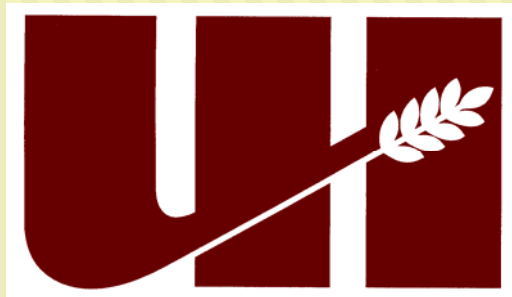


# Ergonomics: A look at the back

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**Presented By: Kim  
Senglaub OTR CHT**



# Occupational Low Back Pain

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- 8 out of 10 people will experience back pain sometime in their lifetime.
- Accounts for the largest single type of work related injury
- Accounts for 30 to 40% of all work comp costs
- The average cost of a low back injury claim for United Heartland is \$2500



# Statistics

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- 45% of employees with a back injury will have a reoccurrence
- 58% with in the first year
- 1 out of 5 will have second episode within 3 months
- What can we conclude?

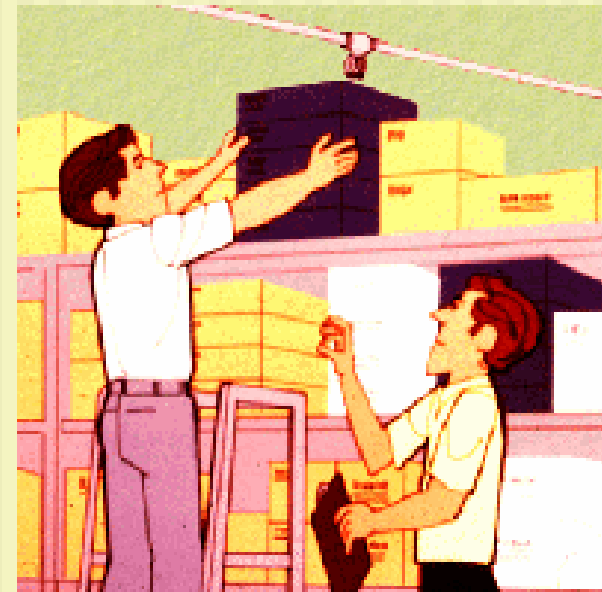


# Occupational Low Back Pain

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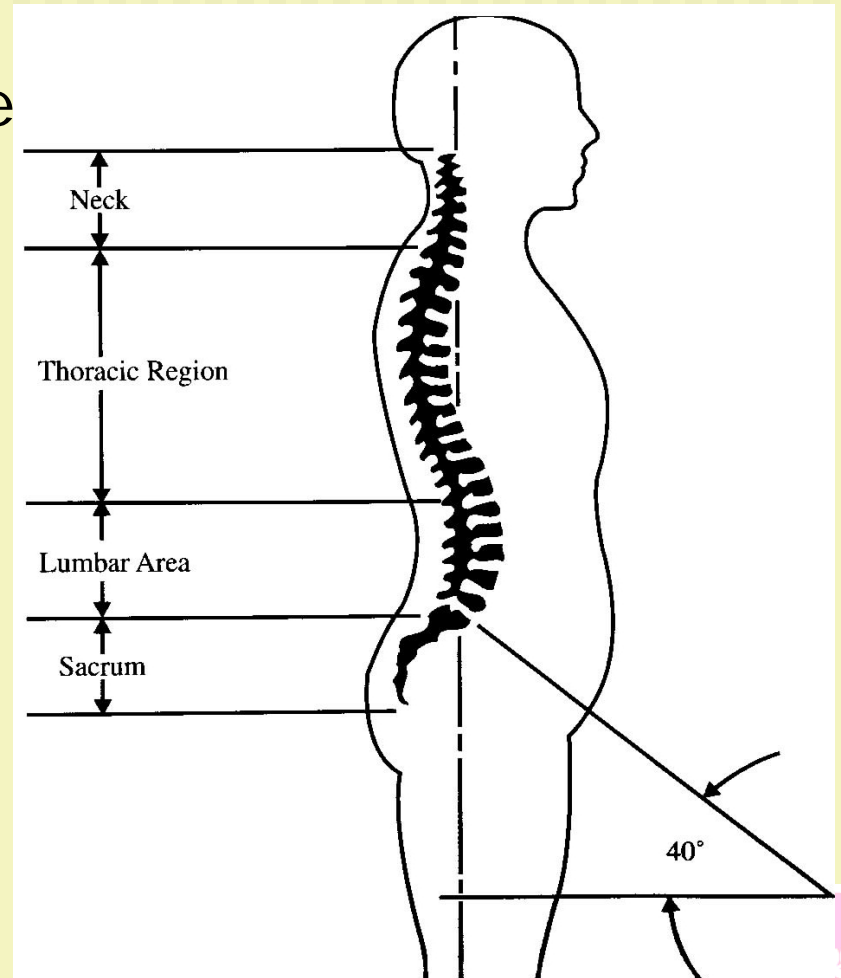
## Characteristics of Low Back Pain - Multiple occupational & non-occupational risk factors

- Heavy physical work
- Bio-mechanically stressful postures
- Whole body vibration
- Direct Trauma
- Age
- Gender
- Congenital abnormalities



# The Back

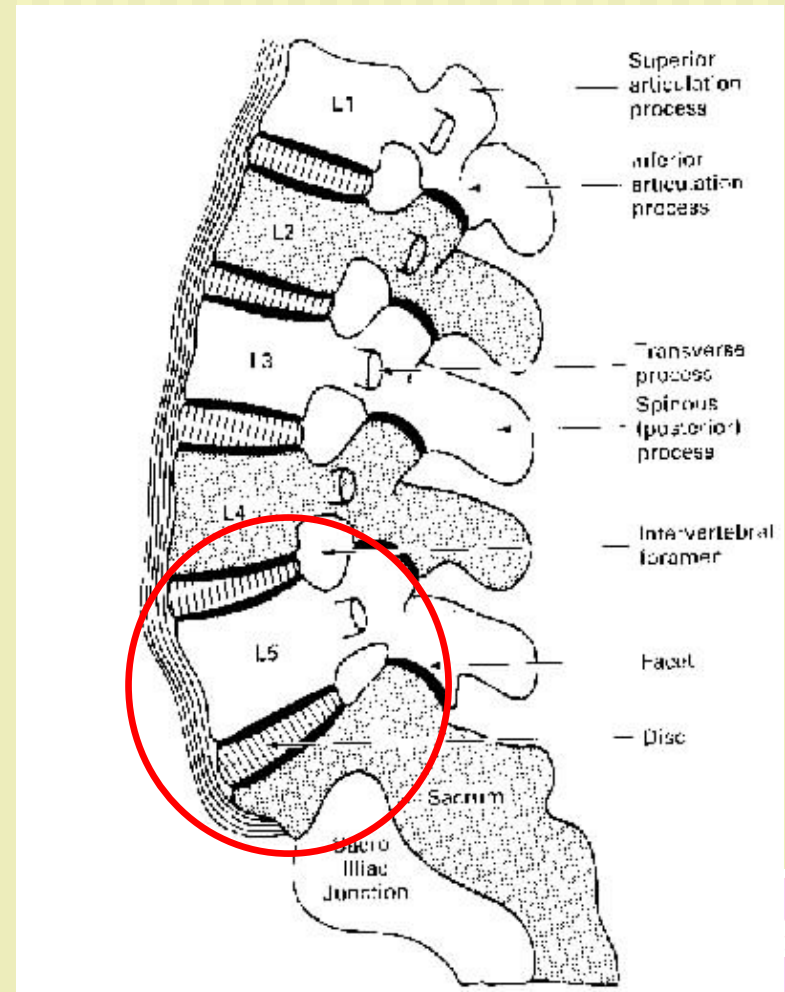
- 24 movable vertebrae
  - 4 main regions
- Vertebrae have opening where spinal cord runs through
- Vertebrae bones are separated by softer tissue called vertebrae disks



(Taken from: Methods Standards & Work Design 10<sup>th</sup> Edt. 1999)

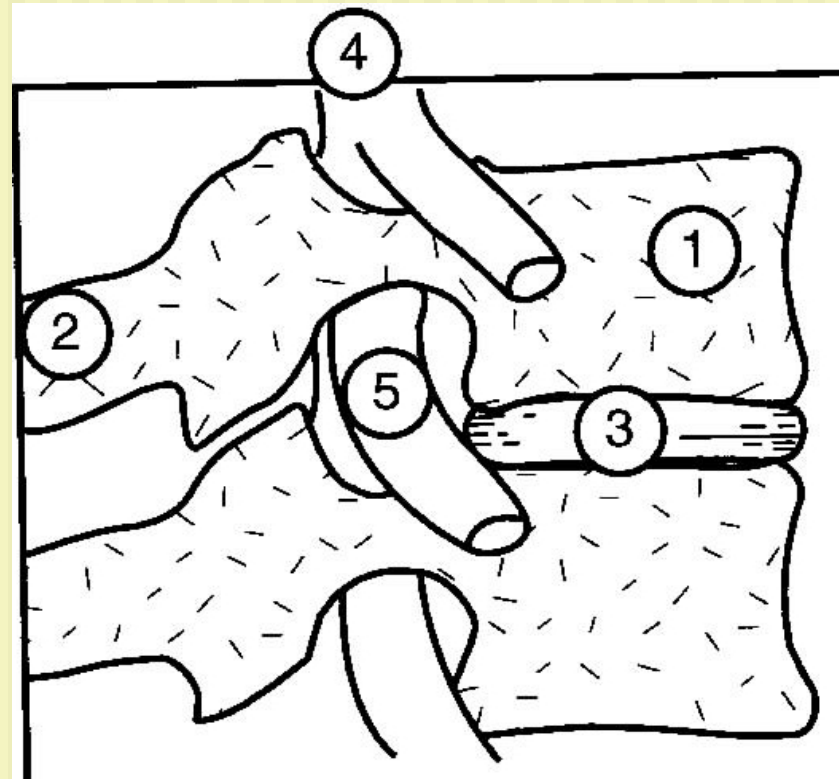
# Lower Back

- L5 S1 most worried about
- Has the most pressure applied
- NIOSH has found:
  - L5-S1 has an action limit of 770 lb

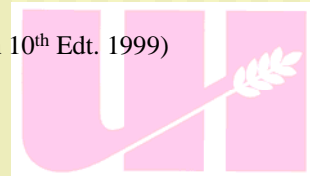


# Vertebrae Disks

- Allow for large range of motion
- Acts as a cushion
  - Protects head and brain from jarring impacts of walking, running, etc.
- Composed of gel-like centers surrounded by fibers
- When disks compress you can change in height up to one inch during the day



(Taken from: Methods Standards & Work Design 10<sup>th</sup> Edt. 1999)



# Types of Back Injury

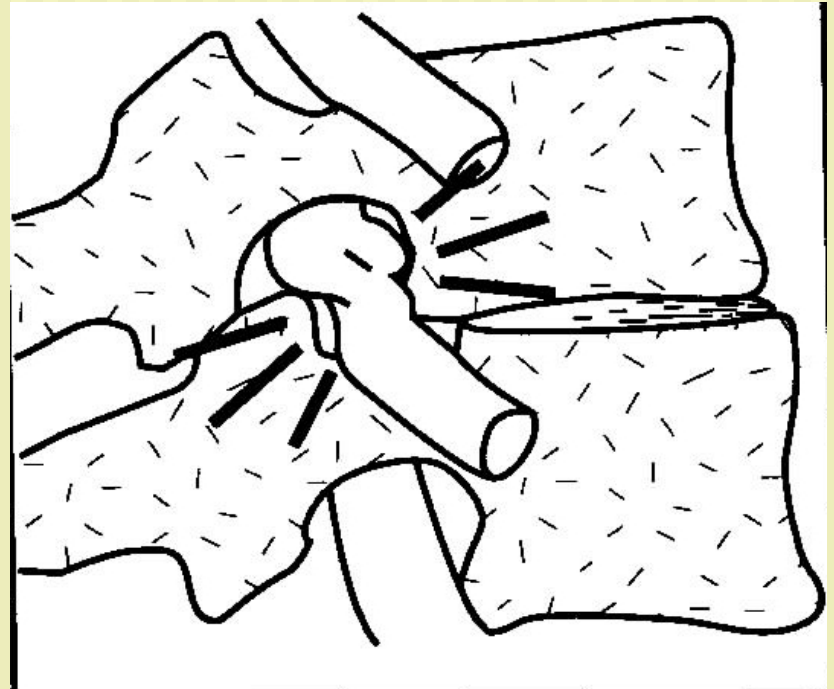
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- Pinched Nerves
- Disk Herniation (Slipped Disk)
- Soft Tissue Injuries
  - Involving: Ligaments, Muscles, and Tendons
  - These are the most common

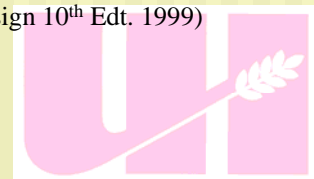


# Pinched Nerves

- Occurs when vertebral disks compress
- Causes
  - Over use
  - Aging
  - Cumulative Traumas
  - Micro-fractures allowed fluid to leak out causing disk dehydration



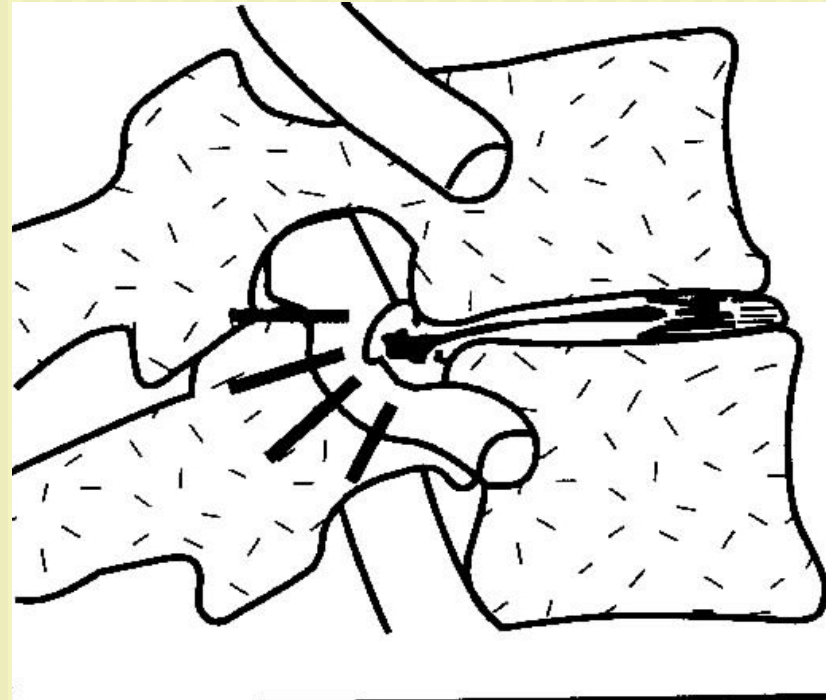
(Taken from: Methods Standards & Work Design 10<sup>th</sup> Edt. 1999)



# Disk Herniation

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- Caused when vertebral disk ruptures allowing gel material to protrude and impinge upon the nerve root



(Taken from: Methods Standards & Work Design 10<sup>th</sup> Edt. 1999)



# Soft Tissue Injuries

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- Involves
  - Pulled Tendons
  - Swollen Ligaments
  - Overworked or strained muscles
- Most common
- Normally associated with manual work
- Probably recede over the course of several days with rest



# Common Causes of Back Stress/Strain

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- Heavy Physical Work Associated with Manual Material Handling
  - Lifting/Lowering
  - Pushing/Pulling
  - Twisting
- Holding Static Postures
- Awkward Movements



# Risk Factors

- Repetition
- Force
- Positioning/posture
- Vibration
- Environmental
- Duration (time)
- Contact Stressors



# Repetition and Force

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- Repetition
  - Doing the same type of task over and over again
- Force
  - More Weight , More Force
  - Distance increases force
  - Pushing vs. Pulling



# Positioning/Posture

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- Twisting
  - Amount of force on spine increases dramatically with every degree you twist
- Bending forward and backward adds stress to back
- Static Postures



# Overuse

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- Muscles starts to fatigue
  - Might give out
  - Less strength
- Vertebrae disks start to compress
  - Outside layers weaken
  - Fluid may leak out



# Vibration

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- Jars back
- Fatigues muscles
  - Tense muscles to help control vibration



# Environment and Duration

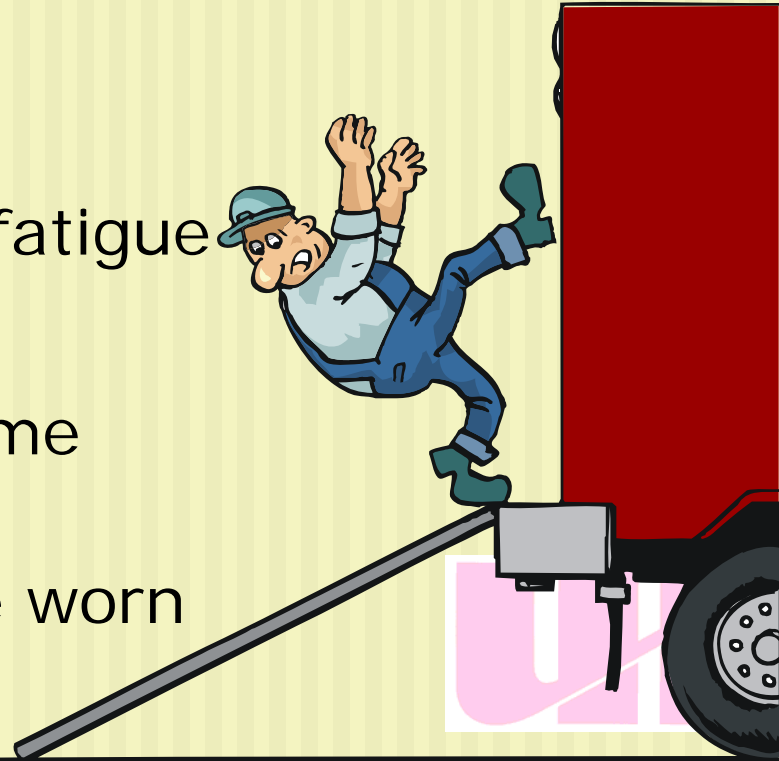
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## ■ Environment

- Cold weather can cause stiff muscles
  - More cloths needed
  - May be slippery
- Hot weather can cause fatigue

## ■ Duration

- Overtime muscles become fatigued
- Vertebrae disks become worn



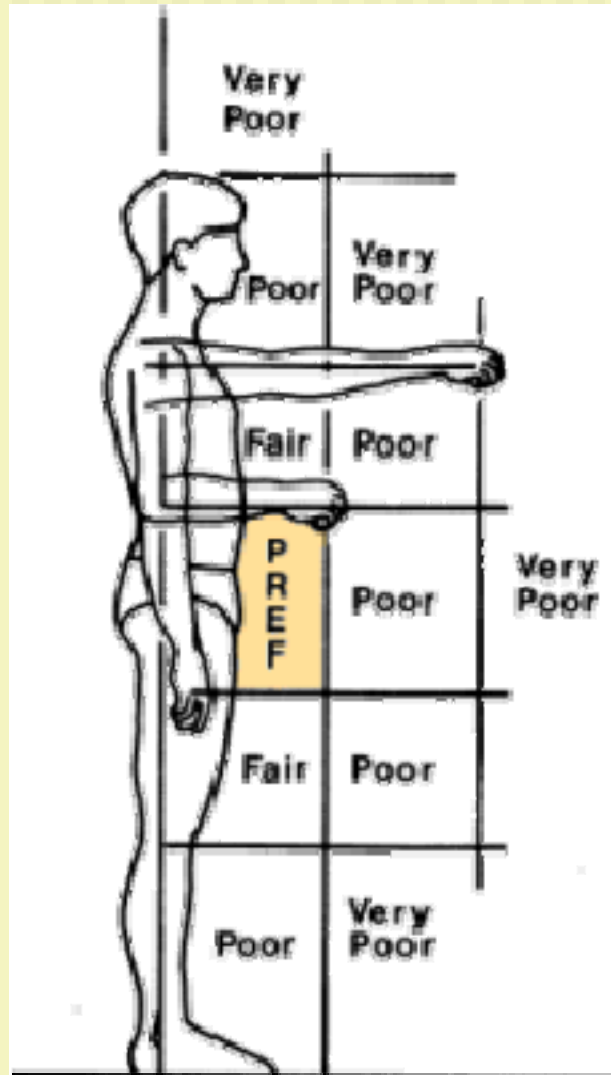
# How to Reduce Exposure

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- Engineering Controls
- Administrative Controls
- Personal Protective Equipment



# Safe Work Zone



# Design Principles for Lift/Lowering Task

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- Reduce Weight
  - Reduce hand distance from the body
  - Use smaller containers
  - Use containers with handles
- Increase Weight
  - Make it impossible to lift
  - Utilize mechanical devices
    - Hand trucks, 4-wheel carts



# Body Mechanics for Lifting

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- Body Mechanics alone will not prevent injury
- What is the proper position for lifting?



# RULES TO LIFT BY



- DO NOT OVEREXERT, GET A FEEL FOR THE LOAD BY TURNING IT, TILTING IT, ETC.



# RULES TO LIFT BY



- STAND AS CLOSE TO THE LOAD AS POSSIBLE WITH YOUR LEGS SLIGHTLY APART



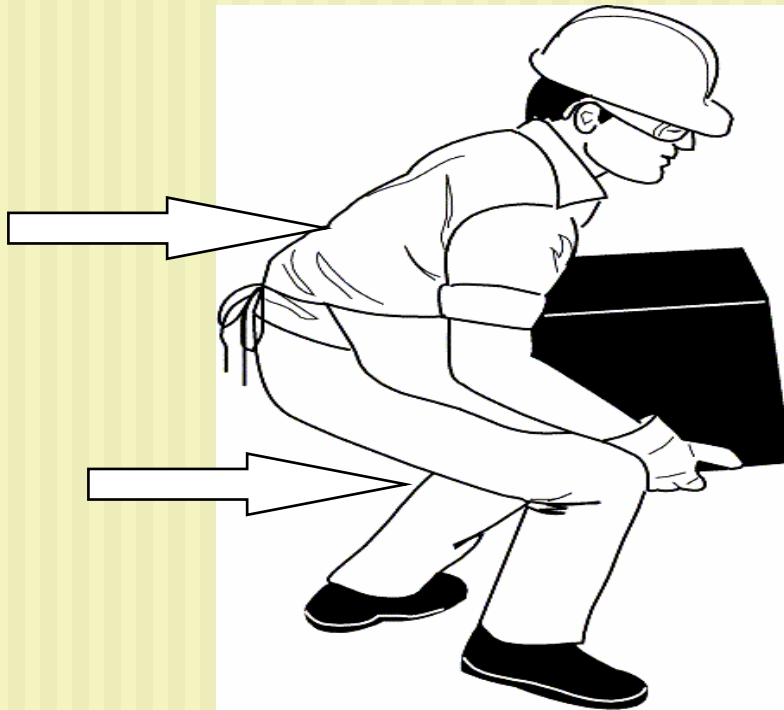
- BEND YOUR KNEES AS FAR AS COMFORTABLE



# RULES TO LIFT BY

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- USE THE MUSCLES OF YOUR LEGS, YOUR STOMACH, AND YOUR BACK



# RULES TO LIFT BY



- LIFT THE OBJECT SLOWLY AND STEADILY. DO NOT JERK OR SPEED UP. KEEP LOAD CLOSE TO THE BODY



# RULES TO LIFT BY



- CARRY THE OBJECT AGAINST YOUR THIGHS OR ABDOMEN.
- KEEP THE LOAD CLOSE TO THE BODY



# RULES TO LIFT BY

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- LOWER THE LOAD BY BENDING YOUR KNEES AND BACK
- LOWER THE LOAD SLOWLY AND STEADILY



# RULES TO LIFT BY

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## *Overview*

- Plant your feet firmly, get a stable base
- Bend at your knees - not your waist
- Tighten your abdominal muscles to support your spine
- Get a good grip, use both hands
- Keep the load close to your body.
- Use your leg muscles as you lift
- Keep you back upright, keep it in its natural posture
- Lift steadily and smoothly without jerking



# RULES TO LIFT BY

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## DO NOT

- Lift from the floor
- Twist and lift
- Lift with one hand (unbalanced)
- Lift loads across obstacles



# RULES TO LIFT BY

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## DO NOT

- Lift while reaching or stretching
- Lift from an uncomfortable posture
- Fight to recover a dropped object



# Lifting

- Use a partner
- Keep load close to you
- Use a cart to reduce distance the load has to be carried



# Design Principles for Push/Pulling Tasks

- Reduce the force required
  - Using dollies, reducing weight
- Replace a pull with a push when possible
- Use ramps with a slope of less than 10%



# Pushing/Pulling

- Larger wheels
- Use your body weight to initiate motion
- Keep cart in motion-  
initial force to move  
greater than constant
- Don't turn while  
moving forward
- Turn with the cart



# Back Belts

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- NIOSH found no evidence supporting their use
- Feel they give false sense of security
- Can put extra pressure on abdomen and back if not worn correctly
- Does not reduce stress caused by twisting



# Summary

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- Keep Work in the “Safe Work Zone”
- Think About Positioning
- Reduce Weights
- Limit Carrying Distance



*Thank You*

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Any Questions?

**References:**

Human Factors in Engineering and Design 7<sup>th</sup> ed. 1993.

Ergonomics: How to design for ease and efficiency 2<sup>nd</sup> ed. 2001.

Methods, Standards, & Work Design 10<sup>th</sup> ed. 1999

