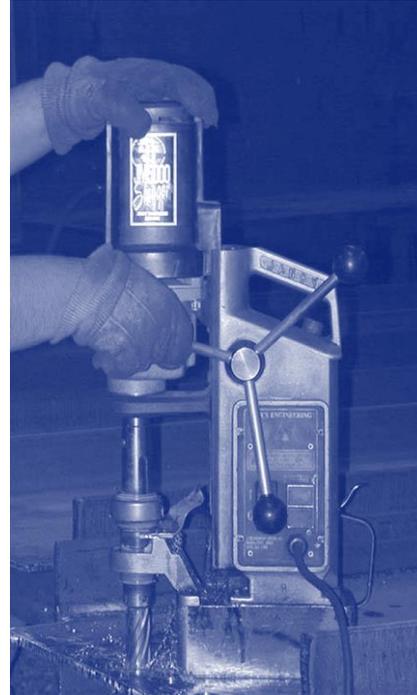


Preventing Musculoskeletal Injuries

Module 5

Special Warehouse
Worker Hazards
in Structural Steel
Fabricating and
Supply Companies



Preventing Musculoskeletal Injuries

Module 5

OSHA Grant Information

This material was produced under grant number SH-26316-SH4 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 trades names, commercial products, or organizations imply endorsement by the U.S. Government.

Preventing Musculoskeletal Injuries

Module 5

Program Development

This program was developed by faculty and students in the School of Planning, Design and Construction at Michigan State University in conjunction with the American Institute of Steel Construction - Safety Committee and the University of Puerto Rico

March 2015

MICHIGAN STATE

UNIVERSITY



Preventing Musculoskeletal Injuries

Module 5

Learning Outcomes: Participants shall be able to:

- Demonstrate understanding of the principles of ergonomics and their applications
- Use good work practices, including proper lifting techniques
- Demonstrate awareness of work tasks that may lead to pain or injury
- Recognize early symptoms of MSDs

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Module 5

MSDs Emphasis in Steel Companies

- ❑ Repetitive stress, improper lifting, awkward position, body twists causes damage both short and long term
- ❑ Change position including height of the work, rotate workers, fatigue mats, and anti-vibration gloves all help
- ❑ Stretching helps



Working in an awkward position

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Module 5

Stretching & Wellness*



Shoulder Stretch

**In Class Stretching Exercise
Instructor Lead Class in Stretching demonstration**

Preventing Musculoskeletal Injuries

Module 5

CIANBRO

STRETCHES



1

Chin Tuck:

Place one finger on your chin & push your head straight back. Do not put your chin to your chest. Keep it up in the neutral position. Feel a stretch up the back of your neck. Hold for **10 seconds** & relax.



2

Head Tilt Right/Left:

Tilt head to side keeping shoulders horizontal & nose to the front. Lift opposite arm up & 45° away from your side while pushing the palm down & pulling the fingers up. Opposite hand will be on shoulder of arm being stretched. Hold for **10 seconds** & switch.



3

Shoulder Rolls:

5 slow shoulder rolls to the front & 5 to the back. Keep your arms down & roll your shoulders.

Shoulder Stretch:

Pull your arm across your body holding it in place with the opposite arm at the elbow as you look over the shoulder of the arm that is being pulled across your body. Make sure to keep your shoulders horizontal. Hold for **10 seconds** & switch.



4

Triceps Stretch:

Put your arm over head and pull down on your elbow with the opposite hand as you place your fingers between your shoulder blades. Hold for **10 seconds** & switch.



5

Upper Back Stretch:

Clasp your hands, intertwining your fingers, & push your arms straight out in front of you, palms are away from you. Push your belly to your spine & separate your shoulder blades. Hold for **10 seconds**.



6



1

/ 1



Preventing Musculoskeletal Injuries

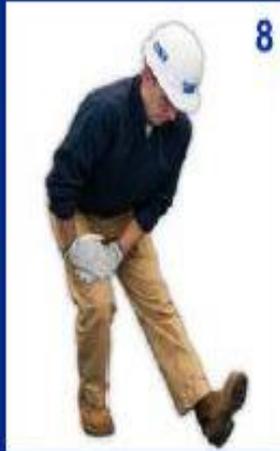
Module 5



7

Lateral Stretch:

Place one hand on your hip & the other arm overhead. Reach with the arm over your head & lean toward the hip being held. Keep your head up, hold for 10 seconds & switch.



8

Hamstring Stretch:

Stand with your feet shoulder-width apart. Put one heel forward & put your hands on the opposite leg just above the knee. Your knee should be slightly bent. Push your buttocks back. Hold for 10 seconds & switch.



9

Quad Stretch:

Assume staggered stance while keeping torso vertical. Anchor ball of foot of back leg to ground / floor; keep knee directly over ankle on front leg. Shift hips slightly forward & drop body weight down just slightly. Hold for 10 seconds & switch.

Wrist Extension:

Put one arm out straight in front of you with the palm facing upwards. Apply pressure with the opposite hand to the palm until you feel a light stretch. Hold for 10 seconds & switch.



10

Forearm Stretch:

Put both arms out straight in front of you and lock your elbows. Clench your fists & bend your wrists down at a 90° angle. Rotate your wrists 45° laterally. Hold for 10 seconds.



11

Finger Stretch:

Hold both arms straight out in front of you with your palms facing down. Spread fingers apart for 10 seconds.



12

Preventing Musculoskeletal Injuries

Module 5

What Are Musculoskeletal Disorders (MSDs)?

- ❑ An injury or disorder of the muscles, nerves, tendons, joints, cartilage, and spinal discs.
- ❑ They also include soft tissue and repetitive motion injuries and disorders.



Illustration sources Back Injury Prevention For the Landscaping and Horticultural Services Industry, K-State Research and Extension, Kansas State University, Manhattan, Kansas https://www.osha.gov/dte/grant_materials/fy06/46g6-ht22/back_injury_prevention.pdf

Preventing Musculoskeletal Injuries

Module 5

MSD IMPACT

- ❑ “Work related MSDs are among the most frequently reported causes of lost or restricted work time
- ❑ In 2011, the Bureau of Labor Statistics (BLS) reported the 387,820 MSD cases accounted for 33% of all worker injury and illness cases in 2011.”

<https://www.osha.gov/SLTC/ergonomics/>

Preventing Musculoskeletal Injuries

Module 5

MSDs Affect Many Parts of the Body

- “Back
- Neck
- Shoulders
- Arms
- Elbows
- Wrists
- Fingers”
- Knees



Source CIANBRO

X Ray of knee with cartilage damage

Preventing Musculoskeletal Injuries

Module 5

Symptoms:

- “Soreness
- Swelling
- Skin Discoloration
- Numbness
- Tingling
- Burning
- Radiating Pain
- Decreased Strength
- Decreased Movement”

These usually develop gradually but sometimes can appear suddenly

Preventing Musculoskeletal Injuries

Module 5

Risk Factors for MSD Injuries?

- Awkward postures
- Improper lifting
- Pulling-pushing-lifting heavy loads
- Repetition
- Excessive force
- Contact injuries
- Static posture
- Vibration
- Unsuitable tools
- Extreme temperature
- Awkward motion demands



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Module 5

MSD Injury Factors

- Intensity of exposure (*How Much?*)
- Frequency of the exposure (*How Often?*)
- Position and movement (*How Positioned?*)
- Duration of the exposure (*How Long?*)

Keeping in mind that it could be a combination of all these factors.

Force + Repetition + Posture + Duration = Increased risk
of a MSD

Preventing Musculoskeletal Injuries

Module 5

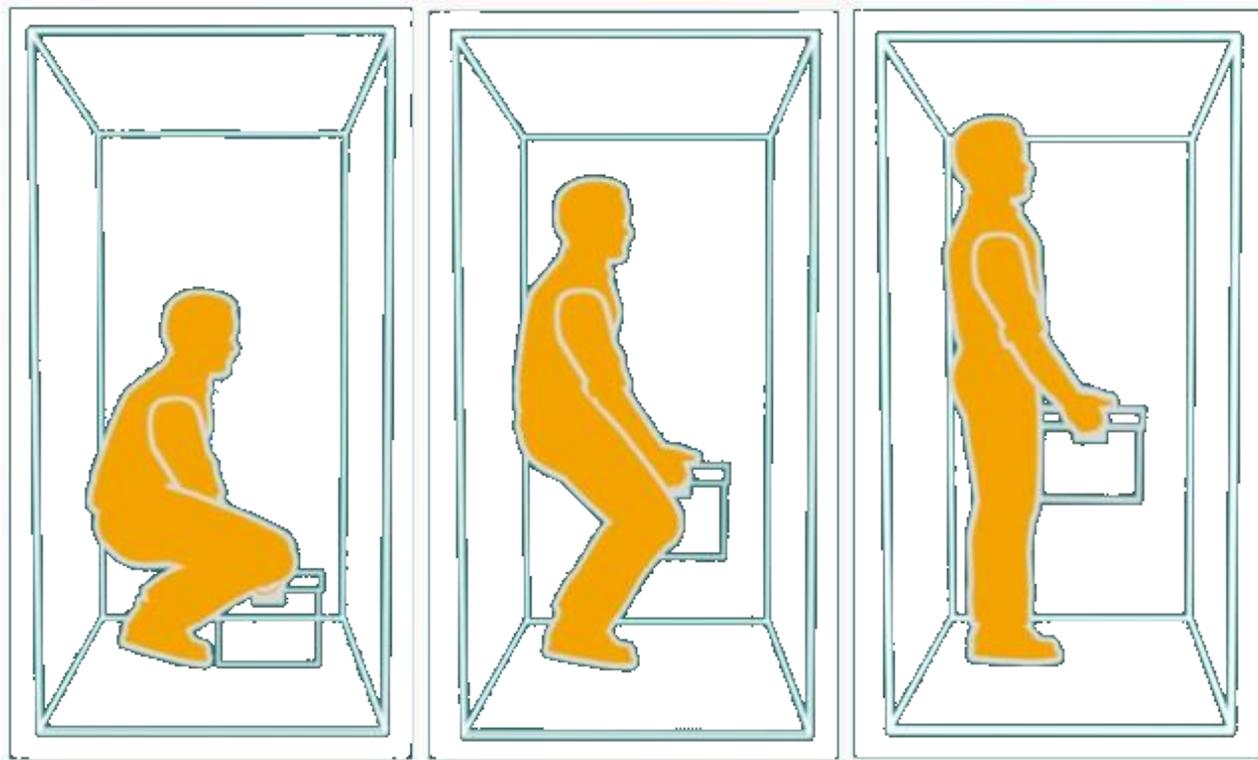
Conditions Aggravated with:

- “Age
- Stress
- Physical conditioning”
- “Lack of exercise
- Poor nutrition
- Poor sleep
- Generally unhealthy lifestyle habits
- Injuries outside of work”

Preventing Musculoskeletal Injuries

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Picture Perfect Lifting



Avoid torso twisting (rotation) while lifting

Source CIANBRO

Preventing Musculoskeletal Injuries

Module 5

Back Injuries

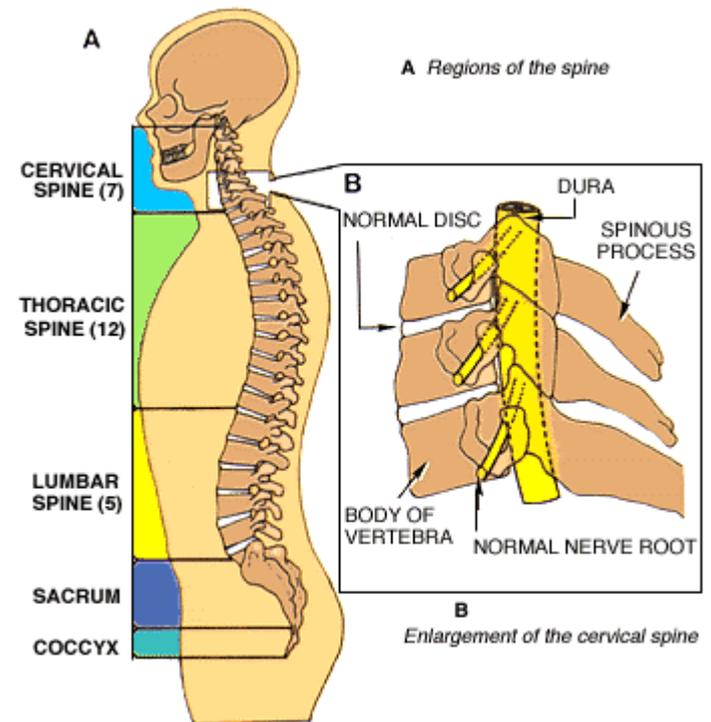
- ❑ “The back is the most frequently injured body part. Once injured, the risk of recurrence doubles
- ❑ Low back injuries represent over 90% of all injury claims
- ❑ Second only to the common cold in lost work days
- ❑ Back pain costs American businesses an estimated \$30 billion each year
- ❑ 4 out of every 5 people will experience back pain in their lifetime”

Preventing Musculoskeletal Injuries

Module 5

Back

- ❑ “The back supports the upper body, protects your spinal cord and allows flexibility”
- ❑ “Most of the stress when lifting and bending is absorbed by the lower back
- ❑ To take some pressure away from the spine, your abdominal and back muscles contract to give added support”



Preventing Musculoskeletal Injuries

Module 5

“Causes of Back Injury

- Improper lifting techniques
- Overexertion
- Poor posture
- Medical factors (age, other disabilities, etc.)
- Slips and falls
- Excessive weight
- Lack of exercise
- Stress”

Preventing Musculoskeletal Injuries

Module 5

“Symptoms of Back Injury

- Pain
- Stiffness
- Numbness in the legs
- Limited ability to sit or stand
- Muscle weakness, spasms and strains
- Decreased range of motion”

Preventing Musculoskeletal Injuries

Module 5

Lifting Considerations

Lifting factors	More weight can be safely lifted when:	The amount of weight that can safely be lifted is reduced when:
How far from the body the load is held (horizontal distance).	The load is close to the body and not too large/bulky, which allows the arms and elbows to be close to the torso during the lift.	The load is farther away from the body or is large/bulky, forcing the arms and elbows away from the torso during the lift.
How high or low is the lift (vertical distance).	The lift is at waist height.	The lift must be made from below the knees or above the shoulder.
How much the employee must twist to lift and move the load.	The lift is performed in front of the body.	The employee must twist the torso to lift and move the load.
How often the lift is repeated.	The lift is performed only occasionally.	The lift is performed repeatedly (several times a minute).
How far the load is carried.	The lift does not involve carrying.	The load must be carried a distance (more than 3 feet).
How the load is gripped.	The load has handles.	The load does not have handles or is slippery.

Preventing Musculoskeletal Injuries

Module 5

Plan your job lift

- “Reduce the weights you lift
- Reduce the distance you carry a load
- Eliminate twisting
- Reduce the frequency of lifting
- Lift in a safe range

When Lifting...

- Keep the load close to the body
- Keep your feet apart for a stable stance
- Position your feet prior to lifting to eliminate twisting
- Don't lift beyond your safe limit. Get help”!

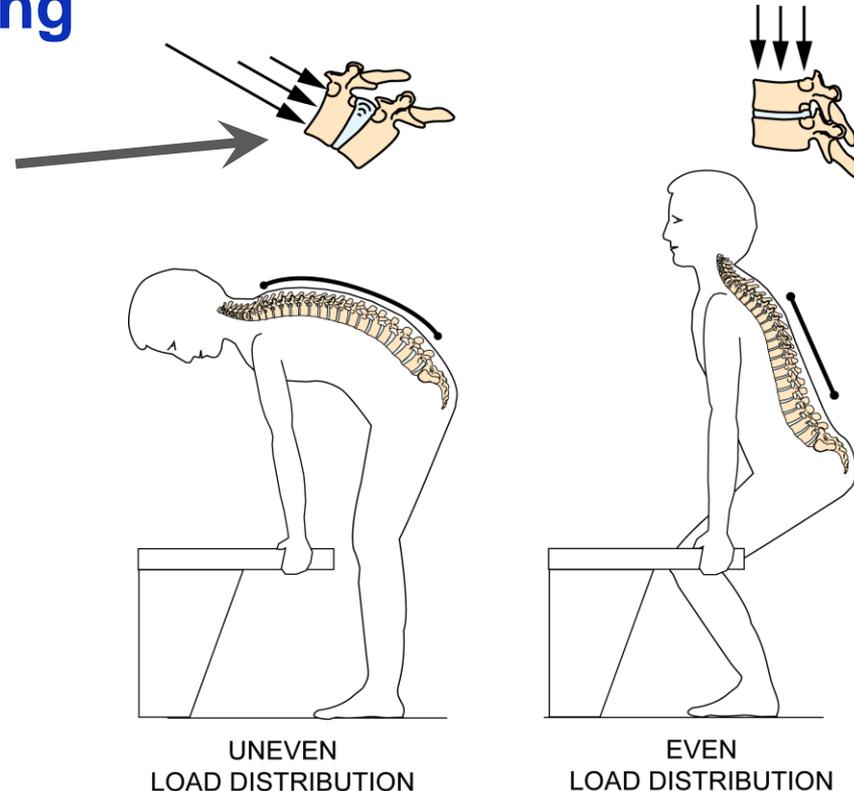
Source: CIANBRO

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Module 5

Improper vs. Proper Lifting

“See the force on the disk when bending at the waist vs. bending at the knees and lifting?”



Source: CIANBRO

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Module 5

Heads Up Not Butts Up

Bad



Lifting with back

Good



Lifting with legs

Source: CIANBRO

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Module 5

Heads Up Not Butts Up

In Class Lifting Demonstration

Instructor Lead Class Lifting Demonstration

Select a volunteer-lift an object from the floor

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Module 5

Vibration Exposure

- ❑ “Whole body vibration (WBV) is a form of mechanical vibration transmitted through a supporting surface to the body. Like in equipment or a truck seat.
- ❑ Vibration from hand tools can be dampened by anti-vibratory gloves, tool wraps or even by choosing tools that provide less vibration.”

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Module 5

Vibration in steel shops

- Grinders
- Sanders
- Drills
- Chipping hammers and chisels

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Module 5

H.A.V.S. Symptoms (Hand-Arm Vibration Syndrome)

- “Tingling or numbness in fingers and palm
- Spasms in fingers
- Blanching of the fingers
- Chronic disorder usually irreversible
- Can develop from repeated and prolonged exposure to vibration
- Damage to the blood vessels, nerves, and muscles

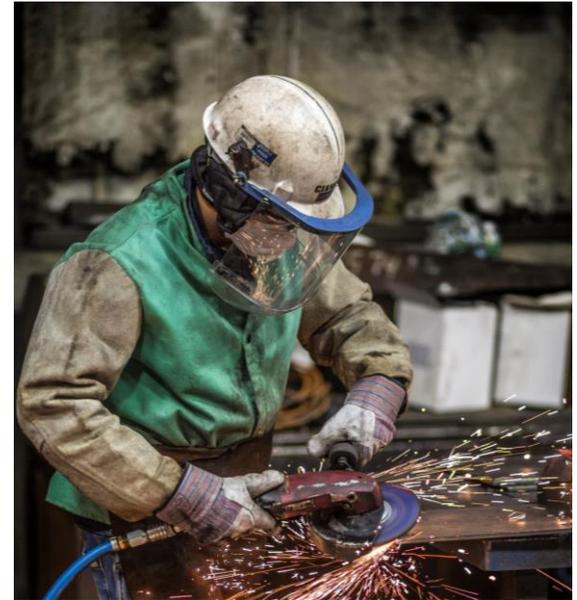
- Half of the 1.5 million American workers who use vibrating tools will develop some form of HAVS (NIOSH)
- 5% of the general population suffers from HAVS”

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Module 5

H.A.V.S. Risk Factors

- “Repeated and prolonged exposure to hand-held vibrating tools
- Improper tool use
- Forceful tool grip
- Aggravated by
 - Temperature - Cold
 - Damp environment
 - Smoking”



Vibration from grinding can be minimized by the use of vibration dampening tools and anti-vibration gloves

Photo from Cianbro

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Module 5

H.A.V.S Control PPE

- ❑ Wear full-fingered, certified anti-vibration gloves to reduce exposure to vibration
- ❑ Wear ANSI Compliant Gloves appropriate for the hazard

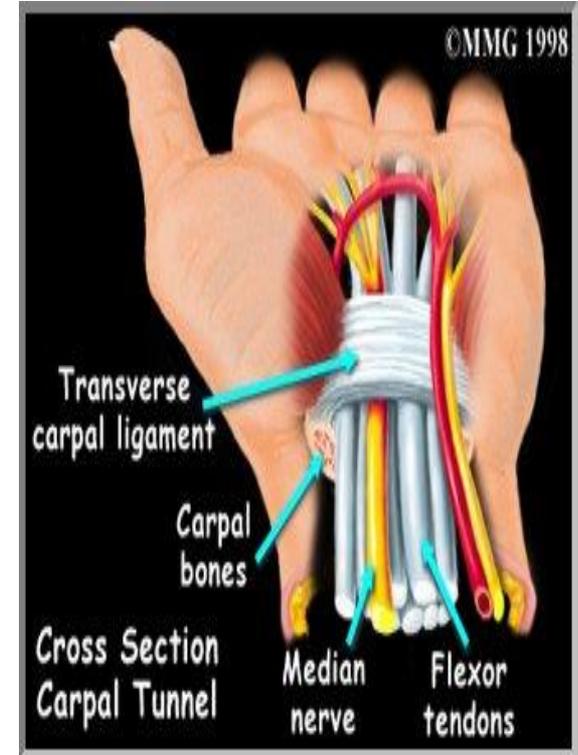


Anti vibration gloves

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Module 5

- ❑ Hands and wrist damage is a fast growing class or worker's compensation claims
- ❑ "Wrist injuries accounted for more than half of all MSDs
- ❑ 5 million U.S. workers suffer from repetitive stress injuries to the wrist
- ❑ Occurs when the median nerve is compressed and inflamed."

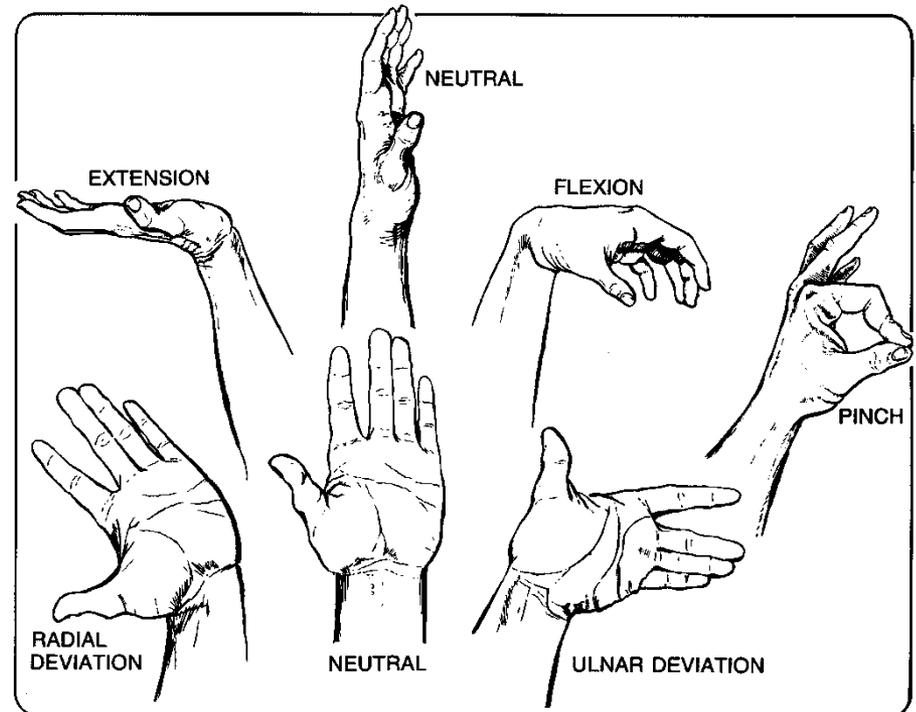


Preventing Musculoskeletal Injuries

Module 5

Carpel Tunnel Syndrome

- ❑ “Causes
 - ❑ Repetition
 - ❑ Sustained exertions
 - ❑ Awkward wrist and positions
- ❑ Symptoms
 - ❑ Tingling and pain in the hand and
 - ❑ Numbness in wrist
 - ❑ Muscle atrophy at base of thumb”



Preventing Musculoskeletal Injuries

Module 5

What Is “Ergonomics?”

**Fitting the job to the
Worker.**



Elevate the work to avoid kneeling and reaching
Photo Source CIANBRO

Preventing Musculoskeletal Injuries

Module 5

What is Ergonomics?

- ❑ “The science of adapting work-stations, tools, equipment, and job techniques to be compatible with human anatomy and physiology to reduce the risk of Musculoskeletal Disorder injuries due to Ergonomic Stressors.”
- ❑ “Fit the job to the person” rather than the “person to the job.”

Preventing Musculoskeletal Injuries

Module 5

Ergonomic Risk Factors

- Poor body mechanics
- Restrictive workstations
- Awkward postures
- Working overhead
- Working below the knees
- Hand tools that do not meet the requirements of the job



Photo source

<https://www.osha.gov/SLTC/etools/electricalcontractors/materials/heavy.html>

Source CIANBRO

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Module 5

What awkward postures do you work in?

- Risks from above shoulders and below the knees work



Workers kneeling during fabrication

Photo from CIANBRO

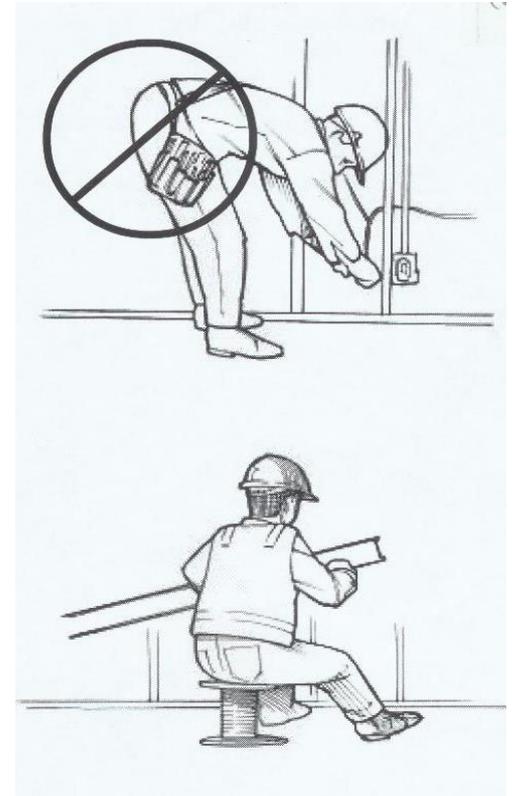
Preventing Musculoskeletal Injuries

Module 5

Ergo Tips-Reduce Bending Over to Work

Reduces the strain on your back from stooping

- ❑ Reduces leg fatigue from holding a squatting position
- ❑ Allows your feet to be flat on the floor with your ankles in their natural position instead of balancing on the balls of your feet and stretching the tendons at the backs of your ankles



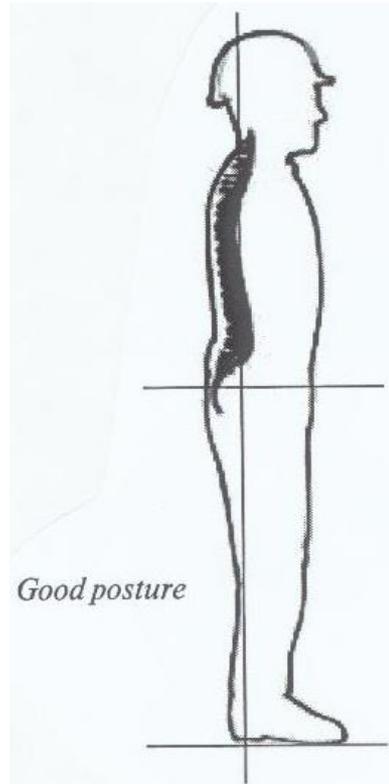
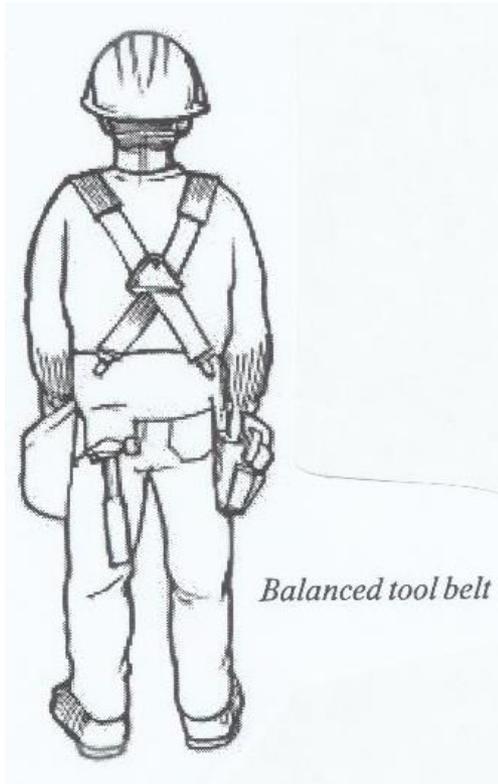
Source: CIANBRO

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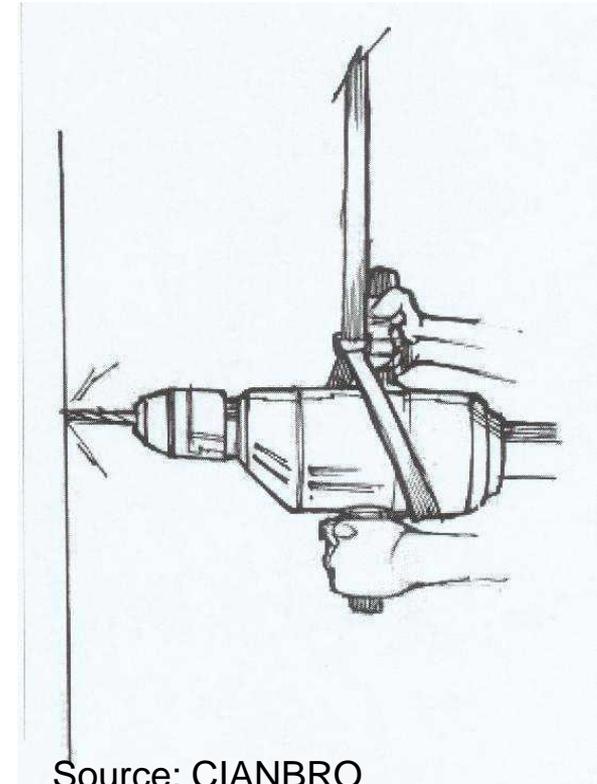
Module 5

Ergo Tips

Balanced Tool Belts



Suspending Tools



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Module 5

Ergo Tips

Mark loads over 50 lbs to warn workers of heavy loads

Marking lifting load



Photo from CIANBRO

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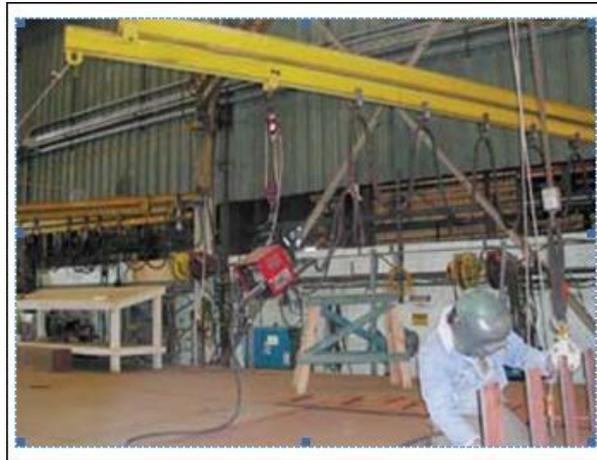
Ergo Tips

Use equipment such as hoist balancers, jib cranes, carts or forklifts to decrease the need for lifting, pushing and pulling loads.



Hand Cart

Photo from CIANBRO



Job Crane

Photo form OSHA 3341-03N 2008

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Module 5

Job Rotation

- ❑ “Job rotation is vital when conducting demanding repetitive tasks.
- ❑ When planning out the job keep in mind that good job rotations are those that have team members using different muscle groups between tasks or at the very least less demanding tasks”.

Preventing Musculoskeletal Injuries

Module 5

Early Reporting of MSD Symptoms

Addressing injuries early can help prevent them from becoming more serious.

Preventing Musculoskeletal Injuries

Module 5

Use of the General Duty clause

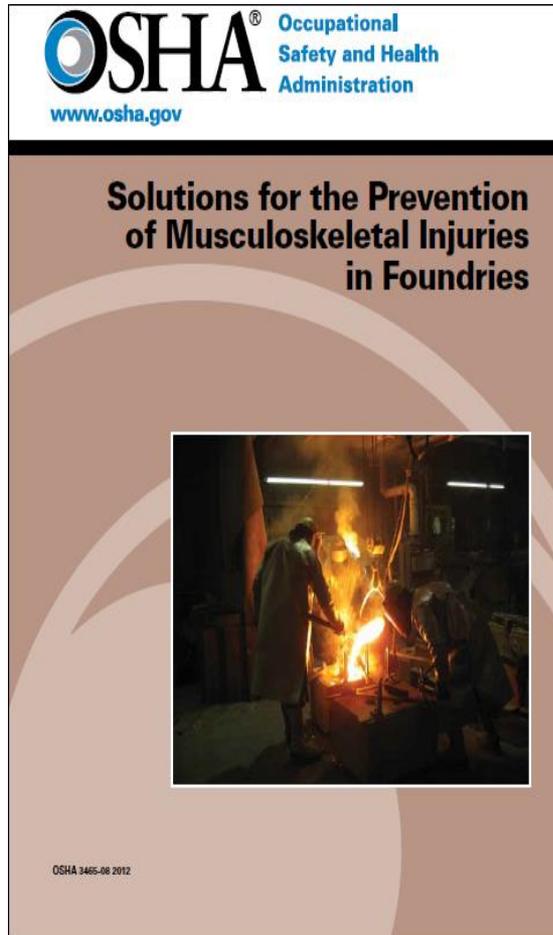
“OSHA will use the General Duty Clause to cite employers for ergonomic hazards. Under the OSH Act's General Duty Clause, employers must keep their workplaces free from recognized serious hazards, including ergonomic hazards. This requirement exists whether or not there are voluntary guidelines”

<https://www.osha.gov/SLTC/ergonomics/faqs.html>

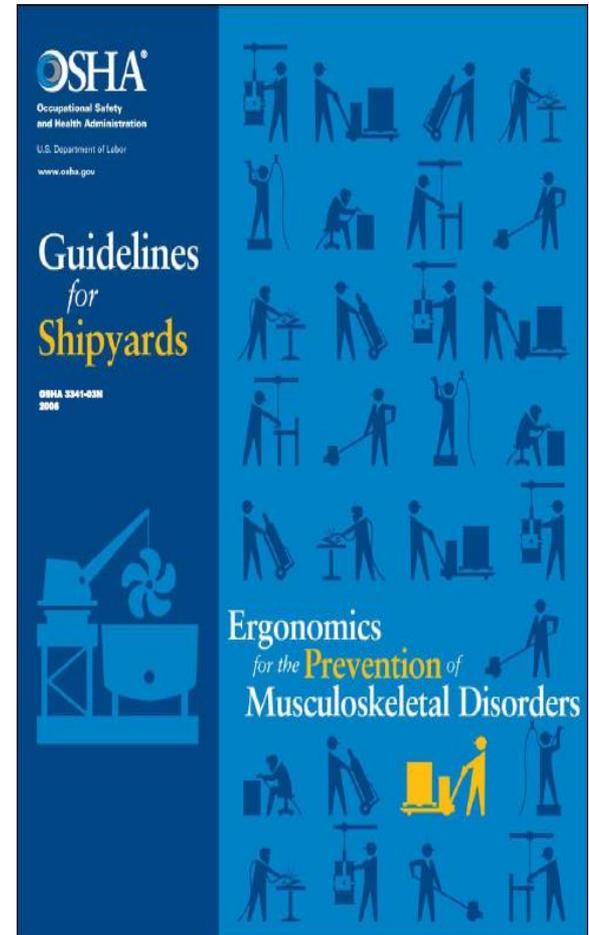
Preventing Musculoskeletal Injuries

Module 5

OSHA Publishes several useful guides for other industries that have parallels to steel fabrication companies and service centers.



OSHA 3465-08 2012



OSHA 3341-03N 2008

Preventing Musculoskeletal Injuries

Module 5

OSHA Resources

The screenshot displays the OSHA website interface. At the top, there is a red header with the OSHA logo, the text 'UNITED STATES DEPARTMENT OF LABOR', and a search bar. Below the header, there are navigation links for 'A to Z Index', 'Newsroom', 'Contact Us', 'FAQs', and 'About OSHA'. The main content area features a navigation menu with options like 'Home', 'Workers', 'Regulations', 'Enforcement', 'Data & Statistics', 'Training', 'Publications', 'Newsroom', 'Small Business', and 'Anti-Retaliation'. The central focus is the 'Ergonomics eTool: Solutions for Electrical Contractors' page, which includes a sidebar with a table of contents and a main content area with a list of ergonomic hazards. A small image of a hand holding a wire is also visible.

UNITED STATES DEPARTMENT OF LABOR

SEARCH

A to Z Index | Newsroom | Contact Us | FAQs | About OSHA

OSHA

SHARE | OSHA QuickTakes Newsletter | RSS Feeds

Occupational Safety & Health Administration We Can Help

What's New | Offices OSHA

Home Workers Regulations Enforcement Data & Statistics Training Publications Newsroom Small Business Anti-Retaliation

eTOOLS

eTools Home : Electrical Contractors Additional References | Glossary | Credits

Ergonomics eTool:
Solutions for Electrical Contractors

Materials Handling | Installation & Repair | Prefabrication | Supplemental Info.

- Materials Handling
- Installation & Repair
- Prefabrication
- Supplemental Info.
 - Tool Index
 - Hazard Index
 - Ergonomic Principles
 - Ergonomic Solutions

Supplemental Information: Hazard Index

Electricians may be exposed to the hazards listed below. These are common ergonomic hazards that occur in the construction trades.

- [Awkward postures](#)
- [Bending the elbow](#)
- [Bent wrist](#)
- [Contact stress](#)
- [Crouching and kneeling](#)
- [Lifting heavy loads](#)
- [Reaching](#)
- [Repetitive motion](#)
- [Static postures](#)
- [Temperature](#)
- [Twisted torso](#)
- [Vibration](#)

<https://www.osha.gov/SLTC/etools/electricalcontractors/supplemental/hazardindex.html#vibration>

Preventing Musculoskeletal Injuries

Module 5

Summary Key Points

- “Use your brain, not your back.
- Work smarter, not harder.
- Fix the job, not the worker.
- Use safe ergonomic habits at home”

Source: CIANBRO

Musculoskeletal Safety

Module 5

Sources

https://www.osha.gov/dte/grant_materials/fy06/46g6-ht22/back_injury_prevention.pdf

<https://www.osha.gov/SLTC/ergonomics/>

<https://www.osha.gov/SLTC/ergonomics/controlhazards.html>

<https://www.osha.gov/ergonomics/FAQs-external.html...>

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=SPEECHES

<https://www.osha.gov/Publications/osh3465.pdf>

https://www.osha.gov/dte/grant_materials/fy10/sh-20835-10/jeopardy_game.pdf

<https://www.osha.gov/dts/shib/shib072709.html>

<https://www.osha.gov/SLTC/etools/computerworkstations/more.html>

<https://www.osha.gov/SLTC/ergonomics/training.html>

http://www.osha.gov/SLTC/trucking_industry/

www.safetyservicescompany.com/.../warehouse-safety-general-guide. OSHA

CIANBROSafety Bulletin-Ergonomics

Grandjean E. "Fitting the task to the Man", Taylor & Francis London, 1988

Lauren Hebert, "Personal Ergonomic Guide material handling Low Back Tasks"

Construction Occupational Health Program, UMass

Musculoskeletal Safety

Module 5

Questions?



Photo from OSHA 3686-09 2010