Ergonomic Solutions in Construction

March 10th 2009

Presented by Construction Ergonomics Coalition Members
Yutonah Bowes, Oregon OSHA
Mark Noll, SAIF Corp.
Kim Rhodes, Emerick Construction
Chris Miller, AGC

Construction Ergonomics

- Introduction to ergonomics
- Risk factors of MSDs
- Solutions to minimize risk factors
- Q & A
- Resources

Oregon OSHA's Position

- Construction Ergonomics Coalition
- Current position
- Services offered
- What to expect in 2009

Introduction to Ergonomics

- Ergonomics (er'gõ nom'iks):
  - The study of work and the relationship of work to the physical and cognitive capabilities of people
  - Fitting the job (tools, tasks, and environment) to the employee, instead of forcing the worker to fit the job

Musculoskeletal Injury Chain

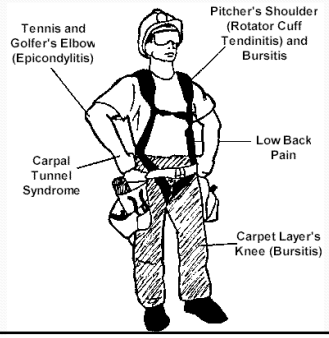
Fatigue	Evaluate job for hazards and make changes
Discomfort	Last chance to make changes
Pain	Injury very likely to follow without change
Injury	Damage may be permanent and result in loss of ability to work
Disability	

LERC 2008

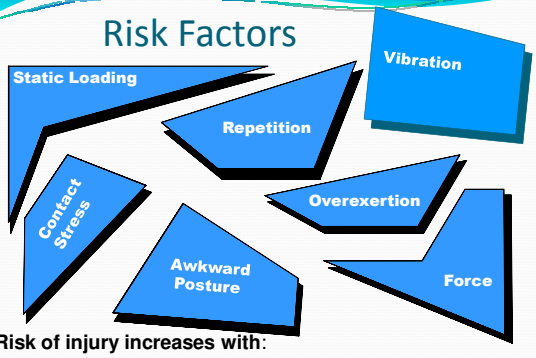
Musculoskeletal Injuries

- Acute Injuries
  - Occur immediately due to overload
  - Can become chronic
- Chronic Injuries
  - Ongoing pain due to injury or overload
  - Difficult to cure
- Cumulative Trauma
  - Occur over time with no obvious cause

Examples of Chronic Injuries



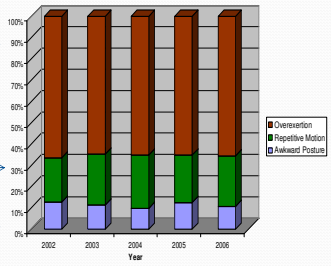
Risk Factors



Risk of injury increases with:
- Prolonged exposure to any of these ergonomic risk factors
- Presence of multiple risk factors within a single job task

Risk Factors in Construction

- Overexertion
- Repetitive Motion
- Awkward Postures



Overexertion

- Occurs when the work exceeds the limits of the person.
  - Weight
  - Duration
  - Frequency
  - Physical condition
  - Others?

Tips to Minimize Overexertion

- Use mechanical lift assists and carts when available
  - Avoid manually handling heavy objects (more than 35 pounds)
  - Avoid carrying objects more than 100 feet
- Practice Proper Cart Handling
  - Push instead of pulling
  - Use both hands when pushing
  - Stand directly behind the cart when pushing (avoid twisting your body)
  - Ensure cart is not overloaded

Tips To Minimize Overexertion

- If you must lift make sure to use proper lifting techniques
  - Examine the load and the surrounding area
  - Bend knees when lifting a load
  - Look forward to keep back straight
  - Position the load close to the body
  - Maintain a firm grip on the load
  - Use smooth, controlled movements
  - Keep arms in front of body
  - Turn feet in direction of movement to avoid twisting

Tips to Minimize Overexertion

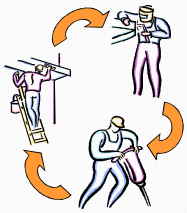
- Use powered tools for the task
  - Powered tools tend to require less exertion to perform a task
  - Ensure that the weight of a powered tool (and cording) does not create additional force issues
- Use only the amount of force necessary to complete the task

Repetitive Motion

- Requires motions to be performed repetitively by the same muscles, tendons, and joints.
  - Lack of recovery time
  - Increases fatigue of muscles
  - Also involves awkward positions

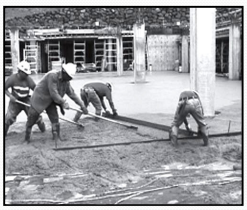
Tips to Minimize Repetition

- Use power tools when available
- Change tasks, stretch, or take a break from repetitive tasks
- Follow job rotation policies where applicable
- Effective job rotations work alternate muscle groups between successive job functions



Awkward Postures

- Requires the body to be in its extreme range of motion
  - Requires smaller muscles to do more work
  - Decreases blood flow
  - Increases muscle fatigue
  - Includes both extension and flex

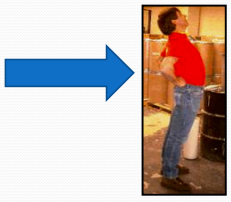


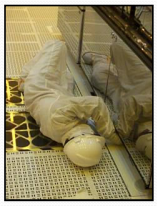
Tips to Minimize Awkward Posture

- Work near elbow height to avoid excessive bending
- Avoid overhead reaching
- Avoid kneeling when possible
- Utilize tool extensions

Tips to Minimize Awkward Postures

- When awkward postures are unavoidable change tasks, stretch, and take frequent short breaks





Tips to Minimize Awkward Posture

- Select the correct tool handle orientation based upon work surface height/orientation (when possible)

Pistol grip

In-line grip

Primary Use	Surface Orientation	Select this tool type
Above shoulder height	vertical surface	in-line grip
	horizontal surface	pistol grip
Between elbow and shoulder height	vertical surface	pistol grip
	horizontal surface	in-line grip
Below elbow height	vertical surface	in-line grip
	horizontal surface	pistol grip

Static Loading

- Occurs when muscles are engaged but your body is not moving

Tips to Avoid Static Loading

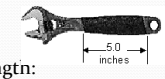
- Avoid prolonged awkward postures
- Change the position of the work or your body position to get as close as possible to the work area
- If prolonged awkward postures are unavoidable, use a "supported" posture to compensate

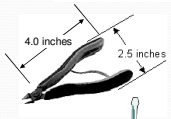
Contact Stress

- Pressure to your body that cuts off circulation or damages tissue
  - Sharp edges on tools
  - Tool handles that don't fit the worker
  - Bodily contact with work surfaces
  - Usually between elbow and finger tips
  - Standing or kneeling on hard surfaces or ladders
  - Shoes that don't support your body

Tips to Minimize Contact Stress

- Pistol grip & in-line tools:
  - Recommended handle length: 5.0 inches
  - Recommended handle diameter: 1.0 to 1.5 inches
- Pliers & crimping action tools:
  - Recommended handle length: 4.0 inches (minimum)
  - Recommended handle span: 2.5 inches
- Avoid handles that end in the palm of the hand





Tips to Minimize Contact Stress

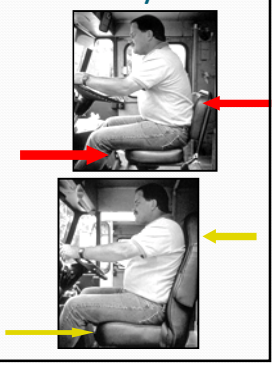
- Avoid pressure on palms, wrists, and elbows:
  - Use padding on hard or sharp surfaces
  - Change your position to eliminate the stress
- Avoid pressure on knees:
  - Avoid kneeling on hard surfaces for prolonged periods
  - Use knee pads when kneeling tasks are unavoidable

Vibration & Torque

- Whole body from heavy equipment
  - Shaking organs and back
  - Poor or worn out seats
  - Poor maintenance
- Hand/arm vibration from power tools
  - Reduced circulation
  - Damages tissue (blood vessels, nerves etc.)
  - Pneumatic tools (jack hammers, plate compactors)
  - Electric tools (drills, nailers, Sawsalls, sanders, grinders)
  - Increased with force

Tips to Minimize Whole Body Vibration

- Preventative maintenance
- Vehicle seat rotation program
- Air suspension seats
- Correct fit seat and adjustment



Tips to Minimize Hand / Arm Vibration

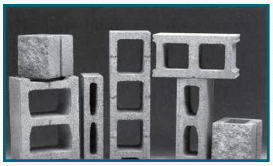
- **To lessen vibration:**
  - Pad tool handles with a soft compressible surface
  - Use vibration damping (gel filled) gloves
  - Select tools with built in damping systems like springs or hydraulics

- **To lessen torque reaction:**
  - Use electric tools as opposed to air driven tools
  - Use pulse tools or auto-shutoff tools

Planning Solutions

- Order Materials in Lighter Weight
  - Paint
  - Concrete
  - Light weight block
- Buy tools with ergonomics in mind
  - Lighter tools
  - Correct fit
  - Low vibration

Lightweight block is 30-40% lighter than standard book and just as strong!!



Training Solutions

- Include Ergonomics in Safety Talks
- Stretch & Flex program
- Training your workers in MSD risk factors & solutions

Employee Involvement Solutions

- Material moving
  - Use forklifts
  - Use two people
- Keep work at waist height
  - Use saw horses to bring work up
  - Forklifts to raise material
- Encourage short stretch breaks
- Maintain the site
  - Good housekeeping
  - Equipment maintenance
- Encourage reporting of ergonomic issues and symptoms

Your Solutions?

Resources

- Handouts
  - 10 improvements for no money
  - The construction Forman's guide to success
  - Cal OSHA's Ergonomic Survival Guide
  - Daily pre-planning
- NIOSH Simple Solutions Publication
- Presentation on CD
- Power Point handouts

NIOSH Case Studies

- Rebar-Tying Tools (Simple Solutions pg. 27)
  - Risk factors
  - Solutions
  - Costs

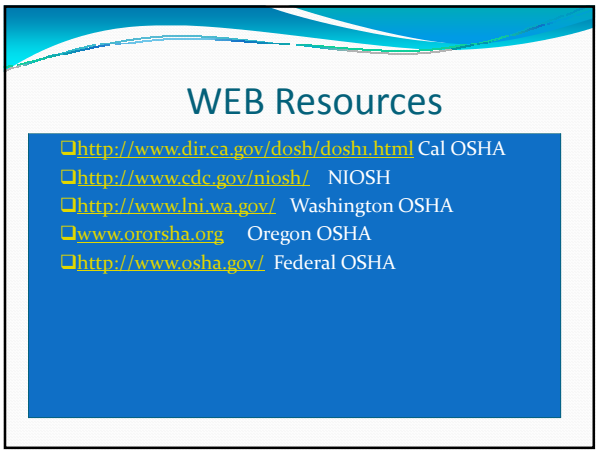
NIOSH Case Studies

- Solutions for Hand-Intensive Work (pg 57)
  - Risk factors
  - Solutions
  - Costs

NIOSH Case Studies

- Solutions for Overhead Work (pg 33)
  - Risk factors
  - Solutions
  - Costs

Questions?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