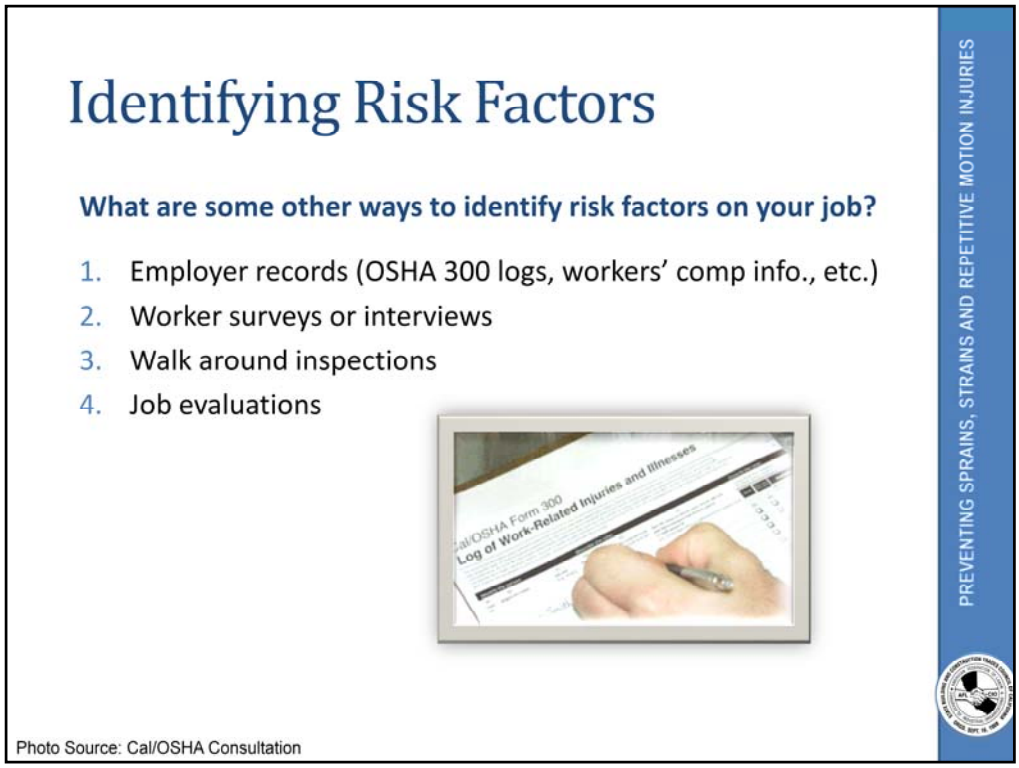
Working in excessive heat can lead to muscle fatigue which may increase risk of sprains and strains.

Poor Work Organization

This refers to the way jobs are structured, carried out, and supervised, for example:

- Production schedule demands
- Infrequent rest breaks
- Not enough workers
- Poor planning
- Poor supervision

Have you experienced poor work organization?



Ask the class: **What are some other ways to identify risk factors on your job?**

Tell the class:

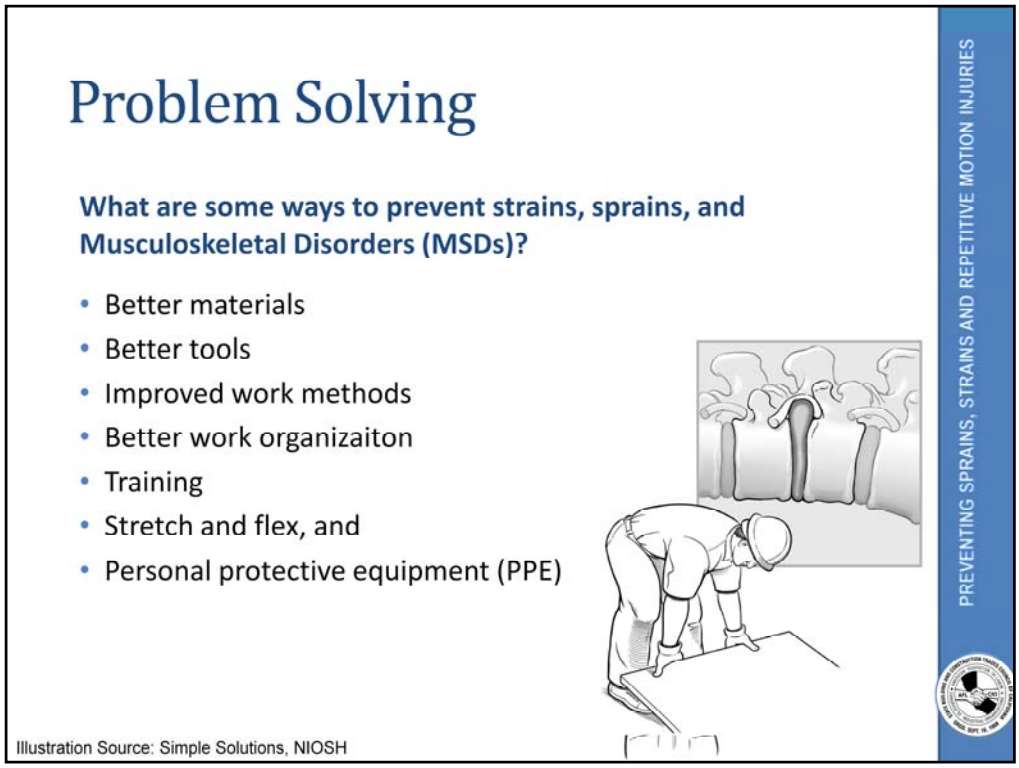
1. Employer Records
Most employers are required to keep a record, called the Cal/OSHA Log 300, of reported work-related injuries or illnesses. You can request this log to see whether workers have MSDs and where they are occurring. By reviewing this log you can identify work areas that might need attention.

2. Worker Surveys or Interviews
Your co-workers are often the best source of information on the potential problems posed by their jobs. You can conduct a written survey or talk to people individually.
See handout: Worker Health Survey, WOSH Specialist Training.

3. Walkaround Inspections
Another useful way to find jobs or tasks that may pose problems is to conduct a walk around inspection of the work area.
See handout: Inspection Checklist, WOSH Specialist Training.

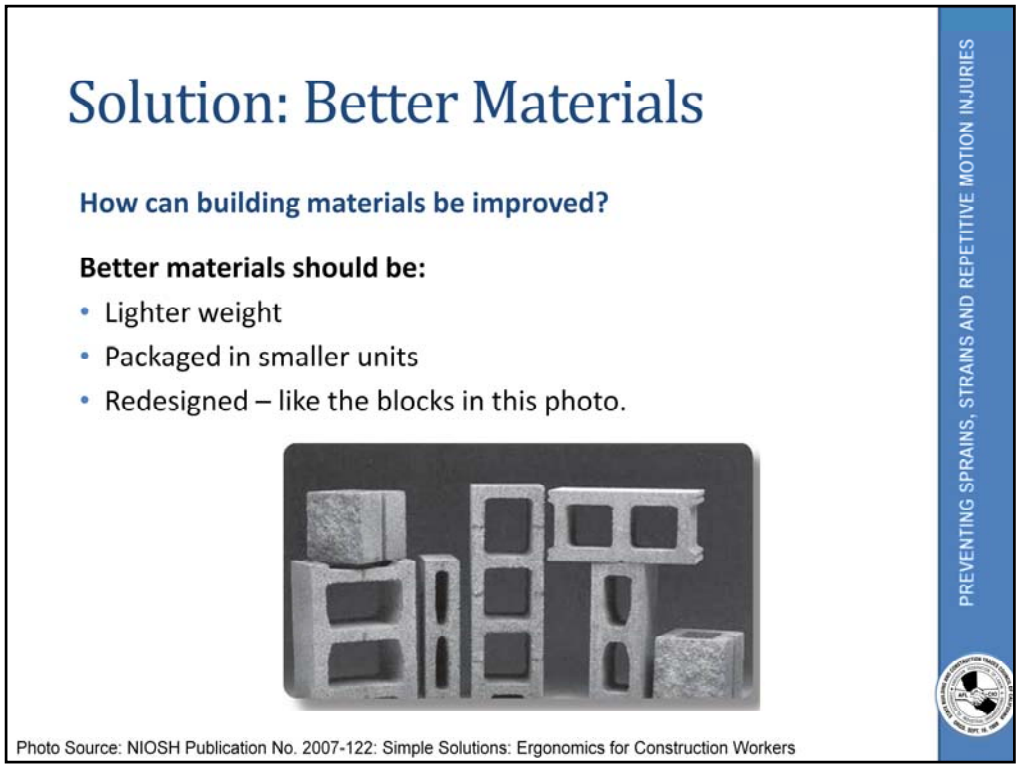
4. Job Evaluations.
During a job evaluation, use a checklist or similar form to record risk factors, as well as to track your progress in resolving a problem. There are many checklists available that can be used to do this, including a Job Safety Analysis (JSA) or Job Hazard Analysis (JHA).

See handout: Construction Ergonomics Checklist, CPWR



Tell the class: *Ergonomic solutions are used to help fit the workplace to the worker. They help eliminate or reduce risk factors. We are going to briefly discuss each of these solutions in the next slides.*

As you discuss the solutions on the next slides ask if anyone has implemented any of these solutions and what they thought of them.



Tell the class: *Contractors can make changes with architects and designers in selecting the material they use for the job. For example, using lighter ladders made out of fiberglass or ordering 3-foot wide drywall.*

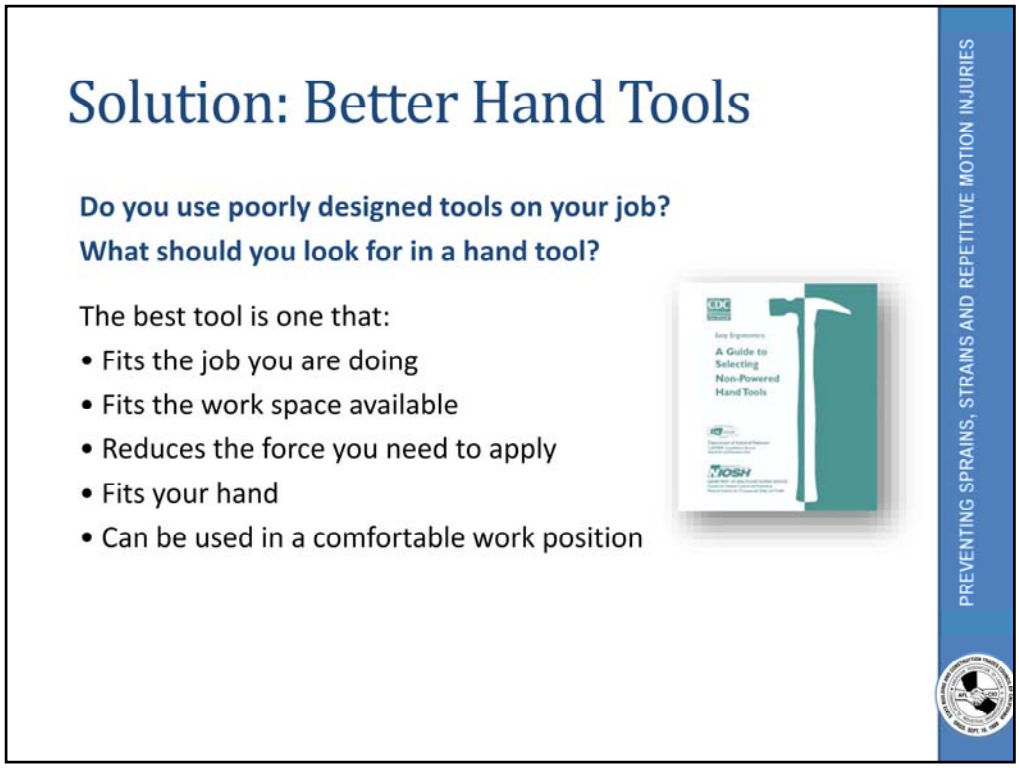
Ask the class: **Why are the bricks in the photo a better design?**

Tell the class: *In this photo the block was redesigned with handholds for easier carrying and to make it lighter.*

Background Information on bricklaying:

It is not uncommon for a bricklayer to handle 200 concrete masonry units per day, and they each weigh 38 lbs or more," said Jennifer Hess, PhD. "That means a bricklayer handles about 7,600 lbs of block during an 8-hour work day. In a week of this work, he lifts the equivalent of more than five Ford F-350 pick-up trucks. Both bricklayers and mason tenders perform physically demanding work, day after day."

Source: Researchers Identify Incentives And Barriers To Adoption Of Back-Saving Best Practices Among Masonry Contractors, CPWR, August 16, 2010.



Ask the class: **Do you use poorly designed tools on your job? If so, please describe them.**

What would you look for in a hand tool?

The best tool is one that:

• *Fits the job you are doing.*

• *Fits the work space available.*

• *Reduces the force you need to apply. It should be balanced and not tip backwards or forwards.*

• *Fits your hand. It should be comfortable in your hand — not too thick, too small or too short. It should have a non-slip handle made of soft material, like rubber or plastic. No sharp edges, finger grooves or ridges in the handle.*

• *Can be used in a comfortable work position.*

See handout: Checklist For Hand Tool Selection. Adapted from Easy Ergonomics: A Guide to Selecting Non-Powered Hand Tools, Cal/OSHA/NIOSH.

Power Tools

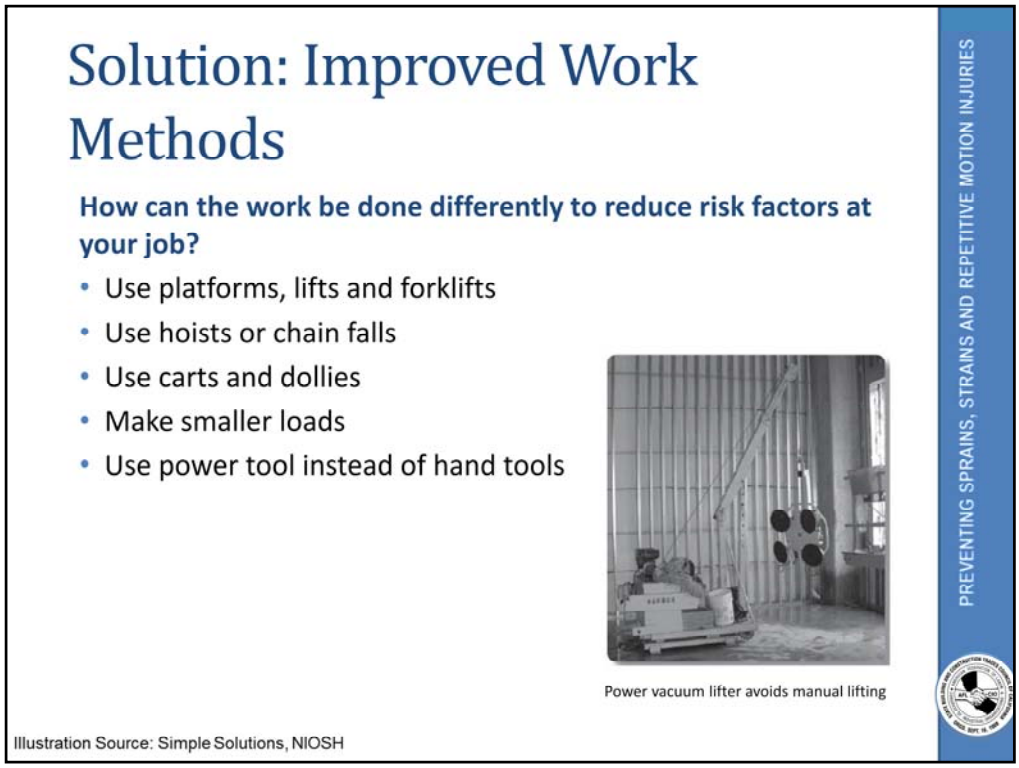
How should you select a power tool?

- It should have a long trigger.
- It should have low vibration and noise levels.
- It should be heavy enough to do the job, but not add strain.

Use a power tool instead of a hand tool when you can.

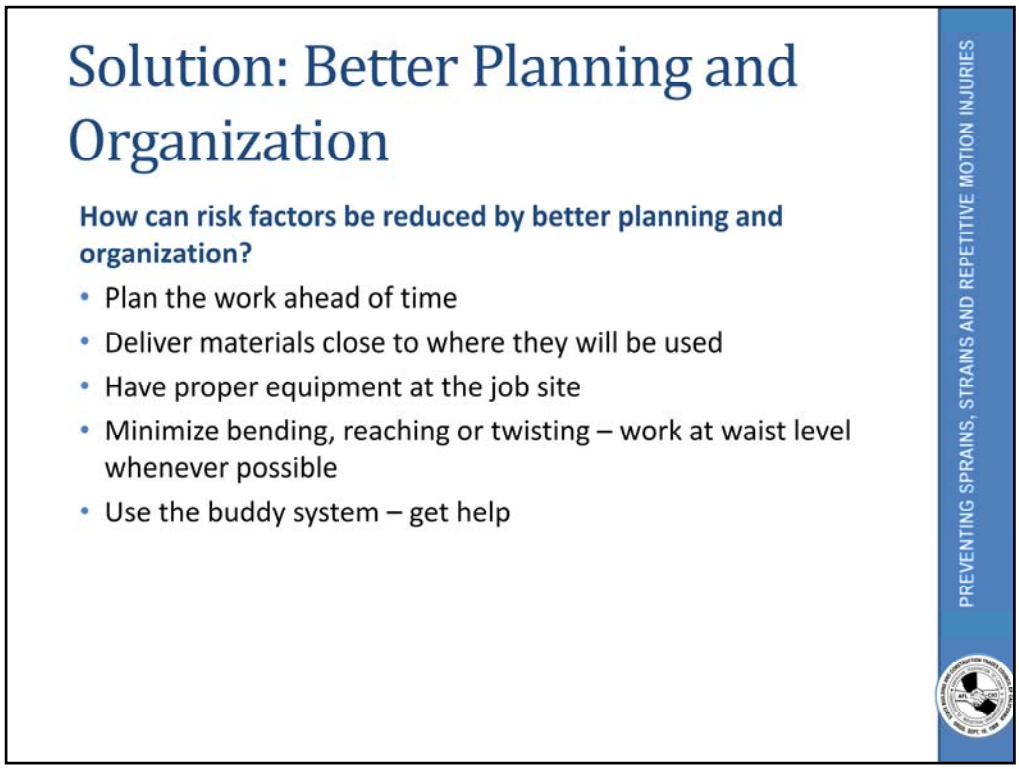
Photo Source: Ergonomics eTool: Solutions For Electrical Contractors, Federal OSHA

Tell the class: *Use a power tool when you can. A power tool can reduce repetition and damage to your hand.*



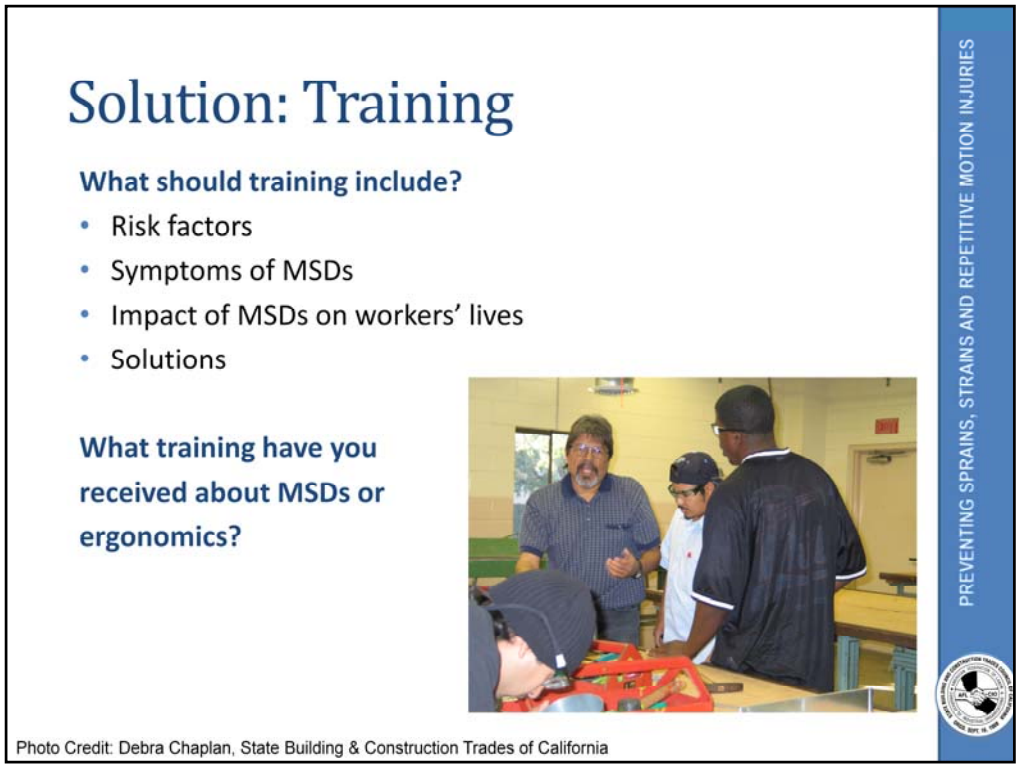
Ask the class: **How can work be done differently to reduce risk factors at your job?**

Refer to examples on the slide.



Ask the class: **How can risk factors be reduced by better planning and organization?**

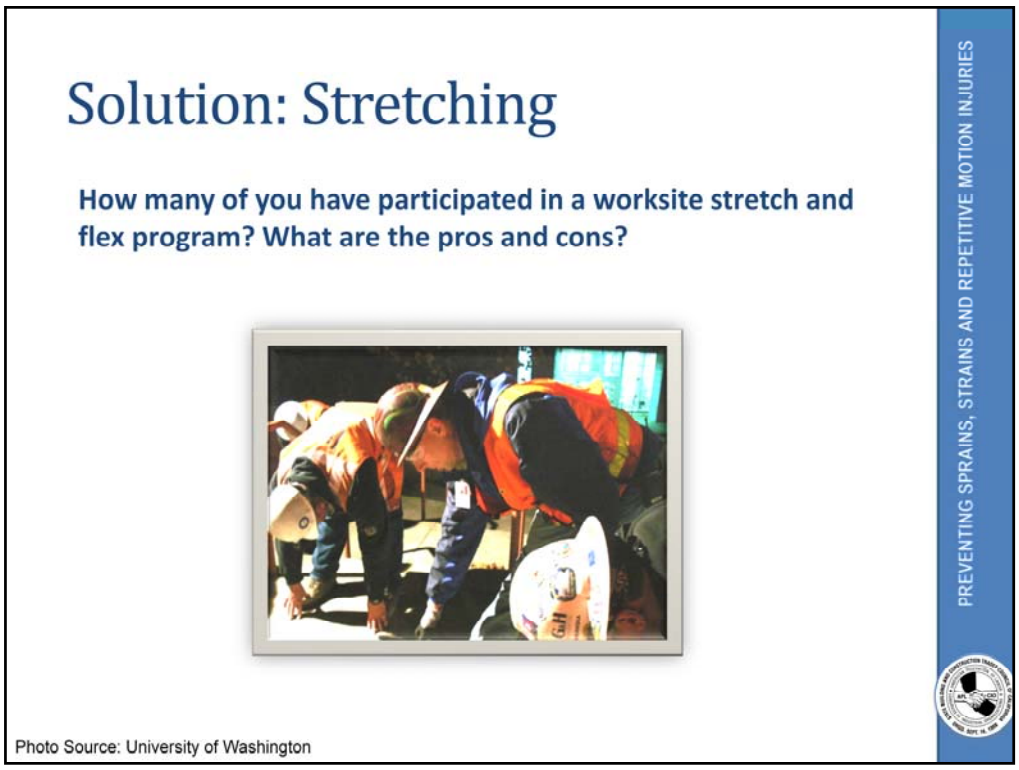
Refer to examples on the slide.



Ask the class: **What training have you received about MSDs or ergonomics at work?**

Tell the class: *Training on MSDs should occur before a person starts their job. It should include:*

- *Understanding how risk factors can increase their chance of injury*
- *Learning about solutions*
- *Learning about new equipment, tools and work methods*
- *Discussing how to make ergonomic changes.*



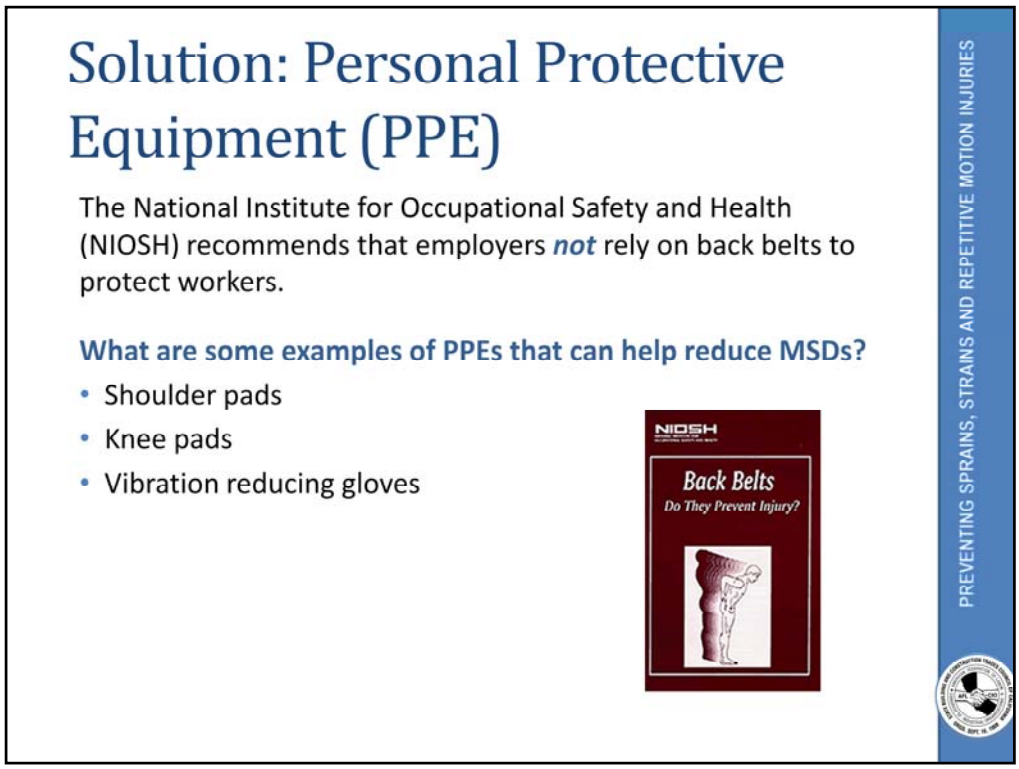
Ask the class: How many of you have participated in a worksite stretch and flex program? What are the pros and cons?

Pros may include:
- *Team building-people interact with each other*
- *Open communication with crew members*
- *Easy to implement*
- *Low cost solution.*

Cons may include:
- *Not taken seriously*
- *Exercises may not be done properly*
- *Puts pressure on workers to take the responsibility for solutions*
- *Workers may feel self-conscious.*

Talk to your medical provider before participating in any stretch & flex program. Stretching programs are usually conducted during the morning safety briefing and are usually 5-10 minutes long. You should exercise judgment and should not perform motions that may aggravate previous injuries or other physical conditions

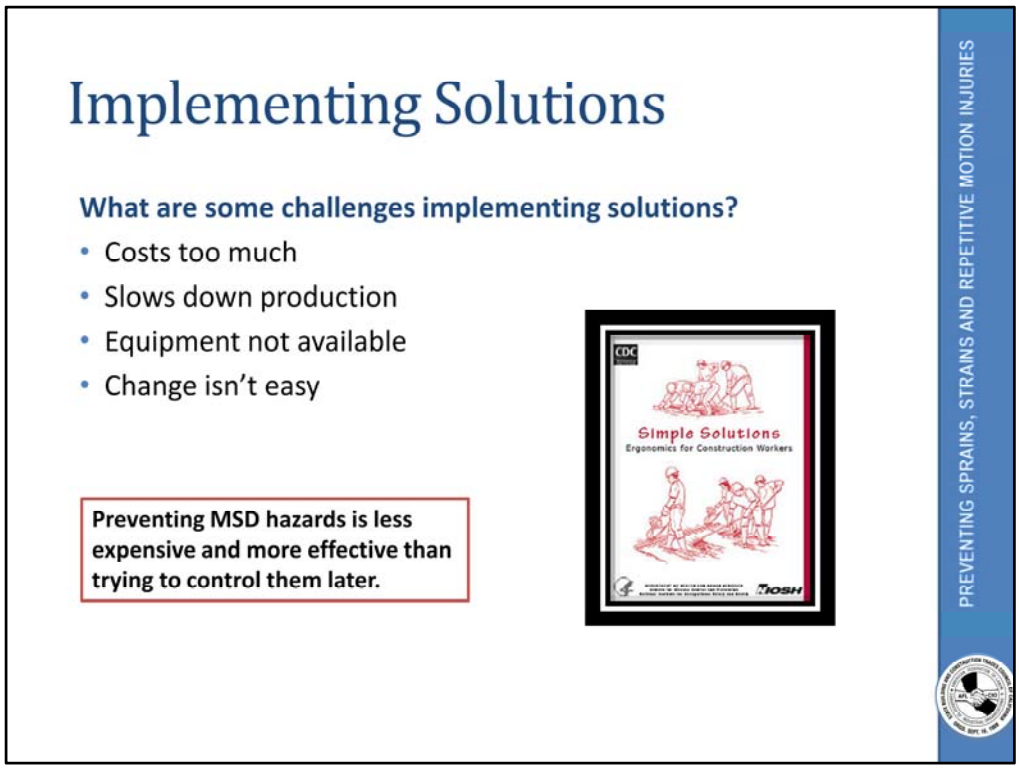
Remember—these programs are not a solution in and of themselves to MSDs.



Tell the class: *Back belts have been studied extensively and experts have concluded that they are not effective in preventing back injuries. The National Institute for Occupational Safety and Health (NIOSH) recommends that employers not rely on back belts to protect worker from repeated lifting, pushing, pulling, twisting, or bending. Instead, NIOSH recommends that employers implement a comprehensive ergonomics program that includes workplace assessment, hazard reduction, and worker training.*

The National Institute for Occupational Safety and Health (or NIOSH) is the United States' federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH is part of the Centers for Disease Control and Prevention (CDC) within the U.S. Department of Health and Human Services.

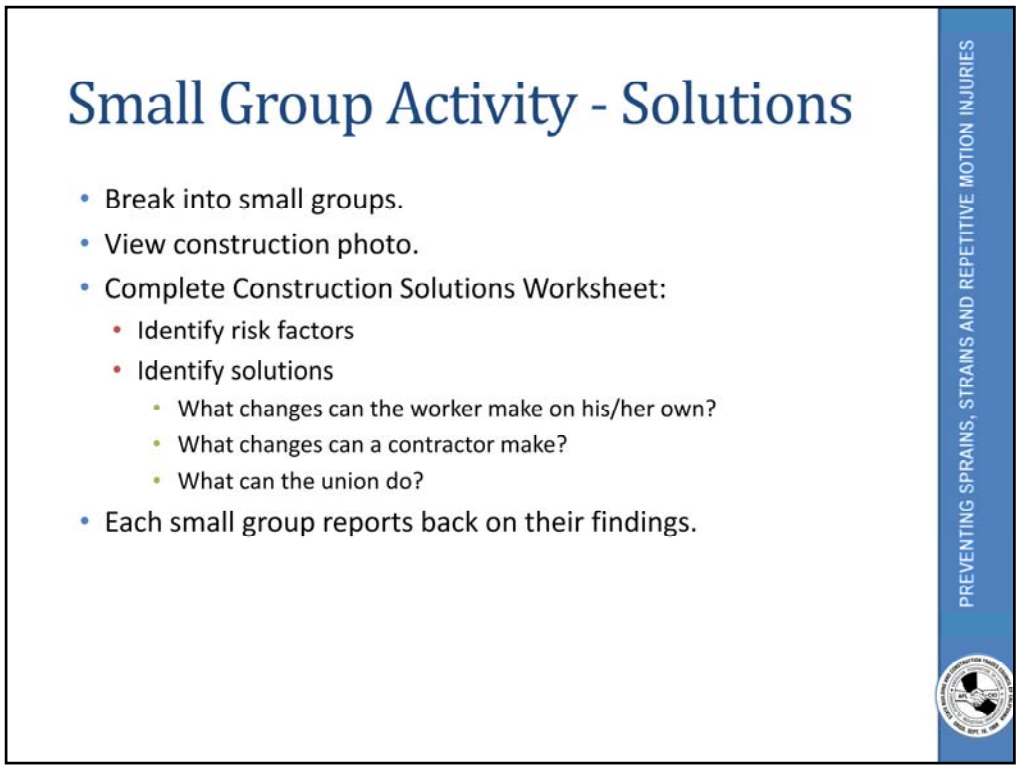
Ask the class: What are some examples of PPEs that can help reduce MSDs?
- Shoulder pads
- Knee pads
- Vibration reducing gloves



Ask the class: **How do we address these challenges?**

Points to raise in the discussion:

1. MSDs are the leading cause of workers' compensation claims. Most MSDs can be prevented. Implementing changes can reduce costs in the long run.
2. MSD injuries can be painful and disabling. Reducing MSDs can reduce the impact of workers' injuries on their families and communities. Employers can save money by eliminating the costs of hiring and training others to replace injured workers.
3. Investing in new tools and equipment can help reduce MSDs and improve production.
4. Change may not come easily. However, workers are creative and should be asked for their input. Workers can often come up with new ways to approach things to help make work safer and more efficient.



Instructions for this activity:

1. Break the class into 5 small groups with 4-5 people in each group.
2. Ask everyone to take out the Construction Solutions Worksheet.
3. Give each small group a different construction task trigger photo to discuss:

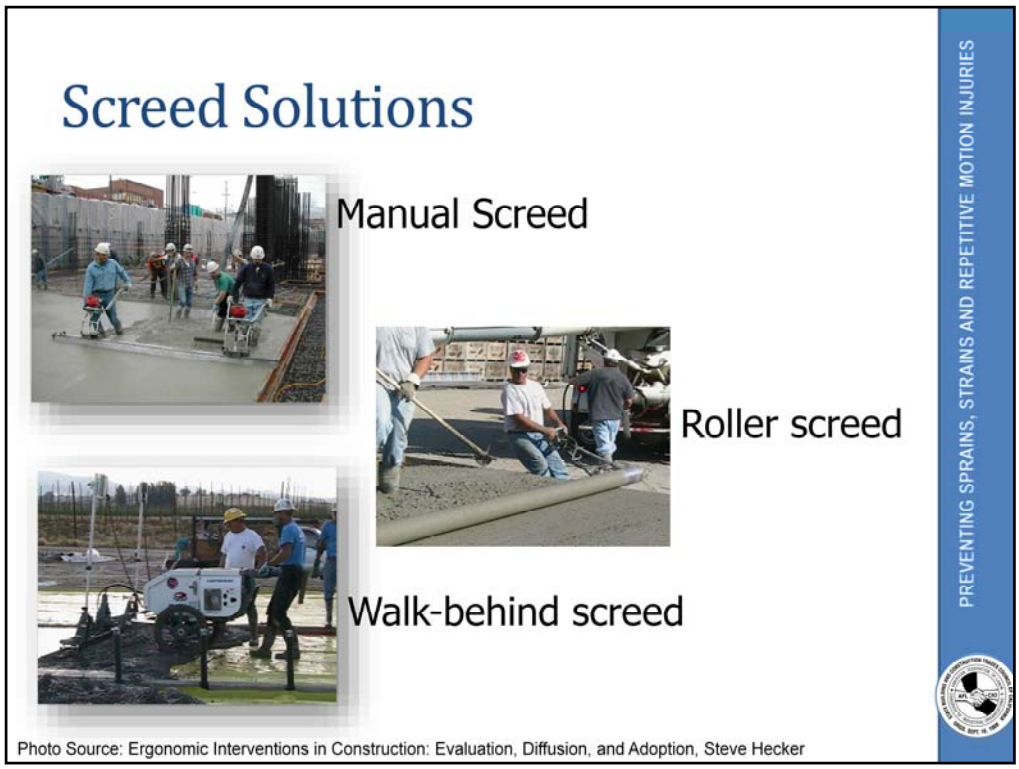
- Group #1: Screeding
- Group #2: Handling Drywall
- Group #3: Rebar Tying
- Group #4: Overhead Drilling
- Group #5: Caulking

4. **Tell the class:** *We've discussed MSD risk factors and various solutions that can be used to eliminate or reduce them. You will now work in small groups to analyze one specific construction job. Identify the risk factors in the job task. Then come up with solutions that can be used. Once your group comes up with solutions, think about how these ideas can be implemented back in your workplace. Also answer the questions on your worksheet about changes the worker, contractor and union can make.*
5. After 15 minutes, bring the class back together. Ask each group to identify the job task they had, explain the risk factors and their solutions. Record their solutions on the flipchart.
6. After all groups report back, you will lead a discussion on what changes the worker can make on his/her own, what changes the contractor can make, and what the union can do. This discussion will take place on slide # 47.

After small groups have met for 15 minutes, bring them back together to report on their task. Start with screeding.

Ask the class: Will the recorder for group #1 please report back their answers for screed operations?

After the screeding small group has reported, show the next slide to make sure the group has included all the points on that slide.



Risks factors might include:

- working in an awkward posture bent over
- using a forceful motion to grip and pull the board over the wet concrete
- using excessive force with arms and shoulders
- Repetition.

These motions put major stress on your back, knees, hands, arms, and shoulders, which may lead to serious muscle or joint injuries.

Solutions might include:

- Using better equipment like a motorized walk-behind screed. This equipment greatly eliminates frequent and prolonged stooping, screeding in a stooped position and repeated arm and shoulder movements. Little effort is needed to move the plow over the concrete surface.
- Other solutions include the manual screed and roller screed, however, they involve some limited pushing and pulling.

See handout: Construction Solutions, Motorized Concrete Screeds, CPWR.

After small groups have met for 15 minutes, bring them back together to report on their task. Continue with handling drywall.

Ask the class: **Will the recorder for group #2 please report back their answers for handling drywall?**

After the handling drywall small group has reported, show the next slide to make sure the group has included all the points on that slide.

Risks factors might include:

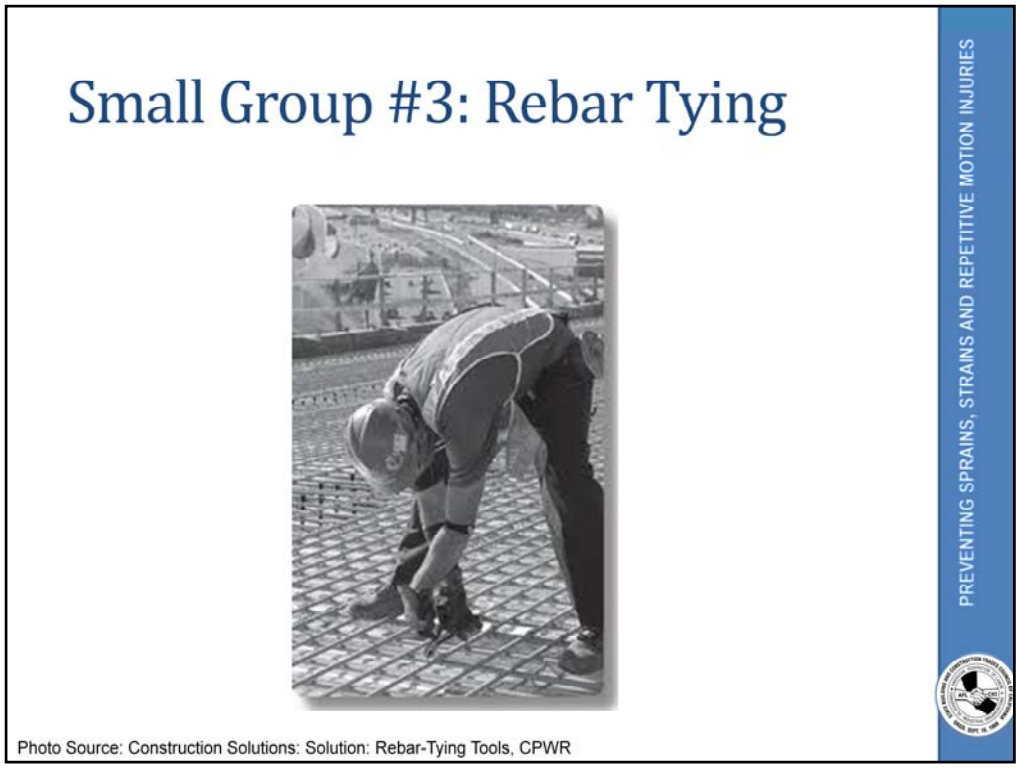
- Pressure put on hands to grip and carry the drywall
- Carrying heavy material in an awkward position.

Solutions might include:

- Using a strap or handles to carry drywall
- Using a cart to carry drywall
- Using a stand to lift and position the drywall in place
- Use the buddy system—get help to carry drywall.

See handout: Drywall Installers: Prevent Back, Wrist, Neck and Shoulder Injuries, California Department of Health Services, California Department of industrial Relations.

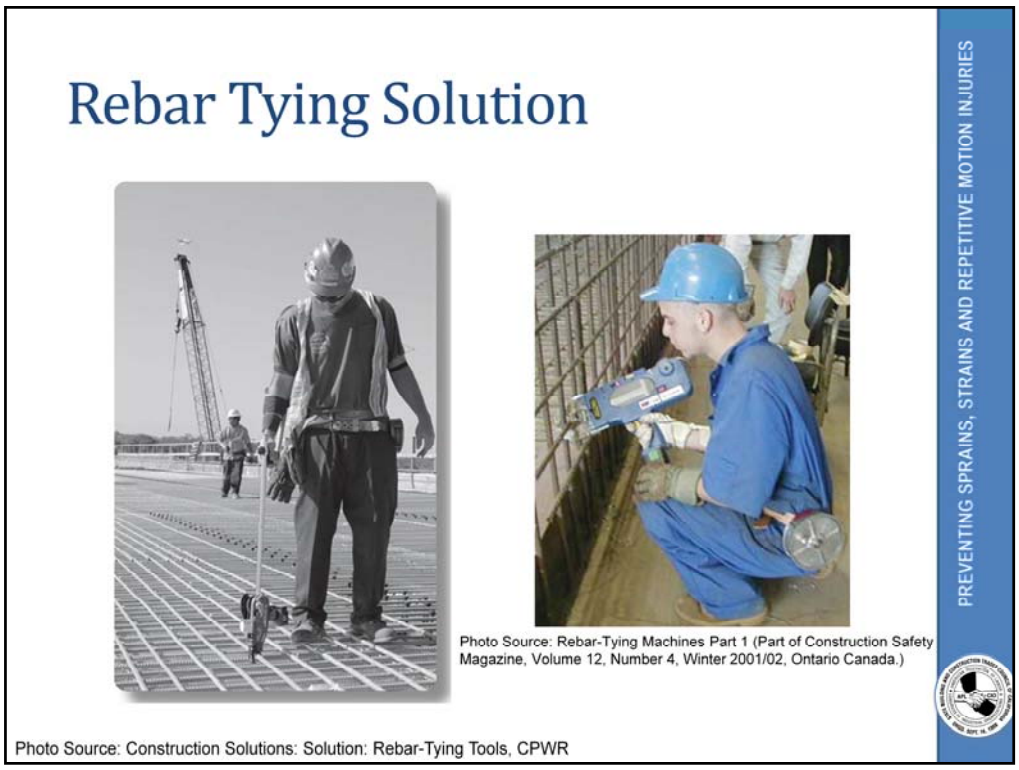
See handout: Back & Lifting Checklist, from Tailgate Meetings That Work: A Guide to Effective Construction Safety, LOHP and SBCTC.



After small groups have met for 15 minutes, bring them back together to report on their task. Continue with rebar tying.

Ask the class: **Will the recorder for group #3 please report back their answers for rebar tying?**

After the rebar tying small group has reported, show the next slide to make sure the group has included all the points on that slide.



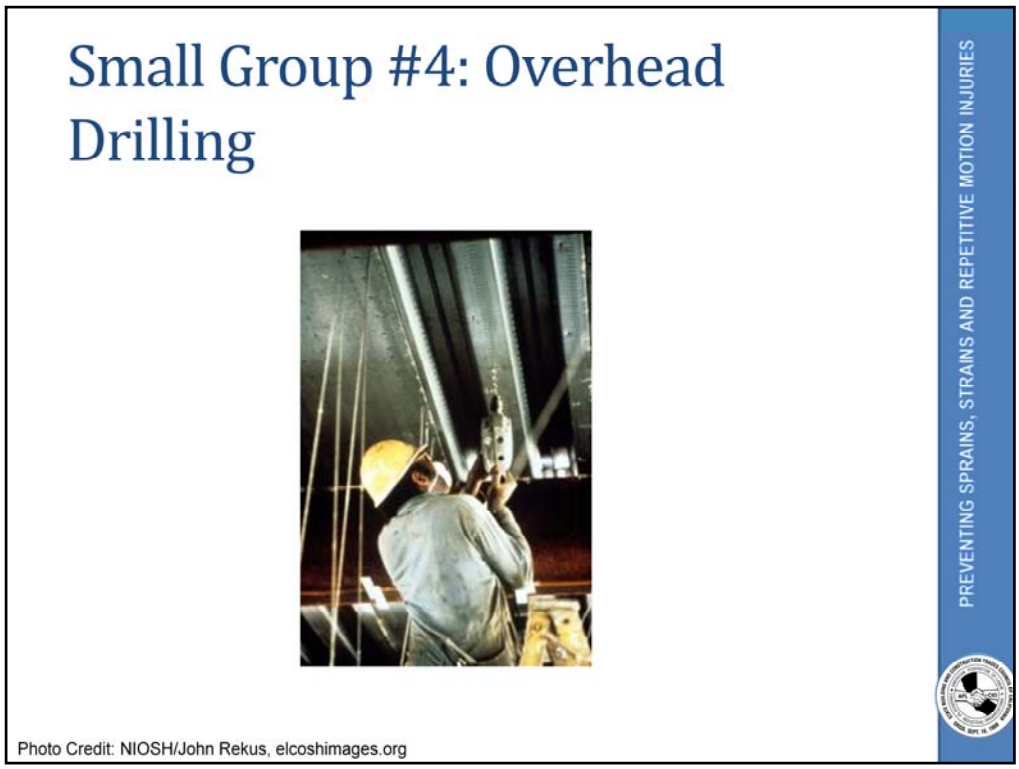
Risks factors might include:

- Working in a static, stooped and prolonged position
- Bending the wrist in an awkward position to twist and tie the wire
- Using excessive force to grip the pliers
- Repeating the same motion over and over.

Solutions might include:

- Use a rebar-tying tool. This lowers your risk of hand and wrist injury because it reduces the hand motions required to use the pliers. It also allows you to work standing up, so there is less stress on your lower back due to stooping and bending.
- Use a rebar tying gun. This equipment allows workers to work upright and avoid the bending, twisting, and awkward postures of tying rebar at ground level. In addition, working with rebar-tying guns requires only one hand. Workers can lean on their knee with the other hand and thereby support their trunk. This in turn decreases some of the muscle activity and muscle fatigue that occur with manual tying.

<u>See handout: Construction Solutions, Rebar-Tying Tools, CPWR.</u>



After small groups have met for 15 minutes, bring them back together to report on their task. Continue with overhead drilling.

Ask the class: Will the recorder for group #4 please report back their answers for overhead drilling?

After the overhead drilling small group has reported, show the next slide to make sure the group has included all the points on that slide.

Overhead Drilling Solution

Photo Source: Ergonomics, David Rempel, University of California

PREVENTING SPRAINS, STRAINS AND REPETITIVE MOTION INJURIES

Risks factors might include:

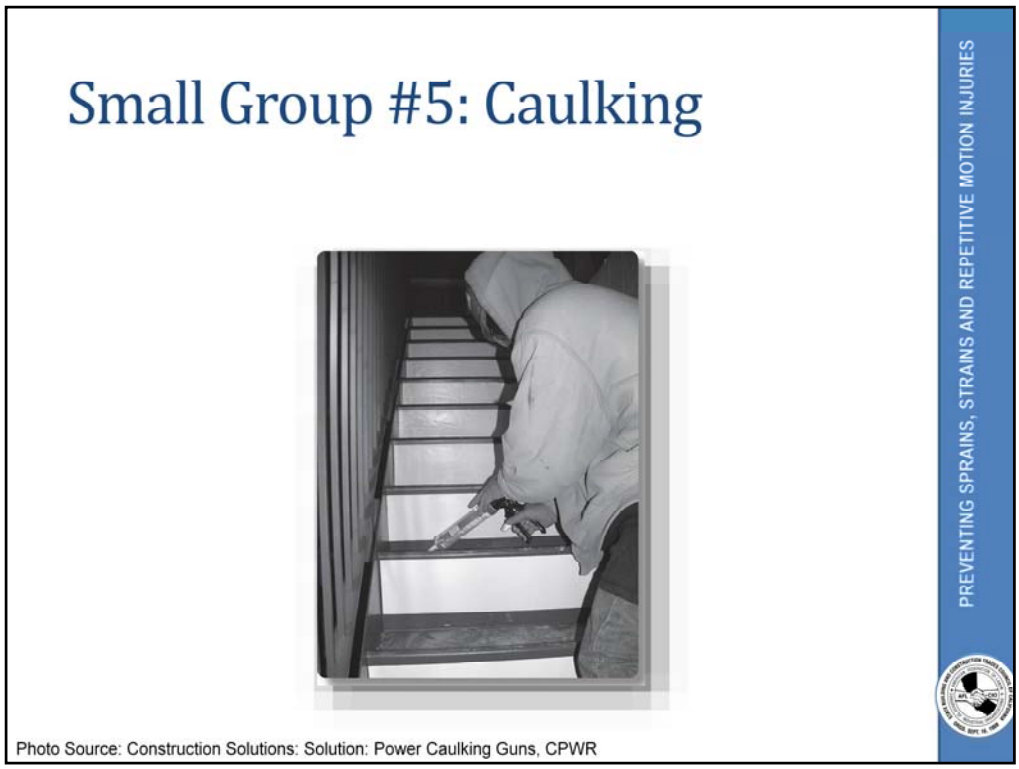
- Working overhead with arms and neck in a fixed, awkward hard-to-hold position This creates stress on the arms, neck, shoulders, and back
- Using a heavy tool that creates vibration in the hands and arms
- Gripping with hands to hold the tool and forcing it upwards
- Repetition.

One solution:

- Use an overhead drill press. It reduces arm fatigue and injuries in workers who repeatedly drill overhead. The final design allows drilling to be done efficiently and prevents the extreme fatigue workers usually experience from overhead drilling.

Source: UCSF Overhead Drilling Project, David Rempel.

See handout: Drilling Overhead. Occupational Health Branch, California Department of Public Health.



After small groups have met for 15 minutes, bring them back together to report on their task. Continue with caulking.

Ask the class: **Will the recorder for group #5 please report back their answers for caulking?**

After the caulking small group has reported, show the next slide to make sure the group has included all the points on that slide.

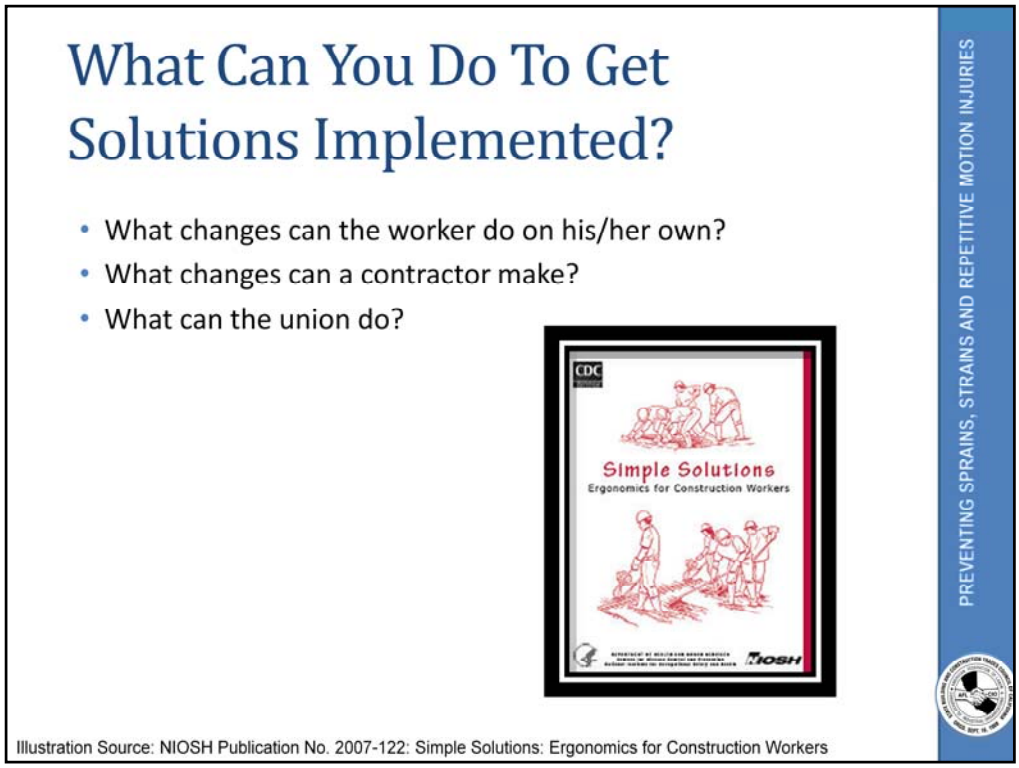
Risks factors might include:

- Using force to pull the trigger. The more pressure your gun requires to pull the trigger the greater your chance of injury. You may have to exert even more force when you apply a thicker sealant material.
- Repetition. If you use these guns often and for long periods of time, you are at risk of stressing the soft tissues in your hand, wrist, and forearm.
- Using a poorly designed tool. Bending your wrist or twist your forearm when pulling the trigger, increases risk of injury. Your chance of developing an injury increases if the gun you use has sharp edges or grooves on the trigger, or has a wide span between the trigger and the grip, forcing you to stretch your hand.

One solution:

- Use a power caulking gun, which may be powered by a battery or compressed air. It eliminates the need for pulling the trigger to apply the caulk or sealant. This reduces the required grip force and hand pressure and will reduce fatigue and strain.

<u>See handout: Construction Solutions, Power Caulking Guns, CPWR.</u>



Ask the class the questions on the slide and lead a discussion on each one. Record what is said for each question on the flipchart. Then proceed with the slide show.

Examples of changes the worker can make:

- Report problems early
- Ask for help when needed
- Suggest solutions to your employer
- Rest your hands when using the same tool for long periods of time
- Invest in hand tools with better grips and handles.

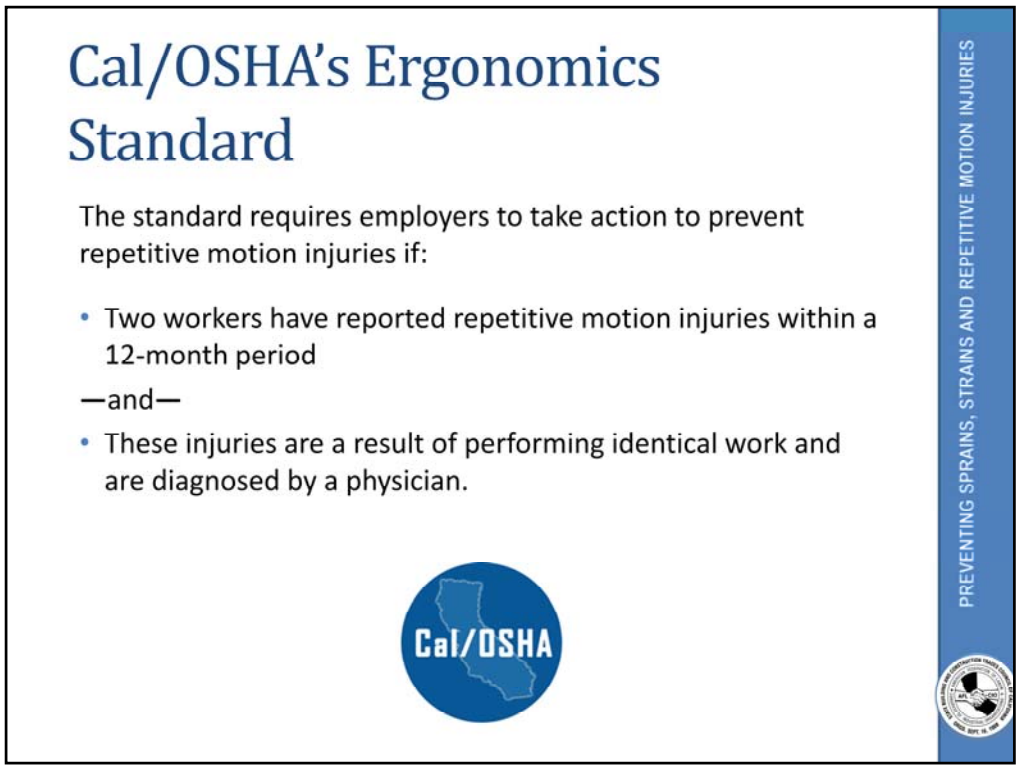
Examples of changes a contractor can make:

- Purchase better materials (lighter, in smaller units, etc.)
- Purchase newly designed tools. Keep tools sharp and in good condition
- Improve work methods: use platforms, lifts, hoists, carts and dollies
- Plan work with ergonomics in mind: deliver materials where they will be used, arrange work to reduce bending, reaching and twisting
- Make realistic production schedules, have enough workers for the job
- Provide training for superintendent, foremen and workers
- Encourage reporting of MSD symptoms and injuries
- Support a comprehensive program to reduce MSDs on the job.

<u>See handout: Construction Foreman: An Ergonomic Approach to Cost Reduction, Cal/OSHA</u>

Examples of what the union can do:

- Work with employers to make sure a comprehensive ergonomics program is in place, and that workers are trained and given proper tools and equipment.
- Make sure information about MSDs and ergonomics is taught in apprenticeship programs.

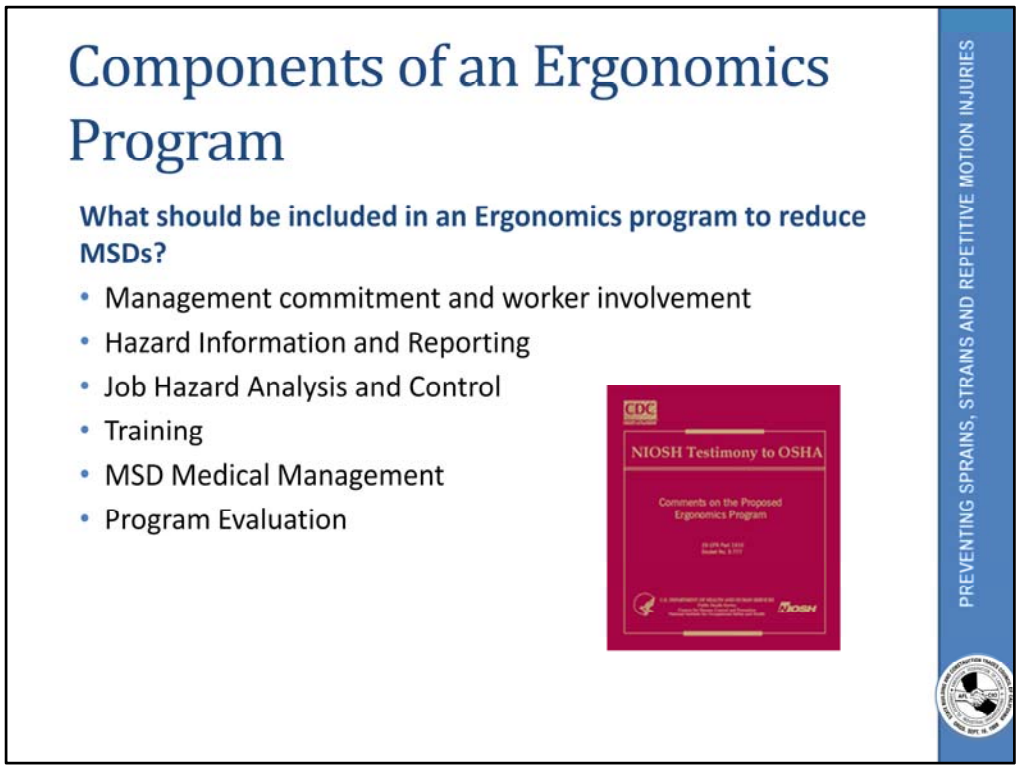


Tell the class: *Cal/OSHA has an ergonomics standard. Note that the standard is in the General Industry Safety Orders (GISO) but it applies to construction. The standard has limitations. It does not take effect unless the two conditions stated in the slide are met. If this happens, the employer must establish an ergonomics program to minimize repetitive motion injuries. The employer must:*

1. *Evaluate work activities that are stressful to the body.*
2. *Implement controls such as redesigning workstations, adjusting tools, or rotating jobs.*
3. *Train workers on the symptoms and causes of repetitive motion injuries, the importance of early reporting and diagnosis, and the methods the employer uses to control or reduce the problem.*

Cal/OSHA also has limited resources to enforce the standard. While Cal/OSHA may be a resource, it is best if you can work with your employer to get a comprehensive ergonomics program established in your workplace.

See handout: California's Ergonomic Standard, WOSH Specialist Training and the Resource section in the course binder.



Tell the class: *Federal OSHA does not have an ergonomics standard. Federal OSHA issued an ergonomics standard in 2000 but it was repealed in 2001 before it took effect. The following components of a comprehensive ergonomics program are suggestions adapted from the proposed federal OSHA Ergonomics standard:*

Management commitment and worker involvement. The employer assigns responsibility to set up and manage the ergonomics program, provides resources and training to ensure participation in the program and communicates with workers about their concerns.

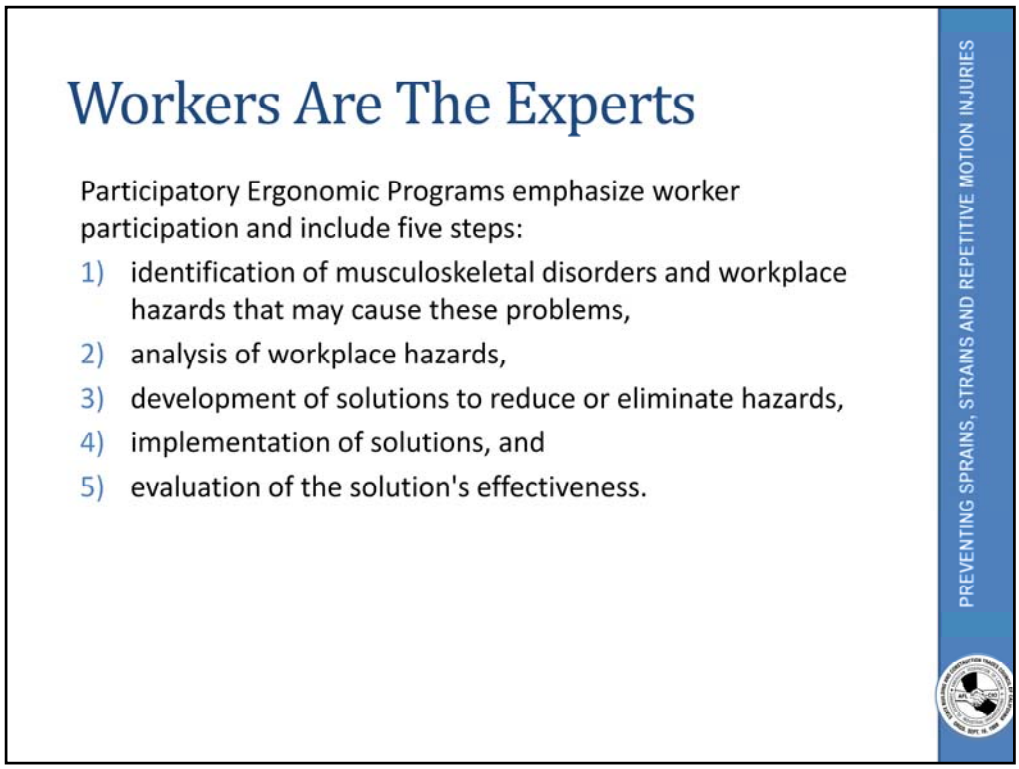
Hazard Information and Reporting. A system to report and evaluate MSD symptoms and injuries without fear of reprisal. Information is provided to workers that explains how to identify and report MSD symptoms.

Job Hazard Analysis and Control. Job evaluation to identify risk factors. Elimination of MSD hazards or reduce them to the extent feasible.

Training. Managers and workers are trained on MSD hazards, signs and symptoms, and how to report MSDs. Employees must also be trained/retrained when a problem is identified, when new hazards are identified or when changes are made to the job that may increase their exposure to MSD hazards.

MSD Management. The employer must respond promptly to workers with MSDs, and provide medical management of injury cases.

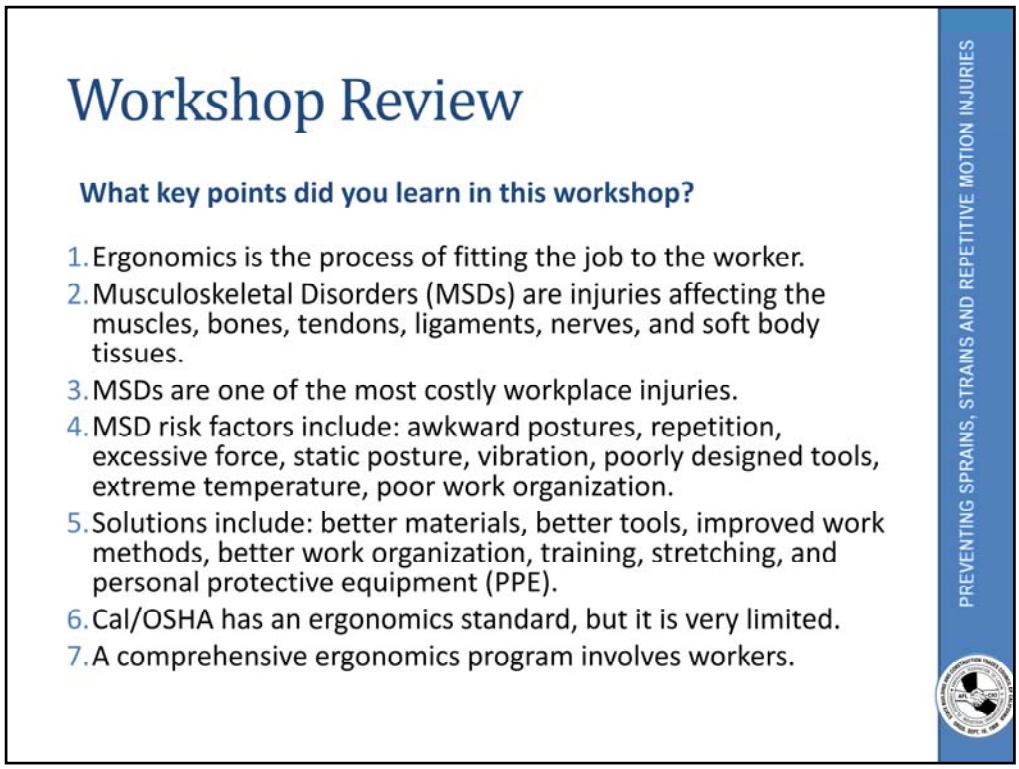
Program Evaluation. The employer must evaluate their ergonomics program annually.



Tell the class: *An expert approach to ergonomics makes specialists, such as safety managers or industrial engineers, the primary directors of workplace changes. In contrast, participatory ergonomics is based on the belief that workers are the experts in identifying problems and finding solutions. In order to successfully do this, workers should receive training on workplace hazards, musculoskeletal disorders that could be caused by these hazards, and ergonomic solutions. They should also be involved in the identification and analysis of hazards in the workplace, and the development of solutions that could reduce these hazards.*

In contrast to the expert approach, participatory ergonomics has been adopted by many companies to aid in the control of workplace hazards. Participatory ergonomic programs are initially put into operation with the assistance of an occupational safety and health specialist. These specialists provide training and technical expertise, however, the long-term goal is to develop worker in-house expertise with the specialist only acting as a consultant as needed. Participatory ergonomics has also been associated with improvements in worker satisfaction, productivity, product quality, awareness of company goals, and communication. Participatory ergonomic programs have been used effectively in several construction environments and have been known to increase morale among workers.

Source: Reducing Sprains and Strains in Construction through Worker Participation: A Manual for Managers and Workers with Examples from Scaffold Erection. Koningsveld, Ernst A.P., Peter Vink, Isle J.M. Urlings, and Annelise M. de Jong. 1998. Study funded by CPWR.



Let participants respond, then review the points on the slide.

Tell the class: *Thank you for attending this training. Please take a few moments to complete the evaluation.*

Collect the evaluation forms and return them to Laura Boatman at the State Building & Construction Trades Council of California.

Section 4: Trigger Photos and OSHA V-Tools

Small Group #1: Screeding

Photo Credit: Cement Masons/Washington State Department of Labor and Industries, elcoshimages.com.

Small Group #2: Handling Drywall

Photo Source: Ergonomic Interventions in Construction: Evaluation, Diffusion, and Adoption, Steve Hecker.

Small Group #3: Rebar Tying

Photo Source: Construction Solutions: Solution: Rebar-Tying Tools, CPWR.

Small Group #4: Overhead Drilling

Photo Credit: NIOSH/John Rekus, elcoshimages.org

Small Group #5: Caulking

Photo Source: Construction Solutions: Solution: Power Caulking Guns, CPWR.

OSHA v-Tool: Sprains and Strains in Construction/Pulling Cables

Each year in the U.S., 31,000 construction workers seek medical attention due to sprains and strains suffered on the job. These injuries happen when the human body is forced to work beyond its limits. Lifting, pulling, pushing, reaching, bending, and other common construction activities can cause these injuries. The pain resulting from these injuries can last a lifetime and affect construction workers' lives at work and at home. But these injuries can be prevented. This video shows how overexertion at construction sites can lead to worker injuries.

The video will also show what employers must do so that the work can be done more safely. Employers have a responsibility to provide a safe workplace and required protective equipment. You'll see that taking the right protective steps can help prevent these injuries. An experienced commercial electrician was wiring a newly built commercial building. He had been doing this kind of work for several years. While standing on a ladder that was too short for the job, he pulled long runs of a heavy gauge wire. He then attached the wiring above his head to the ceiling. The job involves awkward pulling movements while reaching overhead. After several days on the job, the stress on the electrician's arms, neck, back, and shoulders has become too much. As a result, the pain the electrician feels has affected his ability to do the work.

Let's look at the events leading up to these injuries, and see how they could have been prevented. As before, the electrician is attaching wiring to the ceiling. But this time, he is standing on an elevated platform that is the right height for the job. This reduces his overhead movements, and prevents stress to his body. Also, as he attaches the wiring, he is now using a mechanical wire puller to get the wire he needs. This way, he doesn't hurt himself by pulling the wire by hand and straining his body as he did before. Making these types of small changes in work activities can prevent painful injuries.

This example shows the importance of employers using OSHA's ergonomics guidelines. These are guidelines designed so workers can avoid stress and injury to their bodies. These types of injuries are preventable. Follow OSHA's guidelines at work sites. By following the guidelines, workers can avoid suffering a lifetime of pain from these injuries.

If you would like more information, contact OSHA at www.osha.gov or 1-800-321-OSHA, that's 1-800-321-6742.

OSHA v-Tool: Sprains and Strains in Construction/Laying Stone

Each year in the U.S., 31,000 construction workers seek medical attention due to sprains and strains suffered on the job. These injuries happen when the human body is forced to work beyond its limits. Lifting, pulling, pushing, reaching, bending, and other common construction activities can cause these injuries. The pain resulting from these injuries can last a lifetime and affect construction workers' lives at work and at home. But these injuries can be prevented.

This video shows how overexertion at construction sites can lead to worker injuries. The video will also show what employers must do so that the work can be done more safely. Employers have a responsibility to provide a safe workplace and required protective equipment. You'll see that taking the right protective steps can help prevent these injuries. An experienced stonemason and her tender were using large stone pieces to build a walkway for a new two-story townhome. A concrete slab was already in place, and the workers were putting the stone on top of the slab. The tender was mixing the mortar in five-gallon buckets and carrying the mortar to the mason. After the mason spread some of the mortar onto the concrete slab, the workers bent over at the waist to pick up one of the heavy stone pieces. They kneeled down and hunched over to lay the stone piece on top of the mortar. After several days of carrying these heavy loads and kneeling and hunching while doing their work, both of these workers are experiencing severe lower back and knee pain.

Let's look at the events leading up to these injuries, and see how they could have been prevented. As before, the tender is mixing mortar. This time, a cement mixer is being used and the tender wheels the mortar over to the stonemason. The stone pieces have also been placed off the ground and both workers are now wearing knee pads. After the mason spreads some of the mortar, the workers pick up and lay one of the stone pieces into the wet mortar. Making these types of small changes in work activities can prevent painful injuries.

This example shows the importance of employers using OSHA's ergonomics guidelines. These are guidelines designed so workers can avoid stress and injury to their bodies. These types of injuries are preventable. Follow OSHA's guidelines at work sites. By following the guidelines, workers can avoid suffering a lifetime of pain from these injuries.

If you would like more information, contact OSHA at www.osha.gov or 1-800-321-OSHA, which is 6742

Section 5: Factsheets/Worksheets

What Is Cal/OSHA?

Cal/OSHA is the California state program that is responsible for protecting the health and safety of workers.

Cal/OSHA, housed in the Department of Industrial Relations, has several parts:

- The **Division of Occupational Safety and Health (DOSH)** is the agency that enforces regulations and provides consultation services.
  - The **Cal/OSHA Enforcement Unit** enforces occupational safety and health standards by responding to complaints and reports of accidents, and by conducting scheduled (programmed) inspections of certain workplaces. In some cases, it issues citations and fines.
  - The **Cal/OSHA Consultation Service** provides technical assistance on health and safety problems to employers and employees to help employers comply with Cal/OSHA standards. The Consultation Service is separate from the Enforcement Unit and consultants do not participate in Cal/OSHA enforcement activities.
- The California **Occupational Safety and Health Standards Board** establishes health and safety standards that protect workers from injury and illness on the job.
- The California **Occupational Safety and Health Appeals Board** hears appeals from employers who receive a citation from an inspector in the Enforcement Unit.

Almost all workers in California are protected by Cal/OSHA regulations (called "standards"). This includes public employees and immigrant workers who are not legally authorized to work in California. However, some workers are not covered:

- People who are self-employed
- Family members of farm owners who work on the family farm
- Federal employees working in California. These workers are covered by federal OSHA.

Cal/OSHA protects California workers by making sure that employers comply with occupational safety and health regulations, and keep the workplace safe. (See Factsheet O, *Cal/OSHA Standards*.)

What Are Employer Responsibilities Under Cal/OSHA?

Employers must:

- Provide their employees with work and workplaces that are safe and healthful.
- Display Cal/OSHA's *Safety and Health Protection on the Job* poster so that workers are aware of basic rights and responsibilities.
- Be aware of the hazards their employees face on the job, train every worker about the specific hazards on each job assignment, and keep records of this training.
- Correct any hazardous conditions that they know may result in serious injury to their employees. Failure to do so could result in criminal charges, monetary penalties, and even jail.
- Notify the nearest Cal/OSHA office of any serious injury or fatality that occurs on the job. This must be done immediately after calling for emergency help to assist the injured worker.
- Comply with all applicable Cal/OSHA standards.

Workers also have rights and responsibilities under Cal/OSHA. (See Factsheet P, *Worker Health and Safety Rights and Responsibilities*.)

How Does Cal/OSHA Help Employers?

The Cal/OSHA Consultation Service provides technical assistance to employers on health and safety problems. Consulting services include free on-site visits, assistance in complying with Cal/OSHA standards, educational seminars, and publications. Although primarily a service for employers, the Consultation Service is also available to workers.

The Consultation Service can give employers information on how to improve workplace injury and illness prevention programs and how to participate in Cal/OSHA's Voluntary Protection Program (VPP). The Voluntary Protection Program is a certification program that recognizes employers whose occupational safety and health efforts are especially effective and meet certain guidelines.

The Consultation Service is separate from the Cal/OSHA Enforcement Unit, and consultants are not involved with enforcement activities such as inspections, citations, and fines.

How Does Cal/OSHA Help Employers? (CONTINUED FROM PREVIOUS PAGE)

All communications between the employer and the Consultation Service are confidential and are not shared with enforcement staff. In exchange for this free consultation, however, employers must agree to correct in a timely manner any serious hazards that are identified.

Cal/OSHA publications provide information about Cal/OSHA programs, standards, and general health and safety topics. Various types of guidelines and model Injury and Illness Prevention Program plans also are available. You can obtain copies of Cal/OSHA publications by going to their website at www.dir.ca.gov/dosh/puborder.asp. Some of these are available in Spanish, Chinese and other languages.

How Are Cal/OSHA Regulations Enforced?

Cal/OSHA's Enforcement Unit enforces job safety and health standards by conducting inspections and, in some cases, issuing citations and fines. Citations can be issued, for example, if a specific hazard exists, if a standard is violated, or if the employer fails to document injuries and illnesses.

Cal/OSHA inspectors investigate workplaces when they receive a report of a serious injury or death from an employer. They also conduct inspections in response to a complaint filed by an employee, by an employee representative (union representative, health and safety professional, or attorney), or by another government agency.

Cal/OSHA is also authorized to investigate workplaces that are on its list of high hazard industries. In this case, Cal/OSHA randomly selects a workplace in one of these industries for inspection. These are called "programmed" inspections. Cal/OSHA may also inspect an employer because it has been identified as having a higher injury rate than other employers in its industry. Also, Cal/OSHA inspectors who are driving by and witness a hazardous situation can stop and conduct an inspection.

What Is a Cal/OSHA Complaint?

A complaint can be filed by phone, fax, mail, or online. A "formal" complaint is one where the employee or representative gives Cal/OSHA their name. If a worker wants to remain anonymous and does not give a name, the complaint is considered a "non-formal" complaint. Complaints from the public, which includes former employees of a company, are also considered non-formal.

Each complaint is classified by the Cal/OSHA Enforcement District Office to determine what inspection priority the complaint should be given. Complaints about an "imminent" hazard that puts a worker in immediate danger of being killed or seriously injured are given immediate priority. Work-related deaths, which must be reported by the employer to Cal/OSHA, are also investigated

What Is a Cal/OSHA Complaint? (CONTINUED FROM PREVIOUS PAGE)

immediately. Complaints from named employees (formal complaints) about serious hazards are given the next priority. Complaints from anonymous sources (non-formal complaints) about non-serious hazards are given lower priority.

Cal/OSHA often handles non-formal complaints by phoning or sending a letter to the employer asking the employer to investigate and correct the unsafe or unhealthy conditions, instead of conducting an on-site inspection. If the employer does not respond, or the employer's response is inadequate, an on-site inspection may be done.

If you do give your name when making a complaint, Cal/OSHA is required to keep it confidential, unless you give specific permission to reveal who complained.

What Happens During a Cal/OSHA Inspection?

INITIAL CONTACT

Cal/OSHA inspectors request permission to conduct an inspection from a management level representative of the employer. If permission is refused, Cal/OSHA can obtain an inspection warrant.

Cal/OSHA inspectors will request that a worker representative be contacted and invited to accompany the employer and inspector on the inspection. If a worker representative is not available, the inspector must interview workers in private during the inspection.

OPENING CONFERENCE

The inspection process begins with an opening conference between the Cal/OSHA representative and the employer to gather preliminary information, discuss the reason for the inspection, describe what areas it will cover, explain the procedure, and obtain the employer's consent to the inspection.

WALKAROUND

The Cal/OSHA inspector informs the employer of "walkaround" procedures. He or she explains that the inspection may include taking photographs, conducting air monitoring, and examining written programs, training records, and Form 300 records.

CLOSING CONFERENCE

After the inspection is complete, the Cal/OSHA inspector holds a closing conference with the employer to discuss any alleged violations that were found and any requirements for abating (correcting) hazardous conditions.

If workers have a union, a joint closing conference may be held with the employer representative and union representative together, or there may be separate closing conferences.

At the closing conference, the inspector explains any citations or fines that will be proposed.

What Happens After a Cal/OSHA Inspection?

CITATIONS

After an inspection, if Cal/OSHA believes that an employer has violated any standards or regulations, the agency issues a citation. Citations describe the alleged violations, list any proposed penalties (fines), and give a deadline for correcting the hazards.

PENALTIES

There are several categories of violations: serious, willful, repeat, failure to abate, or other-than-serious. Penalties are based on the category as well as the severity and extent of the violation. For a "serious" violation, the penalty can be up to $25,000. Penalties can be adjusted based on the size, good faith, and history of the employer. Cal/OSHA has specific criteria they use to evaluate an employer's good faith.

POSTING CITATIONS

The citation must be posted by the employer at or near each place where a serious violation occurred. For other violations, the citation must be posted in a place readily seen by all employees. It must be posted for a period of three working days or until the problem is corrected, whichever is longer.

Can Employers Appeal Cal/OSHA Citations?

Yes. Employers who receive a citation may appeal to the Occupational Safety and Health Appeals Board to try to change the violations cited, the penalties proposed, the deadline for correcting hazards, or the solutions required. The appeal must be made in writing within 15 working days of receiving the citation.

Unions and/or affected workers can apply to have "party status" during the employer's appeal. They can speak at hearings and file written comments. Also, unions and/or affected workers can file their own appeals on certain issues—the deadline for correcting the hazards and the particular solutions Cal/OSHA has required for abatement.

Cal/OSHA District Offices

Concord
1450 Enea Circle,
Suite 525,
Concord 94520
(925) 602-6517
Fax (925) 676-0227

Foster City
1065 East Hillsdale Blvd.,
Suite 110,
Foster City 94404
(650) 573-3812
Fax (650) 573-3817

Fremont
39141 Civic Center Dr.,
Suite 310,
Fremont 94538-5818
(510) 794-2521
Fax (510) 794-3889

Fresno
2550 Mariposa Street,
Suite 4000,
Fresno 93721
(559) 445-5302
Fax (559) 445-5786

Los Angeles
320 West 4th Street,
Suite 850,
Los Angeles 90013
(213) 576-7451
Fax (213) 576-7461

Modesto
1209 Woodrow,
Suite C-4,
Modesto 95350
(209) 576-6260
Fax (209) 576-6191

Monrovia
750 Royal Oaks Drive,
Suite 104,
Monrovia 91016
(626) 256-7913
Fax (626) 359-4291

Oakland
1515 Clay Street,
Suite 1301,
Oakland 94612
(510) 622-2916
Fax (510) 622-2908

Redding
381 Hemsted Drive,
Redding 96002
(530) 224-4743
Fax (530) 224-4747

Sacramento
2424 Arden Way,
Suite 165,
Sacramento 95825
(916) 263-2800
Fax (916) 263-2798

San Bernardino
464 W. 4th St.,
Suite 332,
San Bernardino 92401
(909) 383-4321
Fax (909) 383-6789

San Diego
7575 Metropolitan Drive,
Suite 207,
San Diego 92108
(619) 767-2280
Fax (619) 767-2299

San Francisco
121 Spear Street,
Suite 430,
San Francisco 94105
(415) 972-8670
Fax (415) 972-8686

Santa Ana
2000 E. McFadden Ave.,
Suite 122,
Santa Ana 92705
(714) 558-4451
Fax (714) 558-2035

Santa Rosa
1221 Farmers Lane,
Suite 300,
Santa Rosa 95405
(707) 576-2388
Fax (707) 576-2598

Torrance
680 Knox Street,
Suite 100,
Torrance 90502
(310) 516-3734
Fax (310) 516-4253

Van Nuys
6150 Van Nuys Boulevard,
Suite 405,
Van Nuys 91401
(818) 901-5403
Fax (818) 901-5578

Ventura
1000 Hill Road,,
Suite 110,
Ventura 93003
(805) 654-4581
Fax (805) 654-4852

West Covina
1906 West Garvey Ave So,
Suite 200,
West Covina 91790
(626) 472-0046
Fax (626) 472-7708

This factsheet was adapted in part from the Division of Occupational Safety and Health's ***User's Guide to Cal/OSHA*** and ***Peterson and Cohen's Cal/OSHA Sourcebook 2004***. Some material is from ***Know Your Rights Under OSHA*** by the National Committees for Occupational Safety and Health Network. The content and language were reviewed by Cal/OSHA staff in October 2004.

What Are Musculoskeletal Disorders?

Our bodies normally recover from the wear and tear of work after a period of rest. But if the stresses continue day after day without time to recover, the damage can lead to ergonomic injuries.

Many different terms are used to describe these ergonomic injuries. For example:

- **Cumulative trauma disorders (CTDs).** Ergonomic injuries involve strain that may develop, or accumulate, over time.
- **Repetitive strain injuries (RSIs).** Ergonomic injuries are often caused by repeating the same motions over and over.
- **Musculoskeletal disorders (MSDs).** Ergonomic injuries affect the muscles, bones, tendons, nerves, and tissues.

These terms do not necessarily refer to different conditions. Many ergonomic injuries can be described in all three ways.

These disorders include a number of specific diseases such as carpal tunnel syndrome, bursitis, and tendinitis. Back injuries are the most common and most costly MSD.

Symptoms of these disorders are most common in the back, hands, arms, wrists, elbows, neck, and shoulders. They include:

- Soreness or pain (aching or sharp)
- Stiffness
- Swelling
- Loss of coordination
- Numbness
- Tingling (as though the area is “asleep”)
- Unexplained weakness

If your work exposes you to any of the ergonomic risk factors described in Factsheet B, these symptoms may be signs that you have an MSD.

It is important to seek medical care if these symptoms:

- Last for more than a week
- Bother you so much that you restrict activities or take time off to recover.

If You Believe You Have an MSD

- Seek early treatment. The longer you have symptoms without getting help, the harder they can be to treat successfully.
- Find a doctor who understands work-related health problems. Don't be afraid to educate your doctor about the possible causes of MSDs at your workplace.
- If your problem is work-related, file a workers' compensation claim to cover lost work time and/or medical costs.
- Don't return to the same working conditions that caused your problem. Work with others at your workplace to ensure that the equipment or activities that contributed to your injury are changed.
- Above all, don't let your condition get you down. Finding the right doctor, getting effective treatment, and improving your work environment take persistence and energy. Don't hesitate to ask for help and don't give up until the problem is solved.

Risk Factors for Ergonomic Injuries

The field of ergonomics examines the fit between workers and their jobs. It looks at:

- What body movements and positions people use when they work.
- What tools and equipment they use.
- The physical environment (temperature, noise, lighting, etc.).
- The organizational environment (deadlines, teamwork, supervision).
- Whether any of these factors may place a worker at risk of injuries or illnesses.

The goal of ergonomics is to fit workplace conditions and job demands to the capabilities of the individual worker, instead of making the worker fit the job.

To prevent injuries, *ergonomic risk factors* must be identified. Ergonomic risk factors are workplace situations that cause wear and tear on the body and can cause injury. Once these have been identified, you can work on finding ways to eliminate them.

Ergonomic Risk Factors

RISK FACTORS	DEFINITION	POSSIBLE SOLUTIONS
Repetition	Making the same motion over and over.	Redesign task to reduce repetitions; increase rest time between repetitions; rotate among tasks with different motions.
Awkward Posture	Prolonged bending, reaching, kneeling, squatting, or twisting any part of your body.	Redesign tasks and equipment to keep the body in more "neutral" positions.
Forceful Motion	Excessive effort needed to do tasks such as pulling, pounding, pushing, and lifting.	Redesign task to reduce the exertion needed; assign more staff; use mechanical assists.
Stationary Position	Staying in one position too long, causing fatigue in muscles and joints.	Redesign task to avoid stationary positions; provide opportunities to change position.
Direct Pressure	Prolonged contact of the body with a hard surface or edge.	Improve tool and equipment design or layout to eliminate pressure; provide cushioning material.
Vibration	Using vibrating tools or equipment.	Insulate the hand or body from vibration; keep tools or equipment in good condition to reduce excessive vibration.
Extreme Temperature	Working where it is too hot or too cold. Cold reduces feeling, blood flow, and strength. Heat increases fatigue.	Control temperature where possible; insulate the body against cold by wearing gloves and warm clothing; provide breaks and fresh water in hot environments.
Work Stress	Includes machine-paced work, inadequate breaks, monotonous tasks, multiple deadlines, poor work organization, or poor supervision.	Establish reasonable workload, sufficient breaks, task variety, individual autonomy.

- The more risk factors you face, the greater your chance of injury.
- The longer you are exposed to a risk factor, the greater your chance of injury.
- By reducing or eliminating risk factors, the chance of injury can be decreased.

Identifying Risk Factors

Below are some ways to identify ergonomic risk factors.

TALK TO WORKERS: SURVEYS OR INTERVIEWS

Workers are often the best source of information on the potential problems posed by their jobs. You can conduct a written survey or talk to people individually. Factsheet C is a sample worker health survey.

LOOK AT JOBS: INSPECTIONS AND JOB EVALUATIONS

Conduct a walkaround inspection of the workplace to see which jobs or tasks may pose ergonomic problems. Those jobs can then be evaluated to identify specific risk factors. When evaluating a job, break the work down into the smallest pieces possible so that you can be specific and detailed.

Once you have watched people do their work and asked them about it, use a checklist or similar form to record risk factors as well as to track your progress in resolving a problem. Factsheet D is a sample ergonomics inspection checklist.

Below are some tips for conducting job evaluations.

A job evaluation should include three parts:

- **Discussion.** Talk to the people doing the job. Ask whether they experience pain or discomfort while performing the job and what specific activities seem to trigger that pain. Understanding the relationship between pain and specific activities can help you pinpoint tasks, workstations, equipment, or tools which may be causing or aggravating injuries.
- **Job description.** Collect information that fully describes each specific task, job, workstation, tool, and/or piece of equipment that you evaluate. Include information about speed, production requirements, and work schedule, including break times. See if there is a written job description available and supplement it with your own notes.
- **Observation and measurement.** Use direct observation, videotapes, photos, and sketches to identify risk factors. Use a checklist to record specific risk factors, including the weights of objects, how long they are held, or how far they are moved.

Worker Health Survey

Return this survey to:

Name: Phone: Date: / /

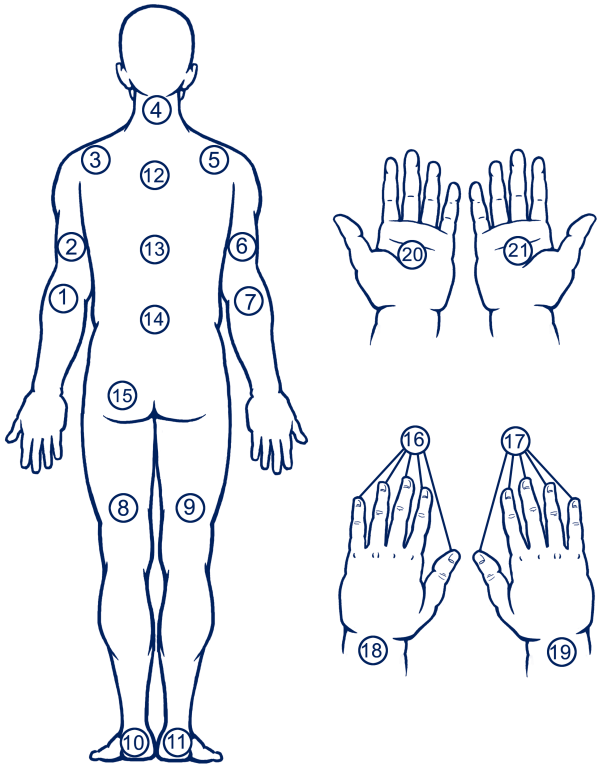
☐ Male ☐ Female ☐ Right handed ☐ Left handed

Employer/department: Job title:

Main job activities:

1. Have you had any pain or discomfort during the past year which you feel might have been caused or made worse by your work?

☐ **Yes** ☐ **No** If Yes, please shade the circle in the part of the body affected.
If No, please stop here.



1. Left elbow
2. Left upper arm
3. Left shoulder
4. Neck
5. Right shoulder
6. Right upper arm
7. Right elbow
8. Back of left thigh
9. Back of right thigh
10. Left foot
11. Right foot
12. Upper back
13. Middle of back
14. Lower back
15. Buttocks
16. Fingers on left hand
17. Fingers on right hand
18. Left wrist
19. Right wrist
20. Left palm
21. Right palm
22. Other (please shade area and describe)_____

2. What part of your job do you think causes your pain or discomfort?

3. What time does your discomfort usually occur? (Check all that apply.)

☐ Morning ☐ Afternoon ☐ Evening ☐ Night

4. Do any of these symptoms wake you up at night? ☐ **Yes** ☐ **No**

If YES, what are the symptoms?

5. Does the pain or discomfort interfere with routine activities (such as eating, driving, walking, cooking, etc.)? ☐ **Yes** ☐ **No**

6. Did this problem begin before or after you started your current job? ☐ **Before** ☐ **After**

7. Have you visited your doctor about this pain or discomfort? ☐ **Yes** ☐ **No**

If YES, please describe the diagnosis or treatment:

8. Have you had to take time off work in the last year because of this pain or discomfort? ☐ **Yes** ☐ **No**

How much? When?

9. Do any co-workers experience similar pain or discomfort? ☐ **Yes** ☐ **No**

How many?

10. Did you report this injury to your supervisor or anyone else in management? ☐ **Yes** ☐ **No**

If yes, what happened?

If no, why not?

Adapted from "*Workplace Ergo Action Kit*" AFL-CIO, Department of Occupational Safety and Health.

Inspection Checklist

Date: Time: Worker observed:

Job title: Task:

Task description:

RISK FACTORS	Found In This Task	Not Found	Don't Know	Notes: At what point in task, how often, etc.
Repetition				
Repeated forceful or awkward motions				
Little or no rest				
Using same body part repeatedly				
Awkward Posture				
Bending or leaning forward				
Reaching or lifting below knee level				
Twisting or bending to the side				
Reaching above chest level				
Bending wrist frequently				
Twisting hands or forearms				
Raising arms to side or forward				
Bending neck				
Forceful Motion				
Lifting, pushing, or pulling more than 50 pounds				
Lifting more than six pounds with one hand				

Inspection Checklist (CONTINUED FROM PREVIOUS PAGE)

RISK FACTORS	Found In This Task	Not Found	Don't Know	Notes: At what point in task, how often, etc.
Forceful Motion, CONT'D.				
Forceful gripping of material or tools				
Handling tools or material in pinch grip				
Stationary Position				
Working in one position for long periods				
Standing for long periods				
Sitting for long periods				
Direct Pressure				
Tool or equipment pressing on hand or body				
Seat or table pressing on leg or body				
Vibration				
Using vibrating hand tools				
Operating vibrating heavy equipment (including large vehicles)				
Temperature and Environment				
Temperature too hot or too cold				
Workplace poorly lit				
Walkways obstructed or slippery				
Work stress				
Pace of work is machine-controlled				
Piece work is used as production incentive				
Insufficient work breaks				
Poor supervision				

Adapted from: NIOSH "Elements of Ergonomics Program," Tool box Tray 5-A, *www.cdc.gov/niosh/eptbtr5a.html*, and "Working Without Pain Train the Trainer Program," Hunter College Center for Occupational and Environmental Health.

Construction Ergonomics Checklist

The Center to Protect Workers' Rights

To be filled out and updated jointly by contractors and union reps — every 2 weeks or as a site changes. This document is intended to help develop an "eye" for ergonomic problems and prevent injuries.

/ / Site _____ General contractor_____Union rep_____
(Date)

Subcontractor_____ Signature_____
(Person filling out this form)

Materials handling

What heavy materials or equipment are being handled on site — drywall, rebar, concrete forms, anything over 20 pounds?

Do any workers have to lift more than 50 pounds at one time without help? Yes____ No____

Do workers have to lift more than 20 pounds often? Yes____ No____

If yes, how can this be changed?

Are there handles to help carry materials? Yes____ No____

If yes, are the handles easy to use and comfortable? Yes____ No____

Are workers told to get someone's help to lift heavy materials? Yes____ No____

Are there carts, dollies, or other aids readily available for moving materials? Yes____ No____

If yes, are the carts being used? Yes____ No____

If no, why not?

If no, is the site clear enough to permit the use of carts? Yes____ No____

Are materials delivered as close as possible to where they will be used? Yes____ No____

If no, how can this be changed?

On what jobs do workers have to lift overhead?

How can this lifting be avoided?

Are materials stored at floor or ground level? Yes____ No____

If yes, do workers have to bend down to lift materials? Yes____ No____

Can the materials be stored at waist height? Yes____ No____

On which tasks do workers have to stretch to pick up or lift materials?

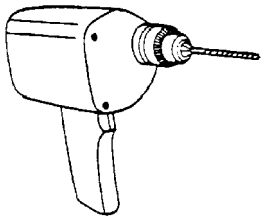
Can the materials be kept closer? Yes____ No ____

Tools

Are tools sharp and in good condition? Yes____ No____

Which tools are very heavy or not well balanced?

Which tools vibrate too much?



Which tools must be used while in a difficult position?

Which tools have poor handle design?

- -grips too big or too small?
- -handles that are too short and dig into hands?
- -handles with ridges that dig into hands?
- -slippery handles?

Which tools require bending of wrists to use?

Do gloves ever make it hard to grip tools? Yes____ No____

Are there other tools with a better design? Yes____ No____

If yes, what are they?

Repetitive work

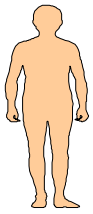
Which tasks or jobs use the same motion dozens of times an hour for more than 1 hour per day? What are the motions?
Can the number of repetitions be reduced by job rotation or rest breaks? Yes____ No____

Awkward postures

Which tasks or jobs involve work above the shoulder more than 1 hour per day? 
Can scaffolds, platforms, or other equipment cut down on the need to work overhead? Yes____ No____
Which tasks or jobs involve work at floor level or on knees for more than 1 hour a day? Are knee pads or cushions available and are they used? Yes____ No____ Can equipment be used to reduce kneeling? Yes____ No____
Which jobs require workers to stay in one position for a long time?
Can rotation or rest breaks be used to reduce time in awkward postures? Yes____ No____
Which jobs require a lot of twisting or turning? Which jobs require a lot of bending?    How can the need to twist or bend be reduced?

Standing

What jobs require workers to stand all day, especially on concrete floors?



Can anti-fatigue matting be used? Yes____ No____

Is it possible to use adjustable stools to allow workers to rest periodically? Yes____ No____

Surfaces for walking and working

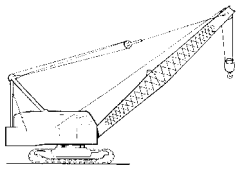
Are working and walking surfaces clean and dry? Yes____ No____

Are the surfaces unobstructed? Yes____ No____

Are the surfaces even? Yes____ No____

Seating

What jobs require sitting all day?



Are the seats well-designed, easy to adjust and comfortable? Yes____ No___

In heavy equipment, do workers have to lean forward to see/do their work? Yes____ No____

Does the seating in any heavy equipment vibrate a lot? Yes____ No____

Weather

Do workers have enough protection from heat, cold, rain, wind, and sun? Yes____ No____

Lighting

Are work areas well lit to prevent tripping and falling? Yes____ No____

Is there enough light to do the work? Yes____ No____

Are there areas where glare is a problem? Yes____ No_____

Production pressures

Do any workers work piece rate? Yes____ No____

Have supervisors or workers been under production pressures that could lead to shortcuts and injuries? Yes____ No____

How could this problem be reduced?

More rest breaks?____

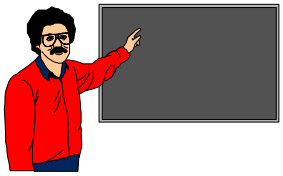
More safety meetings?____

A special safety rep on site?____

Other____

Training

What training have workers had on ergonomics — preventing musculoskeletal disorders?



What training have supervisors had on ergonomics — preventing musculoskeletal disorders?

Musculoskeletal symptoms

Do workers feel free to report symptoms? Yes____ No___

Have any workers been reporting muscle pain, tingling, numbness, loss of strength, or loss of joint movement? Yes____ No____

If yes, where?

Back____ Neck____ Shoulder____ Arm____ Wrist____ Knee____

Which trades have the most problems?

And what may be the main cause(s)?

Repetitive motion____
Awkward postures_____
Fixed postures ____
Heavy lifting____
Not enough rest breaks ____
Other____

Do workers often appear exhausted at the end of the day? Yes____ No____

Solutions

What jobs on site are the most hazardous for musculoskeletal injuries?

Most hazardous jobs for musculoskeletal injuries

1.

2.

3.

4.

5.

What has been done to get worker ideas to help reduce musculoskeletal injuries on the job?

What can be done working together to reduce these injuries?

What can be done to reduce the hazards or make the jobs easier?

Proposed solutions

	Most effective	**Easiest to implement**	**Least expensive**
1.			
2.			
3.			
4.			
5.			
	Least effective	**Hardest to implement**	**Most expensive**

 Report E1-97. Production of this document was supported by grant CCU312014 from the National Institute for Occupational Safety and Health (NIOSH). The contents are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH. CPWR is the research arm of the Building and Construction Trades Department, AFL-CIO: CPWR, 111 Massachusetts Ave. NW., Washington, D.C. 20001, tel. 202-962-8490.

Use BOTH sides of the checklist to compare similar tools. For example, if you have two pliers and want to select the best of the two, compare each tool against the features on the checklist.
The more “Yes” answers the tool has, the better the tool.

Refer to Section D, Tips for Selecting Hand Tools, for more details.

			Check if "YES"			
Checklist for Hand Tool Selection Select the tool that has the most “YES” answers.		EXAMPLE	Single-handle tools		Double-handle tools	
			Tool1	Tool2	Tool1	Tool2
1	For single-handle tools used for power tasks: Does the tool feel comfortable and have a handle diameter between 1 1/4 inches and 2 inches?					
2	For single-handle tools used for precision tasks: Is the handle diameter between 1/4 inch and 1/ 2 inch?					
3	For double-handle tools used for power tasks: Is the grip span at least 2 inches when closed and no more than 3 1/2 inches when open?					
4	For double-handle tools used for precision tasks: Is the grip span no less than 1 inch when closed and no more than 3 inches when open?					
5	For double-handle tools: Is the handle spring-loaded?					
6	Is the tool handle without sharp edges or finger grooves?					
7	Is the tool handle coated with soft material?					

8	Can the tool be used while keeping your wrist straight?					
9	Can the tool be used with your dominant hand or with either hand?					
10	For high- force tasks: Is the handle longer than the widest part of your hand (usually 4 inches to 6 inches)?					
11	Does the tool handle have a non-slip surface?					

Dababneh A, Lowe B, Krieg E, Kong Y, and Waters T, A Checklist for the Ergonomic Evaluation of Non-Powered Hand Tools, accepted for publication in the December 2004 issue of the Journal of Occupational and Environmental Hygiene. 14

HOME --- PREVIOUS

Construction Solutions Worksheet

Task: _____

Risk Factors			**Ergonomics**	**Solutions**			
Check all that apply	Better Materials	Better tools	Improved Work Methods	Better Work Organization	Training	PPE	Other
___ Awkward postures							
___ Repetition							
____ Forceful Motion							
____ Stationary Position							
____ Vibration							
____ Poorly Designed Tools							
____Temperature							
____ Work Organization							

Construction Solutions Worksheet

Task: _____

1. What changes can workers make on their own?

2. What changes can a contractor make?

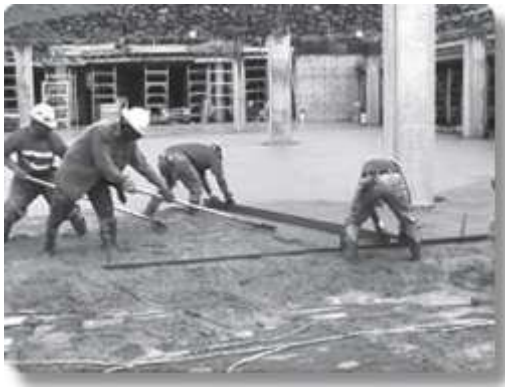
3. What can the union do?

Solution: Motorized Concrete Screeds

Description: Use a motorized screed (also called a vibratory screed). You can work standing upright, and operating the screed takes much less effort than hand screeding.

This type of screed eliminates both screeding in a stooped position and the need for repeated arm and shoulder movements.

The photo on the top shows the problem, while the photo on the bottom illustrates the solution.



Risks Addressed:	When you hand screed concrete, you work bent over, and you have to use a strong grip to pull the board over the wet concrete. Your arms and shoulders exert a lot of force over and over. Doing this work often or for a long period of time increases your chance of fatigue and pain. It puts major stresses on your back, knees, hands, arms, and shoulders, which may lead to serious muscle or joint injuries.
How Risks are Reduced:	A motorized screed should reduce a worker's chance of developing muscle and joint injuries. This equipment greatly reduces the physical effort needed for hand screeding, and eliminates the frequent and prolonged stooping. Little effort is needed to move the plow over the concrete surface. This type of screed eliminates both screeding in a stooped position and the need for repeated arm and shoulder movements.
Quality of Evidence (Risk Reduction):	• Safety and health experts believe there is a risk reduction.
Quality of Evidence Explanation (Risk Reduction):	Biomechanical research shows that high compression forces occur in the spine while stooping, and that sustained or repeated flexion of the spine may decrease the stability of the lower back and increase the risk of fatigue, leaving the back more vulnerable to injury. While there is considerable research shows that working in stooped, kneeling and squatting postures causes low back disorders, the research mostly focuses on those postures in combination with other risk factors such as bending or twisting or heavy loads. The literature combining stooped, squatting or kneeling postures with load handling shows rapid and severe spinal damage. There is much less in the literature regarding the health effects of these postures in an unloaded situation - that is, stooping without lifting. However, safety and health experts believe that it is important to avoid prolonged and repeat forward bending of the back (stooping) even in the absence of the other risk factors for low back disorders.
Effects on Productivity:	Screeding with motorized equipment can be faster than hand screeding. Many contractors report improvements in productivity. The vibration of the blade improves the consolidation of the concrete and reduces time spent "bull floating" the surface.

Return on Investment:	To calculate the return on investment (ROI) for your specific application, please visit our Return on Investment Calculator. While a specific ROI example has not been developed for this particular solution, the ROI Calculator provides a useful tool and guidance on how to generate your own on investment analysis.
Availability:	**Where to Get It** • Allen Engineering Corp., Paragould, AR, *www.alleneng.com* • MBW Inc., Slinger, WI, *www.mbw.com* • MultiVibe®, JLIN Corp., Paducah, KY, *www.multivibe.com* • Marshalltown, Marshalltown, IA, *www.marshalltown.com* Equipment like that described here may be available from local retailers or rental companies. **Approximate Cost** A single-engine motorized screed costs around $1,500. A twin-engine model costs around $4,000 and requires two operators.
Additional Considerations:	There are some drawbacks. Although you can work around electrical or plumbing stubs, some hand screeding may still be necessary. Also, it can be difficult to move the screed to and from the work location. A single-engine screed weighs around 50 lbs., and can be awkward to lift and carry. Some screeds have a quick-release system to remove the plow from the frame, which makes carrying easier. Vibration can also be a problem. It is important to protect workers from hand-arm vibration syndrome (HAVS), a nerve disorder that can become disabling. NIOSH measured vibration levels on three types of motorized screeds. Two had the gasoline engine placed at the bottom of the frame and above the plow. One screed had the engine placed on a single shaft, and the operator held the shaft below the engine. Vibration levels for the two types with the engine at the bottom were below the current recommended guidelines to prevent HAVS. The third screed, which was also older and poorly maintained, gave off much higher vibration that could exceed current HAVS guidelines. Higher vibration levels are expected when the engine is connected to the frame or shaft that the operator must grip. When buying a motorized screed, ask about vibration levels and test drive the screed.

Hazards Addressed:	**Masonry, Tile, Cement & Plaster** ○ Chip, scrape and grind surfaces, or joints ▪ Kneeling & Squatting ○ Install forms, pour or apply refractory materials ▪ Kneeling & Squatting ○ Spread, level, and smooth concrete, mortar, or terrazzo mixtures ▪ Kneeling & Squatting ▪ Stooped postures ▪ Stressful hand & wrist activity
Sources:	Albers, James T., and Estill, Cheryl F. Simple Solutions: Ergonomics for Construction Workers. DHHS (NIOSH) Publication Number 2007-122. March 2007. http://www.cdc.gov/niosh. To view the Table of Contents for the Simple Solutions Document, please visit: http://www.cpwr.com/simple.html. Please send requests for copies of the publication to cdcinfo@cdc.gov, referencing document #2007-122.

SAFETY WALKAROUND CHECKLIST
BACKS & LIFTING

2001

Date Prepared: _____ By: _____

Project Name/No: _____ Location: _____

- ***Check the box if the statement is true.***
- ***Fill in the blanks where the _ appears.***
- ***Citations in brackets are from Title 8 of the California Administrative Code.***

NOTES

HAZARD IDENTIFICATION [1509]

☐ The company has a written Injury and Illness Prevention Program (IIPP) that meets all Cal/OSHA requirements. It includes identification of back hazards on the site, regular inspections, accident investigation, and correction of hazardous conditions.

☐ Materials which may present lifting hazards on the job have been identified:

- ☐ Heavy objects (over 20 lbs. if they will be lifted repeatedly; over 50 lbs. at one time). *(List below.)*
- ☐ Bulky or awkward objects. *(List below.)*
- ☐ Loads whose weight may suddenly shift. *(List below.)*
- ☐ Objects which must be lifted from above shoulder level. *(List below.)*
- ☐ Objects which must be lifted from the floor. *(List below.)*
- ☐ Objects which cannot be held close to the body. *(List below.)*

List identified lifting hazards:

_____

_____

_____

NOTES

☐ Tasks which require repeated twisting, bending, or reaching overhead have been identified. *(List below.)*

List identified twisting, bending, or reaching hazards:

_____

_____

_____

☐ Back injuries and all accidents involving lifting are investigated, and hazards are corrected.

JOB DESIGN [1509]

☐ When possible, jobs are designed to minimize manual material handling.

☐ When possible, mechanical lifting devices (fork lifts, hoists, cranes, and block and tackle) are used.

☐ Manual lifting and carrying devices (dollies, hand trucks, pry bars, and hooks) are available and in good condition.

☐ Where possible, materials and equipment are used that are easy to lift and carry (for example, bricks with handholds or fiberglass ladders).

☐ Where possible, materials are ordered in small, light quantities (for example, 3-foot drywall or small packages of cement).

☐ Lifting tasks are divided among workers to reduce repetitive lifting.

☐ Heavy materials which must be lifted manually are stored off the ground, no lower than knee height. (This limits the height of the lifting required, and reduces pressure on the spine.)

☐ Heavy materials are stored where there is enough space to lift them safely, without reaching or twisting.

TRAINING [1509]

☐ Workers have been trained about all identified lifting hazards on the job, and methods to avoid injury.

☐ Workers have been trained in safe lifting techniques, including team lifting and carrying.

NOTES

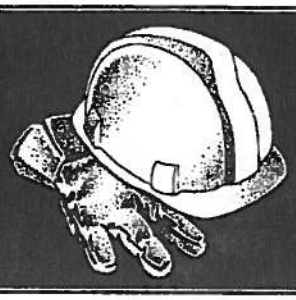
WORK PRACTICES [1509]

- ☐ Materials are delivered as close as possible to where they will be used.
- ☐ Loads are split up to reduce weight.
- ☐ Walkways are kept clear to allow use of material handling devices like carts and dollies.
- ☐ Mechanical devices or team lifting techniques are used for heavy loads whenever possible.
- ☐ Before lifting and carrying heavy objects, workers plan the task, including resting points if necessary.
- ☐ Workers use the correct grip, test the load before lifting, and lift and hold the load close to the body.
- ☐ Loads are lifted and lowered gradually.
- ☐ Workers are encouraged to "warm up" at the start of each shift, and to take regular stretch breaks.

CAL/OSHA ERGONOMICS REGULATION

- ☐ If there has been more than one ergonomic injury within a year to workers doing the same task, the company has set up a program to identify and correct these hazards and provide relevant training. [5110]

TRAINING GUIDE
BACKS & LIFTING



2001

Before you begin the meeting...

☐ *Does this topic relate to the work the crew is doing? If not, choose another topic.*

☐ *Did you read this Training Guide and fill in the blanks where the _ appears? (To find the information you need, look over the Safety Walkaround Checklist for this topic.)*

☐ *Did you bring a large object (such as an empty box) so you can demonstrate lifting techniques at the meeting?*

Begin: Watch your back! Abusing it can cause painful and even permanent injuries. Construction workers miss work because of back injuries more than any other reason. Your back can slowly get worse or can suddenly "go out." Either way, the results are the same—a lot of pain and you're off work! So let's talk about how to **protect** your back.

You or a crew member may want to add a personal story about back injuries.

ASK THE CREW THESE QUESTIONS:

After each question, give the crew time to suggest possible answers. Use the information following each question to add points that no one mentions.

1. What are some common causes of back injuries in construction?

- Lifting materials that are too heavy or unstable
- Lifting objects to or from awkward locations (for example, placing overhead or lifting from the ground)
- Repetitive twisting, bending, reaching overhead, or lifting
- Working for long periods in a bent over or strained position
- Falling
- Tripping over debris
- Wearing tool belts that are too heavy
- Lifting or doing any physical labor when you haven't "warmed up."

2. **How can you avoid back injuries on the job?**

The best way is to plan the job to reduce the need for lifting, twisting, bending, or reaching overhead. Change how the job is done, or change the tools you use. Here are some examples.

- Store materials off the ground, so you don't have to bend so much to lift.
- Store materials where there is space to lift them safely, without reaching or twisting.
- Have materials delivered close to where they will be used.
- Split up large loads into smaller, lighter loads.
- Change the setup of the job. (Perhaps adjust the angle and height of work surfaces.)
- Use a manual lifting or carrying device (like a dolly, hand truck, pry bar, or hook).
- Use a mechanical lifting device (like a fork lift, hoist, crane, or block and tackle).
- Use tools that minimize bending and reaching (like tools with longer handles).
- Make sure walkways are kept clear to allow the use of material handling devices like carts and dollies.

3. **Step-by-step, how do you lift a heavy object safely? Tell me how to do it.**

Remember that proper lifting techniques cannot protect you if the object is too heavy, awkward to hold, or cannot be held close to the body.

> *The instructor should demonstrate the steps below. Use an empty box or something similar (not an object that's very heavy). Have the crew suggest correct techniques for lifting the object and for setting it down. Demonstrate these techniques as the crew instructs you.*

- Face the object. Place one foot behind the object and the other foot beside it.
- Bend your knees but keep your back straight. Grip the object firmly with both hands.
- Bring the object close to your body. Keep your chin, elbows, and arms tucked in tight. Keep your body weight directly over your feet.
- Lift with your legs.
- Do the same process in reverse when you set the object down.
- Avoid any twisting motions.

4. **What about back support belts? Are they a good way to protect yourself?**

Most research says that back belts will not protect you from back injuries.

- They can give you a false sense of security, so you try to lift too much weight.
- Leaving the belt tightened for long periods can actually increase your chances of being injured when you have to lift without the belt.
- People who wear belts have more upper back injuries.

- Belts can be hazardous for people with high blood pressure.
- A belt should never be a substitute for designing the job to minimize manual material handling. Instead of a belt, use mechanical lifting when possible. If you must lift manually, proper lifting techniques protect you better than a belt

5. What are some tasks on this job that could be bad for your back? And what can we do to make these tasks safer?

Back Hazards	Solutions

6. According to Cal/OSHA, we must have a written Injury and Illness Prevention Program (IIPP) for the site. Back and lifting hazards are included in our IIPP. Do you know what our IIPP says about them?

- The company will inspect the job site for all health and safety hazards, including back and lifting hazards.
- We will take steps to reduce any hazards, where feasible.
- We will investigate accidents that cause back injury.
- We will provide needed safety equipment, like manual and mechanical lifting devices.
- We will maintain safety equipment in good condition, and keep it close to the work being done.
- We will give you training.

CAL/OSHA REGULATIONS

Explain: The safety measures we've talked about are included in our company's Injury and Illness Prevention Program (IIPP), as required by Cal/OSHA. At this time, there are few specific Cal/OSHA regulations on back hazards or lifting. However, Cal/OSHA did recently adopt a new ergonomics standard designed to reduce repetitive motion injuries. On any construction job, if there has been more than one ergonomic injury within a year to workers doing the same task, the company must take steps to identify and correct these hazards. We must also provide relevant training. I have a Checklist of recommended safety measures. If you'd like to know more, see me after the meeting.

COMPANY RULES

(Only if applicable.) We have some additional company rules to prevent back injuries.

Discuss company rules: _____

_____

COMMENTS FROM THE CREW

Ask: Do you have any other concerns about back injuries or lifting? Do you see any problems on our job? *(Let the steward answer first, if there is one.)*

What about other jobs you've worked on? Have you had any experience with back injuries or lifting that might help us work safer on this job?

SIGN-OFF FORM
BACKS & LIFTING

Date Presented: _____ By: _____

Project Name/No.: _____ Location: _____

NAMES OF THOSE WHO ATTENDED THIS SAFETY MEETING

PRINTED NAME	SIGNATURE

Solution: Rebar-Tying Tools

Description:

Ironworkers tie rebar by hand with pliers and tie wire. This work requires repeated, fast hand and arm movements while applying a lot of force. If you tie rebar at ground level, you also have to work in a stooped position, with your body bent deeply forward.

The image below shows the problem, while the image on the next page illustrates the solution.

More Detail

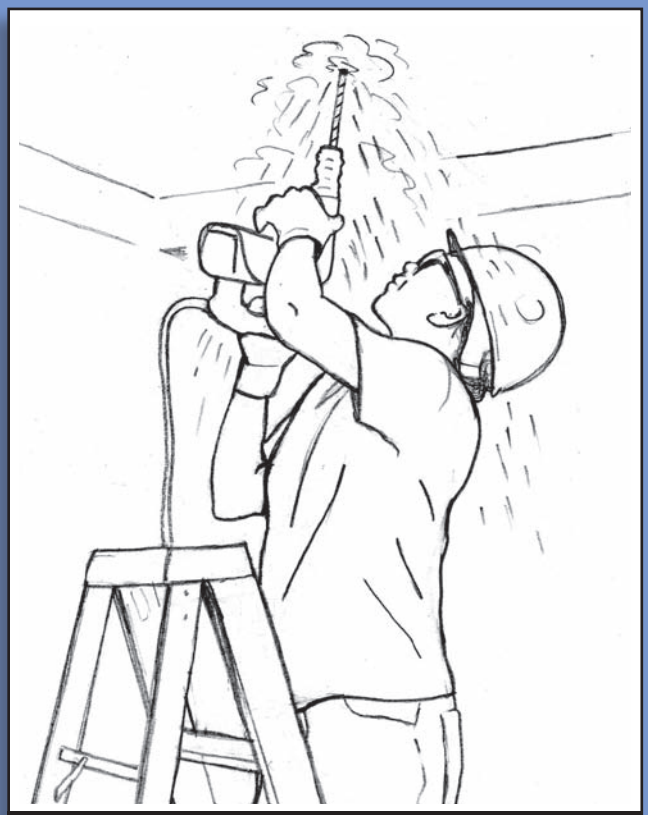
Risks Addressed:	Tying rebar by hand increases your chance of developing hand-wrist disorders due to the high hand forces used to grip pliers, the rapid hand movements used to wrap and twist wire, and the high pressure on the hand and fingers when twisting and cutting wire. If you work at ground level, you also are at risk of low back injuries from frequent and prolonged stooping and bending.
How Risks are Reduced:	Use a rebar-tying tool. This lowers your risk of hand and wrist injury because it eliminates the frequent rapid hand motions required when using pliers. Some rebar tiers allow you to work standing up, so there is less stress on your low back due to stooping and bending. Here is a short summary of research showing improvement in posture and hand stress using these tools. Workplace Solutions: Reducing Work-Related Musculoskeletal Disorders Among Rodbusters.
Quality of Evidence (Risk Reduction):	• Safety and health experts believe there is a risk reduction.
Quality of	Biomechanical research shows that high compression forces occur in the

Evidence Explanation (Risk Reduction):	spine while stooping, and that sustained or repeated flexion of the spine may decrease the stability of the lower back and increase the risk of fatigue, leaving the back more vulnerable to injury. While there is considerable research that shows that working in stooped, kneeling and squatting postures causes low back disorders, the research mostly focuses on those postures in combination with other risk factors such as bending or twisting or heavy loads. The literature combining stooped, squatting or kneeling postures with load handling shows rapid and severe spinal damage. There is much less in the literature regarding the health effects of these postures in an unloaded situation - that is, stooping without lifting. However, safety and health experts believe that it is important to avoid prolonged and repeat forward bending of the back (stooping) even in the absence of the other risk factors for low back disorders.
Effects on Productivity:	There have been documented increases in productivity. The NIOSH-Ontario studies found that power tying tools can tie rebar twice as fast as hand tying. Actual productivity increases will depend on the type of work and the frequency of tying. Also, contractors and rod busters who used the model of power tool involved in the studies reported they preferred it to manual tying for that work. Before using one of these tying tools, make sure the ties are approved for the job you will be doing.
Quality of Evidence (Effects on Productivity):	• Manufacturers or vendors have reported an increase in productivity. • Safety and health experts believe there is an increase in productivity.
Quality of Evidence Explanation (Effects on Productivity):	Workers should experience fewer injuries. Studies conducted by NIOSH and the Construction Safety Association of Ontario (Canada) compared manual methods and one model of power tying tool, and showed that using the power tool may reduce the risk of injury to workers' hands, wrists, and low back.
Return on Investment:	To calculate the return on investment (ROI) for your specific application, please visit our Return on Investment Calculator. While a specific ROI example has not been developed for this particular solution, the ROI Calculator provides a useful tool and guidance on how to generate your own on investment analysis.
Availability:	**TyTecker®** For purchasing information, visit http://www.tytecker.com or contact

	info@verpa-senco.com **Jiffy Clip Inc.** For purchasing information, visit http://www.jiffyclip.com or contact 1-888-943-2547 or info@jiffyclip.com **Benner-Nawman** For purchasing information, visit http://www.ccinetwork.com or contact 1-800-677-3933 or sales@ccinetwork.com **Approximate Cost** *TyTecker*® models are under $1,300 and wire costs around 3 cents per tie. Powered models generally require extra batteries and chargers, which may be included in the price. *Jiffy Clip* models are under $400, but the polymer clips are more expensive than the wire used by other manufacturers' tools. Clips cost around 12 cents per tie. *Jiffy Clips* may be used with or without an extended applicator, which could be useful for small jobs where more expensive rebar tiers may not be cost effective.
Additional Considerations:	Design or engineering specifications should use rebar diameters that allow tying all rebar with the same tool, and use performance-based specifications that allow non-traditional clips or other connectors. Most specifications already use performance-based language for describing rebar ties. Use of these devices requires performance based specification that allow this as an option. While rebar tying tools can reduce the risk of injury to iron workers, the workers themselves are resistant to using them. One reason given is that the tools are 'deskilling'. To increase the potential for successful adoption it will be important to gain worker support to using these tools prior to purchase.
Sources:	Albers, James T., and Estill, Cheryl F. Simple Solutions: Ergonomics for Construction Workers. DHHS (NIOSH) Publications. March 2007. http://www.cdc.gov/niosh. To view the Table of Contents for the Simple Solutions Document, please visit: http://www.cpwr.com/simple.html. Please send requests for copies of this publication to cdcinfo@cdc.gov, referencing document number 2007-122.

Drilling Overhead

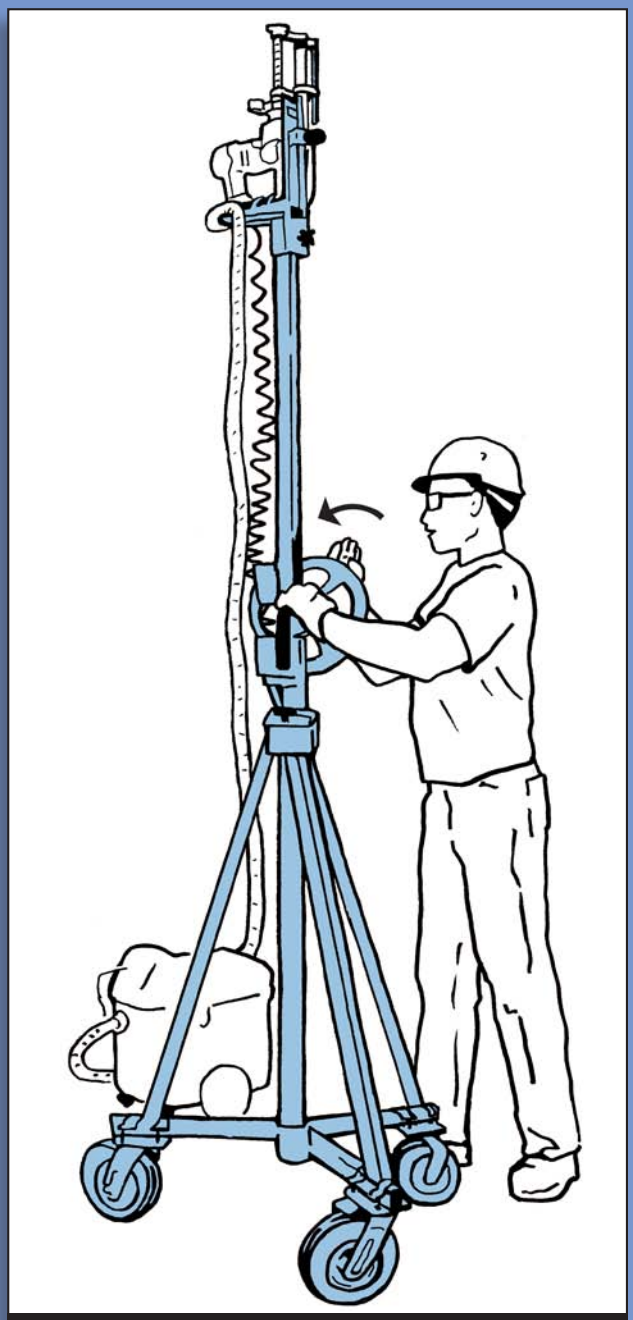
Ways to Make a Tough Job Easier.



Position that can cause pain

Prevent shoulder, arm, neck and back problems.

INSIDE: Ways to prevent injuries while drilling overhead, for plumbers, pipe fitters, electricians and sheet metal workers.



These changes can prevent pain

MARCH 2011

California Department of Public Health
University of California Ergonomics Program
California Department of Industrial Relations

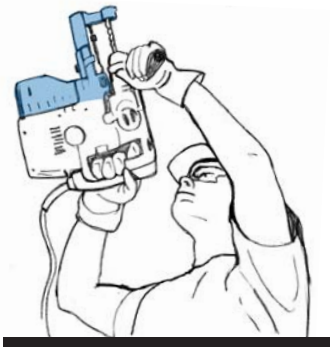
How can injuries be prevented?

Simple solutions to prevent injuries from overhead drilling work.

By law, every employer is responsible for providing a safe and healthy workplace. Every employer must identify all hazards of a job and take action to eliminate or reduce the hazards. Every employer must train their employees about the hazards of a job and how to do the work safely. Here are some things employers and workers can do to prevent injuries to joints, muscles, nerves and tendons:

- **Talk with others at work.** Do workers have pain and discomfort from working overhead? Do workers miss work due to pain? Are the causes of injury present: heavy lifting, awkward body positions, vibration, repetitive motions? What steps has the employer taken to reduce the risk of injury or illness?
- **Drill from a work platform, not a ladder,** as much as possible. This gives workers more flexibility where to position their body as they drill, and support if they have to reach around obstacles. It is harder to fall from a platform than a ladder when the drill bit binds and throws a worker off balance.
- **Use an 'overhead drill press' to hold the drill, rather than holding it by hand.** This new device supports the weight of the drill, and protects the driller from the awkward postures, force and vibration from holding the drill overhead. See "Overhead Drill Press" on page 3.
- **Use a drill with a clutch,** so when the bit jams the drill does not twist the worker's hands and wrists.
- **Use sharp bits when drilling.** This reduces the force required to drill.
- **Use a drill-bit extension shaft,** so a worker can hold the tool below the shoulder and closer to their chest when drilling. A sleeve of PVC pipe over the bit-extension protects hands from the spinning shaft and gives better control of the tool.
- **Use the right drill.** Drills come in different sizes and weights – provide and use a drill that's as light as possible, and still does the task.
- **Use drills designed with reduced vibration.** Many newer drills have been designed to produce less vibration at the handles. Select drills with the least vibration.
- **Alternate overhead work with other work to prevent fatigue.** Spread out the hours of forceful overhead work. Share the work among co-workers to allow the muscles to recover and prevent fatigue and injury.
- **Take regular breaks** to give workers' bodies some rest. Keep the hands and body warm.
- **Use a drill with a dust-capture system attached** to prevent concrete dust from going into the air.* Concrete dust contains silica which can cause silicosis, a serious lung disease.
- **Use safety goggles or a face shield** to keep drilling debris out of workers' eyes.
- **Get medical care for symptoms.** Encourage employees to report pain and injuries and provide medical care for them.

Drill-bit extension shaft with plastic sleeve; work platform.

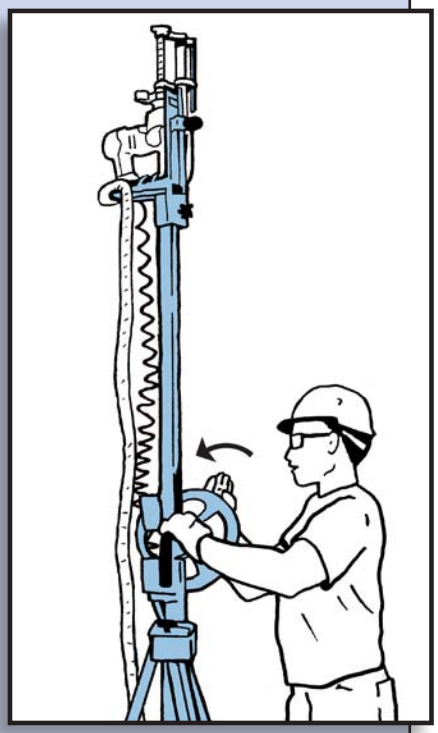


Drill with dust-capture system.

* See Title 8, CCR, Section 1530.1. Control of Employee Exposures from Dust-Generating Operations Conducted on Concrete or Masonry Materials. **www.dir.ca.gov/title8/1530_1.html**

Overhead Drill Press – A Better Tool for a Tough Job

Researchers at the University of California have developed a new tool to take the load off of workers' bodies when drilling holes into concrete and metal ceilings. The "Overhead Drill Press" holds a hammer drill on the top of a column, and uses a wheel and gears to raise the drill to the ceiling. The device was developed and tested with commercial contractors and workers. The device is not a hand tool, but is specialized so an employer would need to provide it for the workers they employ.



- **Workers testing the overhead drill press report:**
  - They are dramatically less fatigued (tired) from drilling.
  - They feel less vibration during drilling.
  - There is better stability and handling of the drill.
- Holding the hammer drill by hand, workers have to press upward with 55 pounds of force while drilling. Workers only use 6 pounds of force to turn the handle that raises the drill using the overhead drill press.
- Workers do not have to hold their arms overhead as much, because the wheel that raises the drill is about chest-high.
- Productivity (number of holes drilled) is about the same as with the usual drilling method.
- **Other features of the device:**
  - Can drill into ceilings up to 15 feet, reducing the risk of falls from ladders.
  - For higher ceilings, the device can be used in a scissor lift, if the wheeled base is removed.
  - A worker using the device is farther from the noise and dust of the drill. A dust-capturing drill can be used with the device.
  - The column of the device can be adjusted to vertical using bubble-levels, so drill target marks can be placed on the floor, rather than the ceiling.
  - Large wheels (9") make it easy to move over uneven surfaces.

WHAT DOES IT COST?

Average workers' compensation claim cost for a shoulder injury?
$31,000

Time a worker with a shoulder injury is off work?
Weeks.

Time until a worker with a shoulder injury can safely drill overhead?
Months, or never.

Approximate cost of an overhead drill press?
$4,000 from the UC Ergonomics Program (sold at cost).

Is overhead drilling work causing pain?

- **Pain, numbness, weakness or tingling in the back, arms, hands, shoulders or neck** affects many workers who drill overhead.
- **Symptoms may start gradually.** Many people try to ignore them at first. Ignoring symptoms makes the condition worse and harder to treat. Workers should inform their employer and get medical care right away if they have symptoms.
- **Symptoms that don't go away are not normal.** They may be signs of serious injuries that can interfere with both work and personal life.

Overhead work can injure the neck, arms, hands, shoulders and back.

Why do workers drilling overhead have problems with joints, muscles, nerves and tendons?

- **Awkward body positions such as holding the hands overhead and tilting the head upward** stress the muscles, tendons, joints and blood vessels of the shoulders, arms, hands, back and neck.
- **Holding arms overhead while forcefully pressing the drill upward** into metal or concrete ceilings creates intense stress on the arms, shoulders and back.
- **Repeated motions.** Repeated overhead drilling and other overhead work can cause "wear-and-tear" damage to the shoulder. These small injuries can become serious if they happen day after day without enough rest.
- **Vibration from the drill** means more force is needed to hold the drill securely. Tightening the grip on the drill can make the hand, arm, shoulder and back more tired. After years of work, vibration can also lead to fingers becoming numb and pale. This may be a sign of "white-finger," a disease that reduces blood circulation and damages nerves. Doctors call this Hand-Arm Vibration Syndrome (HAVS).
- **Cold work.** Cold hands, muscles and joints are more easily injured by vibration and forceful, repetitive work motions.
- **Sudden movement** caused when the drill bit binds can injure the wrist, elbow, shoulder or back, and can cause falls from ladders.

Taking action to prevent injuries

Workers and management can form a safety committee.
A successful committee is one that has strong employer support. An experienced health and safety consultant can provide technical assistance. Here is what a safety committee can do:

- Talk to workers about their jobs and inspect equipment to identify conditions that cause discomfort or injuries.
- Meet regularly to discuss problems and possible solutions.
- Develop and test practical solutions, such as new tools and work methods.
- Encourage workers to report work-related injuries to their supervisor.

What does the law say?

Employers must follow workplace safety regulations made by a government agency called **Cal/OSHA (California Division of Occupational Safety and Health)**. These regulations protect workers from hazards, illnesses and injuries in the workplace. Some workplace safety regulations are: the Repetitive Motion Injuries Regulation, the Sanitation at Construction Jobsites (toilets, handwashing, drinking water) Regulations, and the Fall Protection Regulations.* If an employer violates such regulations, a health and safety complaint can be reported to Cal/OSHA. Complaints are confidential. Cal/OSHA can investigate to see if the workplace is following these safety regulations.

Cal/OSHA also answers questions about workplace safety regulations. Find Cal/OSHA's phone number in the blue Government Pages near the front of the phone book. Look under: State of California, Industrial Relations, Division of Occupational Safety and Health, Compliance or Enforcement, or visit: **www.dir.ca.gov/DOSH/DistrictOffices.htm**.

Cal/OSHA also provides a free **Consultation Service** for employers (**1-800-963-9424**). This program explains workplace health and safety regulations, and helps employers comply with them. They do not cite or impose fines. Visit **www.dir.ca.gov/dosh/consultation.html**.

* Repetitive Motion Injuries (Title 8, Section 5110), available at: **www.dir.ca.gov/title8/5110.html**;
Sanitation at Construction Jobsites (Title 8, Sections 1524, 1526 & 1527), available at: **www.dir.ca.gov/title8/sb4a3.html**;
Fall Protection (Title 8, Sections 1669 to 1672), available at: **www.dir.ca.gov/title8/sb4a24.html**

For More Information

- **University of California Ergonomics Program.** To find out more about the overhead drill press and how to get one, visit **http://ergo.berkeley.edu/**, call **(510) 665-3403**, or write 1301 S. 46th Street, Building 163, Richmond, CA 94804.

- **Other publications about ergonomics in the construction industry:**
  - *Cal/OSHA Ergonomic Survival Guides* (for various construction trades) **www.dir.ca.gov/dosh/PubOrder.asp.** Scroll down to "Construction Ergonomics."
  - *Simple Solutions: Ergonomics for Construction Workers,* DHHS (NIOSH) Publication No. 2007-122, August 2007**. www.cdc.gov/niosh/docs/2007-122/**

- **HESIS (Hazard Evaluation System and Information Service).** HESIS answers questions about workplace hazards and has many free publications available. **www.cdph.ca.gov/programs/HESIS**
  - **For information on workplace hazards: (866) 282-5516** (toll-free in California). Please leave a message and your call will be returned.
  - **For HESIS Publications: (866) 627-1586** (toll-free in California), visit our website, call or write for the list.

- **Workers' Compensation.** For information about workers' compensation for a work-related injury or illness see:
  - **Division of Workers' Compensation, Information & Assistance (I&A) service.** Call **(800) 736-7401** or go to: **www.dir.ca.gov/dwc/ianda.html**
  - Labor Occupational Health Program publications for injured workers in English, Spanish and Chinese. **www.lohp.org/publications/workers_comp.html**
  - *Guide to Getting Medical Care for Job-Related Pain That Won't Go Away.* **www.cdph.ca.gov/programs/hesis/Documents/jobpain.pdf**

ABOUT THIS FACT SHEET This publication was produced by the Hazard Evaluation System and Information Service (HESIS) and the Ergonomics Program of the University of California, San Francisco and Berkeley campuses. The recommendations in this fact sheet are based on research studies and published information, and on general ergonomic principles.

Find a pdf of this document at: **www.cdph.ca.gov/programs/HESIS/documents/DrillOverhead.pdf**.

To obtain a copy of this document in an alternate format, please contact: (510) 620-5757. Please allow at least ten (10) working days to coordinate alternate format services. California Relay Service: 711.

HESIS

HAZARD EVALUATION SYSTEM & INFORMATION SERVICE
Occupational Health Branch
California Department of Public Health
850 Marina Bay Parkway
Building P, 3rd Floor, Richmond, CA 94804
(510) 620-5757
www.cdph.ca.gov/programs/OHB

Solution: Power Caulking Guns

Description:	Using a non-powered caulking gun requires high hand forces to pull the trigger. If you use these guns often and for long periods of time, you are at risk of stressing the soft tissues in your hand, wrist, and forearm. This can lead to serious muscle or joint injuries. The more pressure your gun requires to pull the trigger (low mechanical advantage), the higher your chance of injury. You may have to use even more force when you apply thicker sealant material. If you have to bend your wrist or twist your forearm when pulling the trigger, you also increase your chance of injury. Your chance of developing an injury increases if the gun you use has sharp edges or grooves on the trigger, or has a wide span between the trigger and the grip, forcing you to stretch your hand. The photos below provide an example of the problem, and an photo of a solution: More Detail
Risks Addressed:	Stress to your fingers, hand and forearm due to use of a non-powered caulking gun.
How Risks are Reduced:	A battery (cordless gun) or compressed air (pneumatic gun) provides the power to force the caulk from the gun. Some guns have a variable speed control to manage sealant flow. You do need access to a power source. This may be an electrical outlet or generator to charge the batteries in a cordless gun, or an air compressor to power a pneumatic gun. When you use a pneumatic gun, the hose may produce some resistance (or "drag") on the tool, possibly increasing the grip force necessary. Cordless guns are available for tube, sausage, and bulk caulks. A 12-volt or higher cordless gun will produce 600+ lbs. of thrust force. Pneumatic guns will handle sausage and bulk caulks. Another device available is a caulk-dispensing adapter that can be used with a cordless drill or variable speed AC drill. These adapters are available for 10oz. and 30oz. caulk cartridges.

Quality of Evidence (Risk Reduction):	• Safety and health experts believe there is a risk reduction.
Quality of Evidence Explanation (Risk Reduction):	Reducing the required grip force and hand pressure will reduce fatigue and strain.
Effects on Productivity:	Use of power caulking guns should result in less soft tissue fatigue, discomfort, and injury. Although power caulking guns are heavier than non-powered guns, they do not require high hand forces to get the caulk out of the gun. One minor drawback is that pneumatic caulking guns are tethered to the air compressor with a hose, and the hose must be moved along with the gun.
Quality of Evidence (Effects on Productivity):	• Manufacturers or vendors have reported an increase in productivity.
Quality of Evidence Explanation (Effects on Productivity):	Reducing the required application force and reducing fatigue is expected to increase productivity. Set up time may be increased somewhat to set up power source.
Return on Investment:	To calculate the return on investment (ROI) for your specific application, please visit our Return on Investment Calculator. While a specific ROI example has not been developed for this particular solution, the ROI Calculator provides a useful tool and guidance on how to generate your own on investment analysis.
Availability:	**Albion Engineering Co.** (cordless) For purchasing information, visit http://www.albioneng.com or contact 1-856-235-6688 or by e-mail **Milwaukee Electric Tool Corp.** (cordless) For purchasing information, visit http://www.milwaukeetool.com or contact 1-800-729-3878 or by e-mail **Astro Pneumatic Tool Co.** (pneumatic) For purchasing information, visit http://www.astrotools.com or contact 1-800-221-9705 or customerservice@astrotools.com

Hazards Addressed:	**Masonry, Tile, Cement & Plaster** ○ Apply caulk, sealants and waterproofing materials ▪ Stressful hand & wrist activity ○ Install forms, pour or apply refractory materials ▪ Kneeling & Squatting ▪ Lifting and Carrying (Manual Materials Handling)
Sources:	Albers, James T., and Estill, Cheryl F. Simple Solutions: Ergonomics for Construction Workers. DHHS (NIOSH) Publications. March 2007. http://www.cdc.gov/niosh. To view the Table of Contents for the Simple Solutions Document, please visit: http://www.cpwr.com/simple.html. Please send requests for copies of this publication to cdcinfo@cdc.gov, referencing document number 2007-122.

California's Ergonomics Standard

Cal/OSHA's Ergonomics Standard requires employers to take action to prevent repetitive motion injuries. The regulation can be found in Title 8, California Code of Regulations, General Industry Safety Orders §5110 and is reprinted below.

Subchapter 7. General Industry Safety Orders
Group 15. Occupational Noise and Ergonomics
Article 106. Ergonomics

§5110. Repetitive Motion Injuries

(a) Scope and application. This section shall apply to a job, process, operation where a repetitive motion injury (RMI) has occurred to more than one employee under the following conditions:

(1) Work related causation. The repetitive motion injuries (RMIs) were predominantly caused (i.e. 50% or more) by a repetitive job, process, or operation;

(2) Relationship between RMIs at the workplace. The employees incurring the RMIs were performing a job process, or operation of identical work activity. Identical work activity means that the employees were performing the same repetitive motion task, such as but not limited to word processing, assembly or, loading;

(3) Medical requirements. The RMIs were musculoskeletal injuries that a licensed physician objectively identified and diagnosed; and

(4) Time requirements. The RMIs were reported by the employees to the employer in the last 12 months but not before July 3, 1997.

(b) Program designed to minimize RMIs. Every employer subject to this section shall establish and implement a program designed to minimize RMIs. The program shall include a worksite evaluation, control of exposures which have caused RMIs and training of employees.

(1) Worksite evaluation. Each job, process, or operation of identical work activity covered by this section or a representative number of such jobs, processes, or operations of identical work activities shall be evaluated for exposures which have caused RMIs.

§5110. Repetitive Motion Injuries (CONTINUED FROM PREVIOUS PAGE)

(2) Control of exposures which have caused RMIs. Any exposures that have caused RMIs shall, in a timely manner, be corrected or if not capable of being corrected have the exposures minimized to the extent feasible. The employer shall consider engineering controls, such as work station redesign, adjustable fixtures or tool redesign, and administrative controls, such as job rotation, work pacing or work breaks.

(3) Training. Employees shall be provided training that includes an explanation of:

(A) The employer's program;

(B) The exposures which have been associated with RMIs;

(C) The symptoms and consequences of injuries caused by repetitive motion;

(D) The importance of reporting symptoms and injuries to the employer; and

(E) Methods used by the employer to minimize RMIs.

(c) Satisfaction of an employer's obligation. Measures implemented by an employer under subsection (b)(1), (b)(2), or (b)(3) shall satisfy the employer's obligations under that respective subsection, unless it is shown that a measure known to but not taken by the employer is substantially certain to cause a greater reduction in such injuries and that this alternative measure would not impose additional unreasonable costs.

Note: Authority cited: Sections 142.3 and 6357. Labor Code. Reference: Sections 142.3 and 6357. Pulaski v. Occupational Safety & Health Stds. Bd. (1999) 75 Cal.App.4th 1315 [90 Cal. Rptr. 2d 54].

HISTORY

1. New article 106 (section 5110) and section filed 6-3-97; operative 7-3-97 (Register 97, No. 23).

2. Editorial correction of subsection (b)(1) (Register 97, No. 29).

3. Change without regulatory effect repealing subsection (a)(4) Exemption and amending Note filed 4-28-2000 pursuant to section 100, title 1, California Code of Regulations (Register 2000, No. 17).

Section 6: Training Tips

Effective Training Methods for Adults

Nazima El-Askari, MPH
Labor Occupational Health Program - UC Berkeley

Criteria for Effective Training

- Based on adult learning principles
- Appropriate for diverse populations with differences in language, literacy, culture
- Action-oriented: will provide skills and information that can be used and applied
- Technically accurate
- Activities enhance confidence and leadership skills

Adults Learn Best When Training:

- Is relevant
- Respects participants
- Builds on previous learning
- Uses diverse methods
- Is participatory and interactive

Steps to Develop Training Plan

- Do a needs assessment
- Set objectives
- Select teaching methods
- Develop a training plan
- Present the training
- Evaluate and revise as needed

Needs Assessment – What do you want to know?

- Nature of audience: language, culture, literacy, educational level
- What are their concerns/needs/interests – why are they there?
- What kind of info have they already received?
- How do they learn best; what kind of methods do they prefer;
- How will they use the information/skills?

Setting Learning Objectives: Hit the Bull's Eye

Aim your teaching at what is most essential!

Setting Objectives: What do people need to know

- Knowledge
- Attitudes
- Skills
  - Communication skills
  - Speaking up when there is a problem
  - Problem solving

Selecting Teaching Methods – Use Diverse Methods

Tell me – **I Forget**

Show me – **I Remember**

Involve me – **I Understand**

Participatory Training Methods

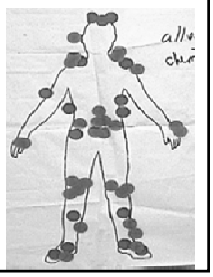
- Reflect adult learning principles
- Draw on participants' own experience
- Encourage teamwork and group problem solving
- Work well with people with reading or writing difficulties
- Emphasize 'learning through doing'
- Create a comfortable learning environment
- Provide opportunity to practice new skills

Participatory Methods: Examples

- Brainstorm
- Role Plays
- Games

Participatory Methods: Examples

- Small Group Activities – Case Studies
- Demonstrations
- Hands-on Practice
- Question and Answer



Adapting for Language and Literacy

- If needed, offer training and materials in multiple languages.
- Assume a range of literacy skills and make training accessible for everyone.
- Avoid putting people on the spot. Always ask for volunteer readers or writers.

Adapting, cont.

- Use visual aids and read aloud what you write on flipchart.
- Show respect and appreciation for cultural differences –be prepared to change references to local culture, pop icons, history, etc.
- Link with community based organizations who represent your target population to learn and to share resources.

Evaluate and Revise

Assess:

- The degree of change in knowledge, attitude, or skills that was intended
- The effectiveness of the teaching methods used
- Usefulness of materials
- Appropriateness, relevance of course content

Assessing Participant Skills

- Written tests
- In class assessment techniques:
  - Role plays demonstrating skills
  - Small group presentations

Your Training Plan

Topic:

TIME	ACTIVITY	INSTRUCTOR'S NOTES	MATERIALS NEEDED

How Adults Learn Best

- **MAKE THE TRAINING RELEVANT.**

Adults need to see that the subject matter and the teaching methods are relevant to their lives and what they want to learn.

Find out beforehand about the participants, and what they're most interested in learning. Use examples and discussions in the training that reflect participants' own experiences, and are relevant to their needs.

- **RESPECT PEOPLE'S EXPERIENCES, KNOWLEDGE, AND SKILLS.**

Adults come to the class with a wealth of prior experience and knowledge. They are more open to learning if treated with respect.

Explain to the class that participants will learn from each other, and plan activities that build on and incorporate participants' own experience.

- **BUILD ON PREVIOUS LEARNING.**

Adults learn best when they can relate new material to what they already know. Learners need road maps, with clear objectives. Each new piece of information needs to build logically on the last.

Avoid presenting large amounts of new information all at once. Use visual aids. Be sure to allow time for breaks and questions. Make sure everyone is ready for the next step before proceeding.

- **USE DIVERSE TRAINING METHODS.**

Adults have different learning styles. Some people learn better if the material is reinforced with visual aids, and some learn better through hands-on activities. Learning works better when information is presented in different ways.

Use a variety of teaching activities, including brainstorming, discussion, visual aids, role plays, games, and case studies. Change the pace and the method frequently, especially when covering difficult and abstract topics.

• ENCOURAGE CLASS PARTICIPATION.

When adults are involved in and help direct their own learning, they are more engaged and learn more. People need to practice as they learn, and hear things more than once to remember them.

Encourage questions and discussion during the class. Use hands-on practice, role playing, non-competitive quizzes, and other exercises often. Incorporate information presented earlier into new activities. Remember that an instructor's skill in asking questions and analyzing people's answers is of greater value than flooding the class with a mass of information they can get elsewhere or don't need.

An old proverb says:

Tell me, I forget.

Show me, I remember.

Involve me, I understand.

Training Steps

1. **DO A NEEDS ASSESSMENT.** Find out about your audience and their training needs. What do they already know, and what do they want to learn?

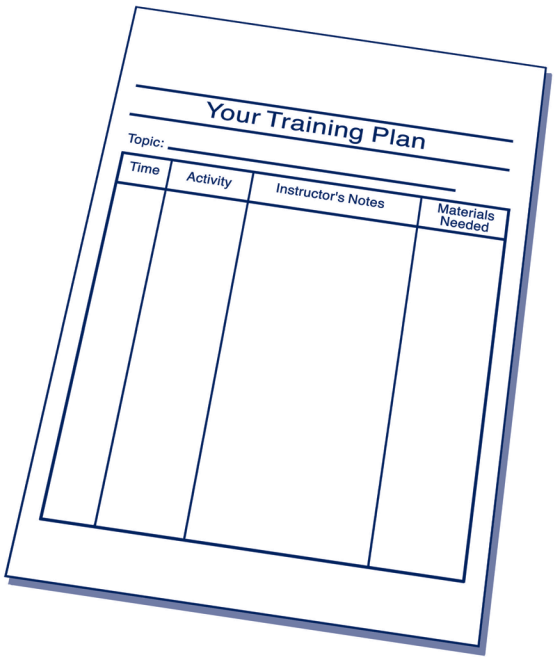
2. **SET OBJECTIVES.** Objectives help you focus on what is most important. Aim for the bull's-eye: emphasize the essential information.

3. **SELECT TEACHING METHODS.** Training is most effective when you use a variety of methods. People learn in different ways and retain more if they hear, see, and practice. Some useful methods are games, role plays, case studies, demonstrations, small group activities and brainstorming.

4. **DEVELOP A TRAINING PLAN.** A training plan is an outline that spells out what activities and methods you will use, how much time each activity will take, and what materials you will need.

5. **PRESENT THE TRAINING.** Follow your training plan as much as possible, but be flexible in meeting participants' needs.

6. **EVALUATE TRAINING AND REVISE TRAINING PLAN AS NEEDED.** Get participants' feedback on how well the training went and how effective it was. Decide what needs to be changed and improve your training plan for next time.



Aim at What is Essential to Know

Sometimes trainers try to cover too much material and lose sight of what is most important.

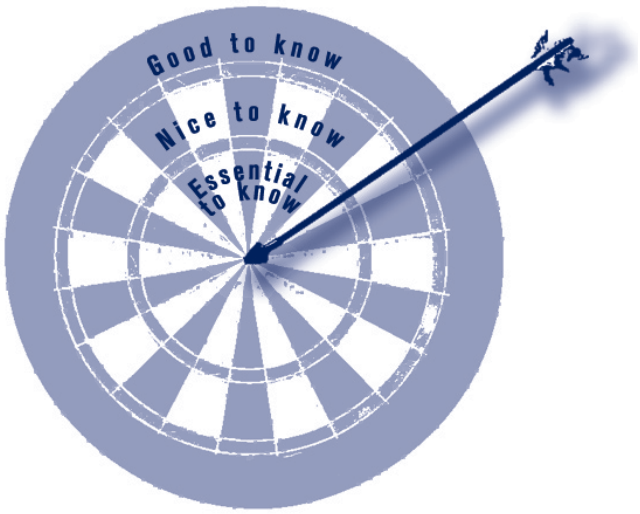
Being selective is critical. Determine whether the material you want to teach is:

- Essential to know,
- Good to know, or
- Nice to know.

Your main aim is to cover what is essential. Since your teaching time is limited, you need to aim carefully.

Aim for the bull's eye. Ask yourself:

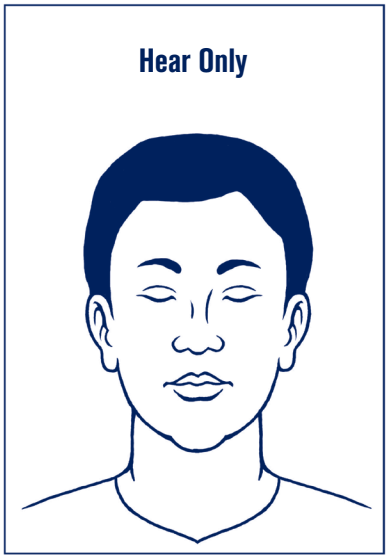
- Why am I teaching this?
- In what way will this prepare the person to stay safe at work, or to perform a new skill?
- Could this time be better used to teach something else that's more important, or to teach the same thing in a better way?



Aim your teaching at what is most essential!

Memory and Learning Methods

Hear Only

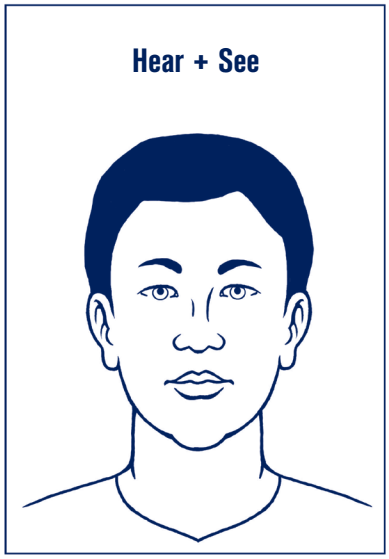


20% Retained

See Only

30% Retained

Hear + See



50% Retained

Hear + See + Discuss + Practice

90% Retained

Teaching Methods Chart

TEACHING METHODS	STRENGTHS	LIMITATIONS	PREPARATION
Lecture	Presents factual material in direct, logical manner. Can include personal experiences which inspire. Stimulates thinking to open a discussion. Works for large audiences	Experts may not always be good teachers. Audience is passive. Learning is difficult to gauge.	Needs clear introduction and summary. Needs limits on time and content to be effective.
Brainstorm	Allows creative thinking and new ideas. Encourages full participation because all ideas are equally valued.	Can become unfocused. Needs to be limited to 10-15 minutes.	Instructor must select and clearly define the problem or questions, then ask for all ideas (without debate or comment), which are recorded on board.
Large Discussion	Pools ideas and experiences from the group. Effective after a lecture, film, story, or brainstorm that needs to be analyzed.	Not practical with more than 20 people. A few people can dominate, while others may not participate.	Needs careful planning by instructor to guide the discussion. Needs advance preparation of questions and key points to bring out in the discussion.
Small Group Discussion	Allows participation of everyone in small groups (4-6 people). Develops group process skills.	Needs careful thought as to the purpose and task of group.	Needs preparation of specific tasks or questions for group to answer.

Teaching Methods Chart (CONTINUED FROM PREVIOUS PAGE)

TEACHING METHODS	STRENGTHS	LIMITATIONS	PREPARATION
Risk Mapping	Small groups creates a visual map of hazards, controls, and plans for action. Does not rely on reading or writing skills. Useful as a follow-up tool after discussion.	Works best for workers from the same or similar workplace.	The work areas being mapped need to be chosen carefully to make sure they are relevant to participants.
Case Studies	Develops analytic and problem-solving skills. Allows for exploration of different solutions. Allows students to apply new knowledge and skills.	People may not see the relevance to their own situation.	The scenario must be clearly defined to be effective. Need to pose the right questions for drawing out critical thinking.
Role Playing	Introduces a problem dramatically. Develops analytic and problem-solving skills. Allows people to assume roles of others and understand their views. Allows for exploration of different solutions. Allows for practice in speaking up.	People may be too self-conscious. May not be appropriate for large groups.	Need to define the problem and roles clearly.
Report Back Session	Allows for full class discussion after role plays, case studies, and small group exercises. Gives people a chance to reflect on what happened.	Can be repetitive if each small group says the same thing.	Instructor should prepare questions to focus the discussion, so it is not repetitive.

Teaching Methods Chart (CONTINUED FROM PREVIOUS PAGE)

TEACHING METHODS	STRENGTHS	LIMITATIONS	PREPARATION
Hands-on Practice	Provides classroom practice of learned behavior (use of equipment, techniques, etc.).	Requires enough time, appropriate physical space, and equipment.	Instructor has to obtain, set up, and check equipment.
Worksheets and Questionnaires	Allows people to think for themselves without being influenced by others. Individual thoughts can then be shared with small groups or the entire class.	Can be used only for a short period of time. Can be isolating since people work alone. May not work if participants have literacy or language limitations.	Instructor has to prepare handouts, select questions, and have a clear idea of the goal. Materials may need to be translated into other languages. Participants should be encouraged to ask for help and work with others.
Audiovisual Materials (videos, DVDs, etc.)	Entertaining way of teaching content and raising issues. Keeps audience's attention. Effective in large groups.	Too many issues may be presented at once to have a focused discussion. Follow-up discussion may not have full participation.	Need AV equipment set up in advance. Effective if instructor prepares questions to discuss after the show. Need to screen material ahead of time to make sure it is relevant and well-organized.

Training Evaluation Checklist

The trainer:

- [ ] Respects the participants, and the knowledge and experience they bring to the class.
- [ ] Knows the participants' needs and tailors the training to these needs (makes it relevant, builds on what they already know).
- [ ] Uses participatory, interactive methods that actively involve the learners and draw on their own skills and knowledge.
- [ ] Uses a variety of different training methods to keep things interesting and to accommodate diverse learning styles.
- [ ] Uses "hands-on" activities whenever possible.
- [ ] Uses good props, demonstration equipment, visuals, etc.
- [ ] Is careful to do more listening than talking.
- [ ] Demonstrates enthusiasm and commitment to health and safety.
- [ ] Is well-prepared in advance and has a clear training plan.
- [ ] Makes expectations clear from the beginning.
- [ ] Gives an overview of what the training will cover.
- [ ] Avoids giving a talk or lecture for more than 10 minutes at a time.
- [ ] Involves all participants, not just some.
- [ ] Creates a safe learning environment for all participants.
- [ ] Recognizes and accommodates cultural and linguistic differences among participants.

Section 7: Resources

RESOURCE GUIDE PART A: SELECTED ORGANIZATIONS

Cal OSHA – *California Occupational Safety and Health Association*

Home Page: http://www.dir.ca.gov/dosh/ **Office:** 1515 Clay Street, Ste. 1301,
Phone Number: (510) 286-7000 Oakland, CA 94612

Cal/OSHA is a division of California's Department of Industrial Relations whose mission is to protect the health and safety of California's workers. It is divided into three main parts: The Division of Occupational Safety and Health (DOSH) enforces the state's regulations and provides technical assistance to employers and employees to help employers comply with the regulations; the California Occupational Safety and Health Standards Board, establishes regulations to help keep workers safe and healthy; and the Occupational Safety and Health Appeals Board hears appeals from employers who have received a citation from a DOSH inspector. Cal/OSHA Consultation, the part of DOSH that provides technical assistance, has created many helpful guides to workplace hazards which you can find for free on this website under the Publications link.
Ergonomic Survival Guides for Construction
http://www.dir.ca.gov/dosh/dosh_publications/

CCOHS – *Canadian Centre for Occupational Health and Safety*

Home Page: http://www.ccohs.ca/ **Office:** 135 Hunter Street East,
Phone Number: 1-905-572-2981 Hamilton ON Canada L8N 1M5

CCOHS was established in 1978 to promote the health and safety of Canadian workers. It offers free factsheets and a monthly newsletter on occupational safety and health in the OSH Answers section of its website. Factsheets are available on a variety of topics and occupations. CCOHS also offers a young workers portal, information on pandemic planning, resources to assist you in promoting good mental health at work, and low cost publications. Links to its free resources are available at http://www.ccohs.ca/resources/ .

CDPH OHB – *California Department of Public Health, Occupational Health Branch*

Home Page: http://www.cdph.ca.gov/programs/ohb/Pages/Programs.aspx
Office: 850 Marina Bay Parkway, Building P, 3rd Floor, Richmond, CA 94804
Phone Number: (510) 620-5757

The OHB is the program in CDPH which is dedicated to preventing worker injuries through prevention programs. You'll find the BuildSafe California tailgate trainings here among many other prevention tools aimed at a variety of workplaces and hazards.

CPWR – *The Center for Construction Research and Training*

Home Page: http://www.cpwr.com/ **Office:** 8484 Georgia Avenue, Suite 1000
Phone Number: 301- 578-8500 Silver Spring, MD 20910

RESOURCE GUIDE PART A: SELECTED ORGANIZATIONS

Formerly known as the Center to Protect Workers' Rights, CPWR conducts research and provides training and service for the construction industry. Created by the Building and Construction Trades Department, AFL-CIO. The Center is supported through government funding by the National Institute for Occupational Safety and Health (NIOSH), the National Institute for Environmental Health Sciences (NIEHS), and the Departments of Energy (DOE) and Labor (DOL).
Construction Solutions Database
http://www.cpwrconstructionsolutions.org/index.php
Construction Chart Book—includes a chapter on musculoskeletal disorders
http://www.cpwr.com/rp-chartbook.html

IHSA--*Infrastructure Health & Safety Association*

Home Page: http://www.csao.org/index_csao.cfm **Office:** 21 Voyager Court South,
Phone Number: (416) 674-2726 Etobicoke, Ontario M9W 5M7

The IHSA, formerly the Construction Safety Association of Ontario (CSAO), the Electrical & Utilities Safety Association (E&USA), and the Transportation Health and Safety Association of Ontario (THSAO), was created in 2010 to prevent workplace injury and illness.

LHSFNA – *Laborers' Health and Safety Fund of North America*

Home Page: http://www.lhsfna.org/ **Office:** 905 16th Street, N.W.
Phone Number: (202) 628-5465 Washington, D.C. 20006

LHSFNA's Occupational Safety and Health Division has many online tips and guides for various common construction hazards, such as ergonomics, falls, noise, and silica. The staff has also provided expert testimony on regulations on request to government officials which you can read here. LHSFNA publishes the free online enewsletter LifeLines, with news to keep you up to date on the construction health and safety issues.

LOHP– *Labor Occupational Health Program at UC Berkeley*

Home Page: http://www.lohp.org/ **Office**: 2223 Fulton St, 4th Floor
Phone Number: (510) 642-5507 Berkeley, CA 94720-5120

LOHP is a public service program at the University of California, Berkeley, affiliated with the Center for Occupational and Environmental Health at the School of Public Health. We seek to reduce occupational injury, illness and death by protecting the health and safety of workers worldwide. In addition to hands-on training, LOHP provides technical assistance, develops educational materials, conducts participatory research, and consults on the development of workplace standards and policies.
Tailgate Meetings that Work (available online in English and Spanish)
http://www.lohp.org/publications/construction_safety.html

RESOURCE GUIDE PART A: SELECTED ORGANIZATIONS

NIOSH – *National Institute for Occupational Safety and Health*

Home Page: http://www.cdc.gov/NIOSH/ **Office:** 395 E Street, S.W. Ste 9200
Phone Number: 800-232-4636; Washington, DC 20201
202-245-0625

The National Institute for Occupational Safety and Health (NIOSH) is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. It was created by the OSH Act of `970 and has headquarters in Washington, DC and Atlanta, GA. It has information available on ergonomics for constructions workers.

OSHA – *Occupational Safety and Health Administrator*

Home Page: http://www.osha.gov/ **Office:** 200 Constitution Avenue
Phone Number: 1-800-321- 6742 Washington, D.C. 20210

The Occupational Safety and Health Administration (OSHA) is the federal agency responsible for ensuring safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance. It was also created by the OSH Act of `970 and has headquarters in Washington, DC. OSHA has information available for construction workers and on ergonomics.

OR-OSHA –*Oregon OSHA*

Home Page: http://www.orosha.org/ **Office:** 350 Winter St. NE, Rm. 430,
Phone Number: 1-800- 922-2689 PO Box 14480
Salem, OR 97309-0405

Oregon OSHA is part of the Oregon Department of Consumer and Business Services and operates under a state-plan agreement with federal OSHA.OR-OSHA is dedicated to improving workplace safety and health in Oregon and committed to working with labor, business, and other government agencies to accomplish that goal. OR-OSHA offers many helpful fact sheet and training program information on its website.

SBCTC – *State Building & Construction Trades Council of California*

Home Page: http://www.sbctc.org/ **Office:** 1225 8th Street, Suite #375
Phone Number: 916-443-3302 Sacramento, CA 95814

The State Building and Construction Trades Council of California (SBCTC) works to improve the health, jobs safety and economic conditions of the members of its affiliates, and of all working men, women and minors in the construction industry. SBCTC offers a Health & Safety page with links to information on upcoming classes as well as other health and safety news.

RESOURCE GUIDE PART A: SELECTED ORGANIZATIONS

SCIF – *State Compensation Insurance Fund*

Home Page: http://www.statefundca.com/ **Office:** 333 Bush Street, 8th floor
Phone Number: 888-782-8338 San Francisco, CA 94104

State Fund is the largest provider of workers' compensation insurance in California. It provides many safety meeting topic factsheets in both English and Spanish in its Safety Resource Center.
Safety Meeting Topics (English/Spanish)
http://www.statefundca.com/safety/safetymeeting/SafetyMeetingTopics.aspx

Washington Dept of Labor and Industry

Home Page: http://www.lni.wa.gov/ **Office:** 7273 Linderson Way SW
Phone Number: 1-800-423-7233 Tumwater, WA 98501-5414

L&I is a diverse state agency dedicated to the safety, health and security of Washington's workers. It offers many free publications to help its workers. Two useful ones are listed below.
Ergonomics Ideas Bank (search by construction worker types and/or particular risk factors)
http://www.lni.wa.gov/Safety/Topics/ReduceHazards/ErgoBank/search.asp
Lifting Calculators
http://www.lni.wa.gov/Safety/Topics/Ergonomics/ServicesResources/Tools/default.asp

Work Safe BC – *Work Safe British Columbia*

Home Page: http://www.worksafebc.com/ **Office:** Main Building
Phone Number: 604 276-3100 6951 Westminster Highway
Richmond, B.C.

WorkSafeBC is dedicated to promoting workplace health and safety for the workers and employers of British Columbia, Canada. It has many online publications available at:
http://www.worksafebc.com/publications/health_and_safety/bulletins/default.asp

RESOURCE GUIDE PART B: TRAINING MATERIALS

BOILERMAKERS

Musculoskeletal Hazards and Controls: Boilermakers
http://www.ihsa.ca/images/pfiles/395_W313.pdf

CARPENTRY

Ergonomics Demonstration Projects: Carpentry, Laborers, Rebar and Concrete Finishing
http://www.lni.wa.gov/wisha/ergo/demofnl/concrete-update.PDF
Ergonomic Survival Guide for Carpenters and Framers
http://www.dir.ca.gov/dosh/dosh_publications/erg_CarpFramer.html
Homebuilding: Carpentry Finishing
http://www.ihsa.ca/images/pfiles/407_W304.pdf

CONCRETE

Body Positions for Spreading and Rodding Concrete
http://www.lhsfna.org/files/bodypositionstipsheet_final.pdf
Concrete Screeding: Walk-Behind Laser Screed Tip Sheet
http://www.lhsfna.org/files/Laser_Screed_tipsheet.pdf
Concrete Trowel Handles
http://www.lhsfna.org/files/trowelltipsheet_final.pdf
Concrete Work
http://www.lni.wa.gov/wisha/ergo/demofnl/concrete-update.PDF
Ergonomics Demonstration Projects: Carpentry, Laborers, Rebar and Concrete Finishing
http://www.lni.wa.gov/wisha/ergo/demofnl/concrete-update.PDF
Ergonomic Tip Sheets for Concrete Construction
http://www.lhsfna.org/index.cfm?objectID=443C54F5-D56F-E6FA-9C77F0C03D2A962D
Ergonomics Workin for Cement and Concrete Construction Workers
http://www.lhsfna.org/files/cc_ergo_manual_11-03.pdf
Homebuilding: Concrete Floors and Drains
http://www.ihsa.ca/images/pfiles/382_W303.pdf
Insoles for Rubber Boots for Concrete Work
http://www.lhsfna.org/files/insolestipsheetfinal.pdf
Rebar Tying Tool
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0603.pdf
Rubber Boots for Concrete Work
http://www.lhsfna.org/files/rubberbootstipsheet_final.pdf
Use Skid Plates for Moving Concrete Filled Hoses (Tip Sheet)
http://www.orosha.org/pdf/ergo/skidplatetips.pdf

RESOURCE GUIDE PART B: TRAINING MATERIALS

CONSTRUCTION ERGONOMICS

ANSI Adopts Sprain and Strain Standard
http://www.lhsfna.org/index.cfm?objectID=6F343BC9-D56F-E6FA-9FACDAFD4C10CAFE
Asbestos Abatement
http://www.lhsfna.org/files/ERFSlagc-Asbestos.pdf
Assessing the risk of sprains and strains
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0616.pdf
Awkward posture and excessive force
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0613.pdf
Back Belts in Construction
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0605.pdf
Back Care Program
http://www.csao.org/uploadfiles/magazine/vol9no1/91back.htm
Back Pain
http://www.njlaborers.org/health/articles/backpain.php3
Back, Shoulder, Knee and Other Musculoskeletal Problems
http://www.lhsfna.org/index.cfm?objectid=EB4CE18C-D56F-E6FA-9F264298BF045289
Balanced tool belts can start your back off in the right position
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0621.pdf
Choosing Safer Hand tools in Construction
http://www.lhsfna.org/files/handtools1.pdf
Construction Chart Book
http://www.cpwr.com/rp-chartbook31-50.html
Construction Ergonomics
http://www.orosha.org/consult/ergonomic/consergopres.ppt
Construction Forearm – an Ergonomic Approach to Cost Reduction
http://www.dir.ca.gov/dosh/dosh_publications/foremanweb.pdf
Construction Solutions Database (solutions included for everything, not just ergo hazards)
http://www.cpwrconstructionsolutions.org/index.php
Contact Stress in Construction Work
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0607.pdf
Core drilling
http://ergo.berkeley.edu/casestudies/coredrilling.php
Drilling Overhead
http://www.cdph.ca.gov/programs/hesis/Documents/DrillOverhead.pdf

RESOURCE GUIDE PART B: TRAINING MATERIALS

Drywall delivery safety access hatch
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/drywallsafety.pdf
Drywall Installers
http://www.cdph.ca.gov/programs/hesis/Documents/drywall.pdf
Easy Ergonomics: A Guide to Selecting Non-Powered Hand Tools
http://www.cdc.gov/niosh/docs/2004-164/pdfs/2004-164.pdf
Ergonomics Best Practices for the Construction Industry
http://www.ohiobwc.com/downloads/brochureware/publications/ConstSafeGrant.pdf
Ergonomics Demonstration Project Wallboard
http://www.lni.wa.gov/wisha/ergo/demofnl/wallboard_fnl.pdf
Ergonomics for Hazardous Waste
http://www.lhsfna.org/files/ERFSlagc-Hazardous_Materials.pdf
Ergonomics for Lead Abatement
http://www.lhsfna.org/files/ERFSlagc-Lead_Abatement.pdf
Ergonomics for Women in the Trades
http://www.orosha.org/consult/ergonomic/ergotrades.ppt
Ergonomics in Construction: Pre-job planning questions to ask
http://www.orosha.org/consult/ergonomic/ergoconstruction.doc
Ergonomic Survival Guide for Laborers
http://www.dir.ca.gov/dosh/dosh_publications/Erg_Laborer.pdf
Ergonomics Working: Heavy and Highway Construction Laborers
http://www.lhsfna.org/files/hh_ergo_manual_11-03.pdf
Hammer Drill Support Arm
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0602.pdf
Hand Arm and Whole Body Vibration
http://www.consultnet.ie/vibration.htm
Hand tool ergonomics
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0615.pdf
Hand Tools
http://www.lhsfna.org/files/ERFSlagc-Hand_Tools.pdf
Heavy Tool Mount
http://ergo.berkeley.edu/casestudies/toolmount.php
How much can I lift?
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0609.pdf
How to get through a day's work and still have something left over
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0623.pdf
Job rotation gives the body a break
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0622.pdf

RESOURCE GUIDE PART B: TRAINING MATERIALS

Lifting and Your Back
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0608.pdf

MSI risk factors
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0614.pdf

Muscular Disorders
http://www.csao.org/uploadfiles/magazine/vol11no3/musculo.htm

Musculoskeletal Injury Risks and Mitigation in Residential Construction: Ergonomics Demonstration Project Preliminary Results
http://www.lni.wa.gov/wisha/ergo/demofnl/resid_const_update.pdf

Overcome the "Don't sit on the job" attitude and your body will thank you
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0618.pdf

Overhead Drill Press
http://ergo.berkeley.edu/research/overhead_drill.php

Overhead drilling Project
http://www.youtube.com/watch?v=iUdhtrOwmr0

Pavement Breaker Operators
http://www.cdph.ca.gov/programs/hesis/Documents/pavement.pdf

Pavement Breaker Storage
http://ergo.berkeley.edu/casestudies/pavement.php

Power Tools
http://www.lhsfna.org/files/ERFSlagc-Power_Tools1.pdf

Prevention of Strains, Sprains and Material Handling Injuries in Construction
http://www.workzonesafety.org/files/documents/training/toolbox_talks/osha_alliance/Construction_strains_sprains.pdf

Protect Your Back (factsheet)
http://www.orosha.org/pdf/pubs/4844a.pdf

Protect Your Knees (factsheet)
http://www.orosha.org/pdf/pubs/4844c.pdf

Protect Your Shoulders and Your Neck and Your Future
http://www.orosha.org/pdf/pubs/4844b.pdf

Pushing and Pulling on a construction site
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0611.pdf

Reduce your risk of back injury – let your equipment do the work
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0617.pdf

Reducing Sprains and Strains in Construction through Worker Participation: A Manual for Managers and Workers with Examples from Scaffold Erection.
http://www.elcosh.org/record/document/15/d000011.pdf

RESOURCE GUIDE PART B: TRAINING MATERIALS

Repetition and excessive force
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0604.pdf
Residential Construction
http://www.lni.wa.gov/wisha/ergo/demofnl/resid_const_update.PDF
Safe drywall delivery options for prime contractors
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/drywall_options.pdf
Safe Manual Handling tip for Construction Workers
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0612.pdf
Scaffold Erection
http://www.lhsfna.org/files/ERFSlagc-Scaffold.pdf
Selecting Hand tools in construction workers
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0610.pdf
Simple Solutions: Ergonomics for Construction Workers
http://www.cdc.gov/niosh/docs/2007-122/
Sprains and Strains Prevention
http://www.workzonesafety.org/files/documents/training/toolbox_talks/osha_alliance/sprains_strains_prevention.pdf
Success story-- stretching& strengthening (construction company)
http://www.osha.gov/dcsp/success_stories/ergonomics/hensel.html
Support for Overhead drilling
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0601.pdf
Suspending tools prevent back, arm and shoulder fatigue
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0620.pdf
Tailgate Training for California Construction Workers (in English and Spanish)
http://www.lohp.org/publications/construction_safety.html
10 Little or No Cost Improvements
http://www.orosha.org/consult/ergonomic/tenimprove.doc
10 Tips to Improve Construction Ergonomics
http://www.statefundca.com/safety/ErgoMatters/ConstructionErgo.asp
Traffic Safety Cone Storage
http://ergo.berkeley.edu/casestudies/conestorage.php
Truck Seats
http://ergo.berkeley.edu/casestudies/truckseats.php
Using a pipe carriage prevents back, shoulder, and wrist fatigue
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0619.pdf
Utility Cover Removal Operation
http://ergo.berkeley.edu/casestudies/utilitycover.php

RESOURCE GUIDE PART B: TRAINING MATERIALS

Vibration Health Effects
http://www.ccohs.ca/oshanswers/phys_agents/vibration/vibration_effects.html
Wall Board
http://www.lni.wa.gov/wisha/ergo/demofnl/wallboard_fnl.pdf
What are MSIs?
http://www.worksafebc.com/publications/health_and_safety/bulletins/constructive_ideas/assets/pdf/ci0606.pdf

ELECTRICIANS

Ergonomics e-tool: Solutions for electrical contractors
http://www.osha.gov/SLTC/etools/electricalcontractors/
Ergonomic Survival Guide for Electricians
http://www.dir.ca.gov/dosh/dosh_publications/ElectriciansErgo.pdf
Manual Crimping
http://ergo.berkeley.edu/casestudies/crimping.php

ERGONOMICS-GENERAL

At Home, Hobbies and Sports
http://www.working-well.org/sports_guideln.html
Crafts-Labor Ergonomics Self-Assessment Tool
http://www.montana.edu/wellness/Ergonomics/Crafts-Labor%20Ergo%20Self-Assessment%20Tool.pdf
ErgoMatters: short articles
http://www.statefundca.com/safety/ErgoMatters.asp
Ergonomic Guidelines For Manual material handling
http://www.cdc.gov/niosh/docs/2007-131/
Ergonomics Factsheet
http://www.statefundca.com/safety/safetymeeting/SafetyMeetingArticle.aspx?ArticleID=41
Ergonomics Ideas Bank
http://www.lni.wa.gov/Safety/Topics/ReduceHazards/ErgoBank/default.asp
Ergonomics Page
http://www.osha.gov/SLTC/ergonomics/index.html
Evaluating Ergonomic Programs (Video)
http://www.osha.gov/SLTC/video/ergoprogramsthatwork/video.html
Evaluation Tools such as lifting and vibration calculators
http://www.lni.wa.gov/Safety/Topics/Ergonomics/ServicesResources/Tools/default.asp
Introduction to Ergonomics online course
http://www.orosha.org/educate/onlinecourses/1201/1201FinalPDF.pdf
Workbook http://www.orosha.org/pdf/workshops/201w.pdf
Instructor Guide http://www.orosha.org/pdf/workshops/201i.pdf

RESOURCE GUIDE PART B: TRAINING MATERIALS

Manual Material Handling
http://www.csao.org/uploadfiles/magazine/vol9no1/91mats.htm
MSD Prevention Guideline for Ontario: Part 1
http://www.osach.ca/misc_pdf/MSDGuideline.pdf
Part 2: Resource Manual
http://www.osach.ca/misc_pdf/MSDResource.pdf
Part 3A: MSD Prevention Toolbox – Getting Started
http://www.osach.ca/misc_pdf/MSDToolboxA.pdf
Part 3B: MSD Prevention Toolbox – Beyond the Basics
http://www.osach.ca/misc_pdf/MSDToolboxB.pdf
Muscular Disorders: Awareness (free 20 minute online course)
http://www.ccohs.ca/products/courses/msd_awareness/
Sample written ergonomics program
http://www.statefundca.com/safety/SampleErgoPlan.asp
Skilled Crafts and Labor Ergonomics: The Art and Science of Fitting Work to the Person
http://www.montana.edu/wellness/Ergonomics/Crafts-Labor%20Ergo%20G.ppt
10 tips for effective ergonomics
http://www.lni.wa.gov/Safety/Topics/Ergonomics/ServicesResources/10Tips/default.asp

MASONRY

Concrete Trowel Handles
http://www.lhsfna.org/files/trowelltipsheet_final.pdf
Ergonomic Best Practices / Acceptable Practices in the Masonry, Stonework, Tile Setting Industries
http://www.lni.wa.gov/wisha/ergo/demofnl/masonry_update.pdf
Ergonomic Survival Guide for Cement Masons
http://www.dir.ca.gov/dosh/dosh_publications/CErg_CementMasons.pdf
Fire Proofing
http://www.lhsfna.org/files/ERFSlagc-Fireproofing.pdf
Getting a Grip
http://www.csao.org/uploadfiles/magazine/vol11no4/grip.htm
Grout Delivery System
http://www.ohiobwc.com/downloads/blankpdf/SafetyandHygiene08Adena.pdf
Mason Industry
http://www.lni.wa.gov/wisha/ergo/demofnl/masonry_update.pdf
Masonry Trade
http://www.ihsa.ca/images/pfiles/372_W301.pdf
Masonry Trowels: Bigger isn't Better
http://www.csao.org/uploadfiles/magazine/vol13no3/trowels.htm
Material Handling
http://www.lhsfna.org/files/ERFSlagc-Material_Handling.pdf
Muscular Injuries in The Masonry Trade
http://www.csao.org/uploadfiles/magazine/vol10no3/injuries.htm

RESOURCE GUIDE PART B: TRAINING MATERIALS

Plaster Tending: Mixing Station Setup
http://www.lhsfna.org/files/ERFSlagc-Plaster_Tending.pdf
Scaffolding
http://www.ohiobwc.com/downloads/blankpdf/SafetyHygiene093DCMeyerMasonry.pdf
Scaffold Handling
http://www.ohiobwc.com/downloads/blankpdf/SafetyHygiene091appelgren.pdf
Work Smarter not Harder—poster for the masonry trade
http://www.ihsa.ca/images/pfiles/373_W310.pdf

PAINTERS

Influence of Wall Painting on Shoulder Muscle
http://www.oiweb.com/data/PaintRollerStudyJan09.pdf
Painter Safety
http://www.statefundca.com/safety/safetymeeting/SafetyMeetingArticle.aspx?ArticleID=638
Prevention of repetitive stress injuries of the forearm, wrist and hand by use of an ergonomic paint brush
http://www.proformtech.com/ergonomics.html
Spray Painting Safety
http://www.statefundca.com/safety/safetymeeting/SafetyMeetingArticle.aspx?ArticleID=110

PLUMBERS/PIPE FITTERS

Ergonomic Risk Assessment for Navy Public Works Center
http://www.denix.osd.mil/ergoworkinggroup/upload/PublicWorks.pdf
Homebuilding: Plumbing
http://www.ihsa.ca/images/pfiles/385_W308.pdf
Plumbing Safety
http://www.statefundca.com/safety/safetymeeting/SafetyMeetingArticle.aspx?ArticleID=501

ROOFERS

Flat Roofing
http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/flat_roofing_bk65.pdf
Hoomebuilding: Sloped Roofing
http://www.ihsa.ca/images/pfiles/386_W309.pdf
Roofers
http://www.ihsa.ca/images/pfiles/392_W311.pdf
Roofing Materials Distribution
http://www.lni.wa.gov/wisha/ergo/demofnl/allied013105.pdf
Wood Feathers
http://www.lni.wa.gov/WISHA/ergo/demofnl/WoodFeathersRpt030805.pdf

SHEETMETAL WORKERS

Ergonomic Survival Guide for Sheet Metal Workers
http://www.dir.ca.gov/dosh/dosh_publications/CErg_SheetMetal.pdf
Mechanical Contractor Shop
http://www.lni.wa.gov/wisha/ergo/demofnl/mckinstry_fnl.PDF
Reducing Work-Related Musculoskeletal Disorders among Rodbusters
http://www.cdc.gov/niosh/docs/wp-solutions/2010-103/pdfs/2010-103.pdf
Sheetmetal Trade
http://www.ihsa.ca/images/pfiles/396_W314.pdf

TELECOMMUNICATIONS WORKERS

Success story-- ladders& telecom workers
http://telsafe.org/Documents/Ladder%20Case%20Study%201662007.pdf

WELDERS

Ergonomics
http://www.ccohs.ca/oshanswers/safety_haz/welding/ergonomics.html
Ergonomics in the Welding Environment
http://www.aws.org/technical/facts/FACT-13.pdf
Ergonomics in Welding
http://wisha-training.lni.wa.gov/training/presentations/Ergo4Welders.ppt
IHSA's Safety Talks: Welding
http://www.ihsa.ca/pdfs/msd/MSDs_Welding.pdf

RESOURCE GUIDE PART C: GLOSSARY

AWKWARD POSTURE
A fixed or constrained position that places a strain on muscles, tendons, or joints. In general, the more a joint deviates from a neutral position, the greater the chance of injury.

BONES
The hard tissue making up the skeleton in humans and other vertebrates.

CALIFORNIA ERGONOMICS STANDARD
The standard requires employers to take action to prevent repetitive motion injuries if:
Two workers have reported repetitive motion injuries within a 12-month period
—and—
These injuries are a result of performing identical work and are diagnosed by a physician.
It does not take effect unless the two conditions stated in the slide are met. If this happens, the employer must establish an ergonomics program to minimize repetitive motion injuries.

CUMULATIVE TRAUMA DISORDERS (CTDS)
Injuries involving strain which develop, or build up over time

ERGONOMICS
The word is used to describe the science of fitting the job to the worker, not the worker to the job. MSDs are the problem and ergonomics is the solution.

ERGONOMICS PROGRAM
An ergonomics program should include:
- Management commitment and worker involvement
- Hazard Information and Reporting
- Job Hazard Analysis and Control
- Training
- MSD Medical Management
- Program Evaluation

FORCE
The amount of effort put out by your body's muscles, tendons and ligaments.

INCIDENCE RATE
A measure of the frequency with which a disease occurs in a population over a period of time. Incidence rates can be used to show the relative level of injuries and illnesses among different industries, firms, or operations within a single firm. Because a common base

and a specific period of time are involved, these rates can help determine both problem areas and progress in preventing work-related injuries and
illnesses. To compute incidence rates for your establishment, see the Bureau of Labor Statistic's page on this at http://www.bls.gov/iif/osheval.htm .

LIGAMENTS

Tough, stretchy fibrous tissue that connects two bones or cartilages or holds together a joint.

MUSCULOSKELETAL DISORDERS (MSD'S)

Disorders involving muscles and bones, nerves, ligaments, blood vessels, tendons, and soft tissues in the body, such as carpal tunnel syndrome (CTS), tendinitis, and bursitis.

NEUTRAL POSTURE

The position that places the least amount of strain on the body's muscles, tendons, and joints. In general, this will be in the middle of a joint's range of motion.

OVEREXERTION

Occurs when the amount of work being done overloads the muscles and tendons of the body and injury may occur. Overexertion injuries result from excessive physical effort. The most common injuries seen here, according to the National Safety Council, are strains and sprains, especially to the lower back.
http://www.nsc.org/nsc_events/Nat_Safe_Month/Documents/PreventingOverexertion.pdf

REPETITIVE MOTION INJURIES (RMI'S)

Injuries often caused by repeating the same motion over and over.

REPETITIVE STRAIN INJURIES (RSI'S)

Injuries caused by doing the same or similar task repeatedly.

RISK FACTORS

A risk factor is anything that can increase your risk of injury. The more risk factors you have, the more likely you will be injured. Examples include awkward postures, repetition, excessive force, static postures, vibration, poorly designed tools, extreme temperatures, and poor work organization.

RESOURCE GUIDE PART D: SELECTED MUSCULOSKELETAL CONDITIONS

BRICKLAYER'S ELBOW

Also called, tennis elbow, this occurs from repeatedly bending the elbow or twisting the forearm while gripping tightly. May result in pain and inflammation to the upper and lower arm, wrist and elbow.

BURSITIS

A painful condition that affects the small fluid-filled pads called bursae that act as cushions among your bones and the tendons and muscles near your joints. Bursitis occurs when bursae become inflamed. The most common locations for bursitis are in the shoulder, elbow and hip. But you can also have bursitis by your knee, heel and the base of your big toe. Bursitis often occurs near joints that perform frequent repetitive motion.

GANGLION CYST

Noncancerous fluid-filled lumps (cysts) that most commonly develop along the tendons or joints of your wrists or hands. They may also appear in your feet. A ganglion cyst may develop suddenly or gradually over time.

RAYNAUD'S SYNDROME

A condition that causes some areas of your body such as your fingers, toes, the tip of your nose and your ears to feel numb and cool in response to cold temperatures or stress. In Raynaud's disease, smaller arteries that supply blood to your skin narrow, limiting blood circulation to affected areas.

WHITE FINGER

Also known as hand-arm vibration syndrome and dead finger, it can be caused by repeated use of vibrating power tools. Symptoms include a tingling or numbness in the fingers, fingers may change color from white to blue/purple then red, pain and loss of manual dexterity and reduced grip strength.

NERVE PROBLEMS

CARPAL TUNNEL SYNDROME

CTS is caused by damage to a nerve passing through the wrist. It is a progressively painful hand and arm condition caused by a pinched nerve in your wrist. A number of factors can contribute to carpal tunnel syndrome, including the anatomy of your wrist, certain underlying health problems and possibly patterns of hand use. Bound by bones and ligaments, the carpal tunnel is a narrow passageway — about as big around as your thumb — located on the palm side of your wrist. This tunnel protects a main nerve to your hand and nine tendons that bend your fingers. Compression of the nerve produces the numbness, pain and, eventually, hand weakness that characterize carpal tunnel syndrome.

RESOURCE GUIDE PART D: SELECTED MUSCULOSKELETAL CONDITIONS

SCIATICA

Sciatica is a pain that radiates along the path of the sciatic nerve and its branches — from your back down your buttock and leg. The sciatic nerve is the longest nerve in your body. It runs from your spinal cord to your buttock and hip area and down the back of each leg.
Sciatica is a symptom, not a disorder. The radiating pain of sciatica signals another problem involving the nerve, such as a herniated disk.

THORACIC OUTLET SYNDROME

Caused by a compression of the nerves and vessels between the neck and shoulder, thoracic outlet syndrome is a group of disorders that occur when the blood vessels or nerves in the thoracic outlet — the space between your collarbone and your first rib — become compressed. This can cause pain in your shoulders and neck and numbness in your fingers.
Common causes of thoracic outlet syndrome include physical trauma from a car accident, repetitive injuries from job- or sports-related activities, certain anatomical defects, such as having an extra rib, and pregnancy.

TENDON PROBLEMS

DE QUERVAIN'S TENDINITIS

De Quervain's tendinitis occurs when tendons around the base of the thumb are irritated or constricted and swell. If you have de Quervain's tenosynovitis, you're likely to feel discomfort every time you turn your wrist, grasp anything or make a fist. Activities that rely on repetitive hand or wrist movement can aggravate the condition.

EPICONDYLITIS

Epicondylitis is a painful condition that occurs when tendons in your elbow are overworked, usually by repetitive motions of the wrist and arm. Many occupations feature repetitive wrist and arm motions that can cause this condition. The pain occurs primarily where the tendons of your forearm muscles attach to the bony prominence on the outside of your elbow. Pain can also spread into your forearm and wrist.

ROTATOR CUFF TENDINITIS

The rotator cuff is a group of muscles and tendons that attach to the bones of the shoulder joint, allowing the shoulder to move and keeping it stable. Rotator cuff tendinitis refers to irritation of these tendons and inflammation of the bursa (a normally smooth layer) lining these tendons. It may be caused by working with the arm overhead for many hours or days (such as painters and carpenters).

RESOURCE GUIDE PART D: SELECTED MUSCULOSKELETAL CONDITIONS

TENDINITIS

Tendinitis is inflammation or irritation of a tendon, which are the thick fibrous cords that attaches muscle to bone. The condition causes pain and tenderness just outside a joint. While tendinitis can occur in any of your body's tendons, it's most common around your shoulders, elbows, wrists and heels.

TENOSYNOVITIS

Tenosynovitis is inflammation of the lining of the sheath that surrounds a tendon. It may result from overuse or strain. The areas of the body most often are the wrists, hands, and feet. Symptoms include difficulty moving a joint, joint swelling in the affected area, pain and tenderness around a joint, especially the hand, wrist, foot, or ankle, pain when moving a joint, and redness along the length of the tendon.

TRIGGER FINGER

Trigger finger is a type of extreme tenosynovitis, leading to locked fingers. Trigger finger limits finger movement. When you try to straighten your finger, it will lock or catch before popping out straight. Trigger finger is a condition that affects the tendons in your fingers or thumb. Often painful, trigger finger is caused by a narrowing of the sheath that surrounds the tendon in the affected finger. People whose work or hobbies require repetitive gripping actions are more susceptible.

Selected sources:

A Guide to the Safe Use of Video Display Terminal. Yale University. Office of Environmental Health and Safety.
http://www.yale.edu/ehs/Documents/phys/Vdtguide.pdf

Mayo Clinic Diseases and Conditions.
http://www.mayoclinic.com/health/DiseasesIndex/DiseasesIndex

Medline Plus
Health Information from the National Library of Medicine
http://www.nlm.nih.gov/medlineplus/medlineplus.html

Section 8: Training Forms

State Building & Construction Trades Council of CA **Harwood Grant #SH22310-11-60-F-6**

TRAINING ATTENDANCE ROSTER

Training Topic: _____ Type of Training: _____

Activities/modules/chapters covered in this session: _____

_____

Course Date: _____ Start Time: _____ End Time: _____

Course Location: (city/state): _____

Union or Company Name: _____

Trainer Name: _____

	Student Name (print)	Signature	Company Name	Check if Worker	Check if Manager
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I certify that the information on this page is accurate. _____

(Signature of trainer)