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Chapter of the National Safety Council

Drive SAFE Work SAFE Live SAFE

# HHW Refresher 2020

Helping Make Life Safer

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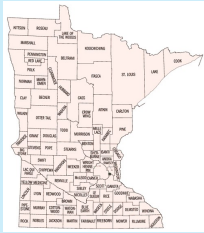
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## Introduction

- Your name and job title
- How long have you worked for HHW
- What you hope to gain from today's program



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## Course Goals

- Improve knowledge of the basic hazard and risk assessment techniques.
- Improve knowledge of the basis risk management techniques
- Engage in learning and problem solving
- Determine how to select and use appropriate personal protective equipment
- Reinforce safe work practices, PPE, significance of site-specific safety and health plan

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On a good day

The Job Gets Done  
And  
No One Gets Hurt

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The Nature of What We Do

- Hazard vs Risk
- A Hazard is an intrinsic property of a material or a process.
- Risk is the likelihood that the negative event associated with that hazard will occur.
- We assess hazards
- We assess and manage risks

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Hazard vs Risk



HAZARD AND RISK - SAME DIFFERENCE?

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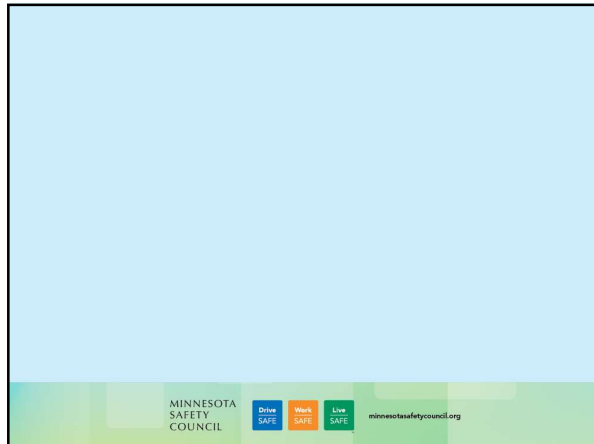
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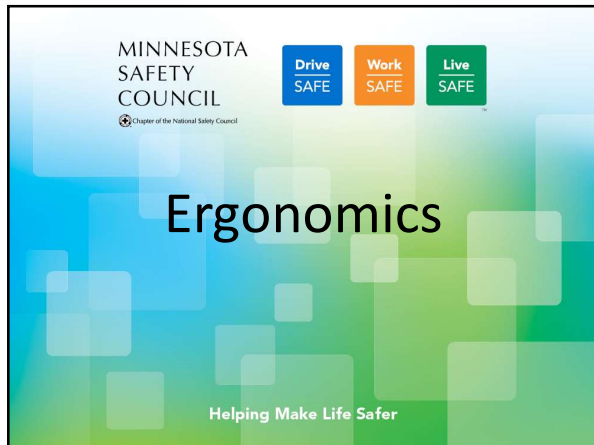
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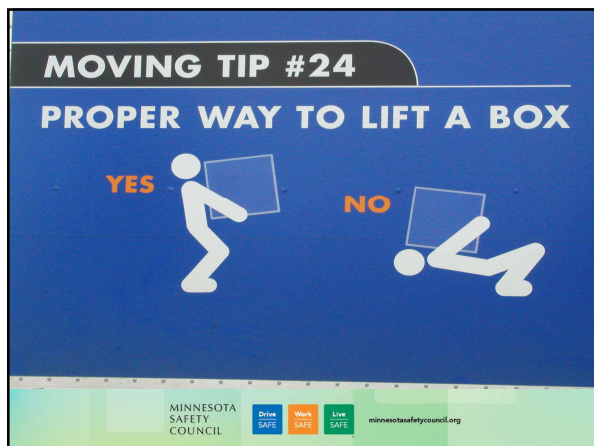
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## Ergonomics

A way to work smarter by designing tools, equipment, workstations and tasks to fit the job to the worker

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## Ergonomics

- Where is it an issue?
- How do you recognize an ergonomic risk?
- How do you manage and ergonomic risk?



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## THE SPINE'S BASIC FUNCTIONS

- Providing Support
- Protecting the Spinal Cord
- Providing Flexibility to Allow Bending and Rotating

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## Natural Position of the Spine

- The spine has *normal curves*, which means the discs within the spine are in normal compression and the muscles are in their strongest positions.

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## Three Curves Of The Back

- Cervical — at the neck
- Thoracic — at the mid-back
- Lumbar — at the lower back



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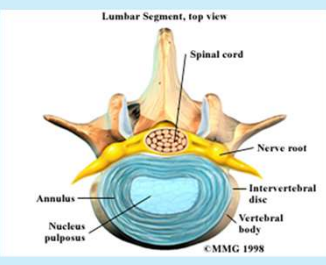
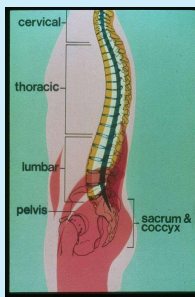
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## Spinal Anatomy



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### Risk Factors in Ergonomics

- How close is the load?
- Origin and destination?
- Frequency and duration?
- Hand holds?
- Twisting and/or lateral bending?

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### Additional Risk Factors

- Footing?
- Confined space?
- Acceleration?
- Rhythm?
- Unexpected interruptions?
- ?????



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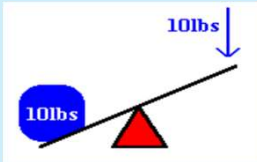
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### The Forces Involved

The amount of force you place on your back in lifting may surprise you!  
Think of your back as a lever.

With the fulcrum in the center, it only takes ten pounds of pressure to lift a ten pound object.



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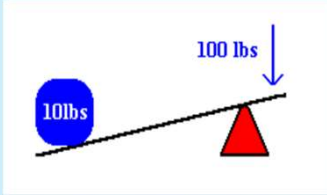
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### The Forces Involved

If you shift the fulcrum to one side, it takes much more force to lift the same object. Your waist acts like the fulcrum in a lever system, on a 10:1 ratio.

Lifting a ten pound object puts 100 pounds of pressure on your lower back.



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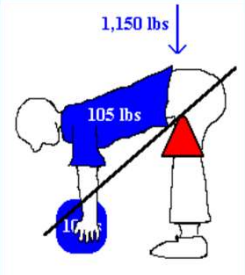
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### The Forces Involved

When you add in 105 pounds for the average human upper torso, you see that lifting a ten pound object actually puts 1,150 pounds of pressure on the lower back.



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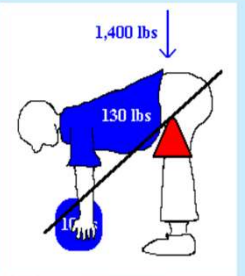
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### The Forces Involved

If you were 25 pounds overweight, it would add an additional 250 pounds of pressure on your back every time you bend over.



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### Result Of Poor Posture/Awkward Position

- The compression on the discs becomes uneven and the muscles are in weaker positions, which can increase the risk of back injury.



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### Twisting

- Twisting the weight of your upper body, combined with the weight of what you're lifting, increases the amount of pressure on your back by 4 times.

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### Lifting Stress



Heavy loads or loads held away from the body put great stress on the lower back

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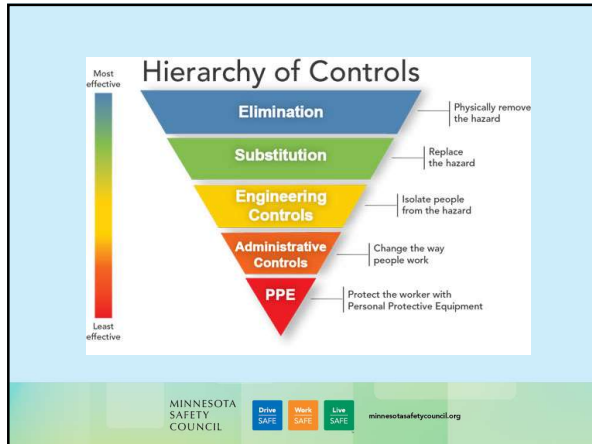
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### Engineering Controls

- Consider lift-assist devices and height adjustable work benches
- Use carts, hand trucks, hoists, conveyors or other mechanical assistance
- Provide well located handles



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### Administrative Controls

- Workplace policy, procedures, and practices that minimize the exposure of workers to risk conditions.
- Train employees in proper lift technique and
- Rotate workers who do the lifting
- Encourage participation in a stretching and strengthening program

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### *Work Practices*

- Plan the lift
- Store heavy items where you won't have to bend or reach to lift them
- Create 2-person lifts
- Maintain freedom of movement in work area

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### *Twisting*

- To avoid twisting:
  - Take a wide stance.
  - Pivot with your feet.
  - Keep your shoulders and hips in alignment.

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### *Alternatives to Lifting*

- Use carts, hand trucks, hoists, conveyors or other mechanical assistance
- Slide objects instead of lifting them when you can
- Store heavy items where you won't have to bend or reach to lift them



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### Guidelines for Safe MMH

- Preserve the Curves
- Keep it Close
- Lock and Lift
- Build a Bridge



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### Principles Of Good Body Mechanics

- Keep the load close to your body while lifting.
- Keep the natural curves in your back.

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### Maintain Neutral Posture

- Postures where the body is aligned and balanced.
- Neutral postures minimize the stress applied to muscles, tendons, nerves and bones and allows for maximum control and force production.

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### Keeping the Natural Curves

- Equalizes the pressure on the discs in your lower back.
- Places back muscles, bones and ligaments in their strongest and most efficient range.
- Result: Less chance of a back injury.

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### Work in the Power Zone

- The power zone for lifting is close to the body, between mid-thigh and mid-chest height.
- Working from the power zone ensures that you are working from proper heights and reaches.

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## Reduce Excessive Motions

- A job is considered highly repetitive if the cycle time is 30 seconds or less.

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## REDUCE EXCESSIVE FORCE

- Using mechanical assists, counterbalance systems, adjustable height lift tables and workstations, powered equipment and ergonomic tools will reduce work effort and muscle exertions.

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## Proper Lifting – Diagonal Lift

- Test the load and plan the move.
- Use a wide, balanced stance.
- Keep back in its normal, upright, arched position.
- Keep the load close.
- Bend the knees.
- Keep head & shoulders up.
- Tighten abs.
- Lift with legs.
- Don't twist. Pivot with feet.
- Communicate



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### Ergonomic Control Methods

- Lifting - **solutions**
  - Use proper lifting techniques

**Caution: This technique may be effective only if loads are small, light-weight, and can easily fit between the knees.**

Keep the load close to your body and lift by pushing up with your legs.

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### Ergonomic Control Methods

- Lifting - **solutions**
  - Use proper lifting techniques

Lean the sack onto your kneeling leg. Slide the sack up onto your kneeling leg. Slide the sack onto the other leg while keeping the sack close to your body. As you stand up, keep the sack close to your body.

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### Keeping The Load Close

- Anything held away from your body is 7-10 times heavier to lift than anything held close. This means that the pressure on your back is also 7-10 times greater.
- Keeping the load close reduces the amount of force needed to lift, which also reduces the pressure on your spine.

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Factors For Safe Lifting And Moving Of Materials

- Weight of load
- Size of load
- Shape of load
- Amount of space to work in

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The Most Difficult Lift

- A lift from the floor and through the first 6 inches

Make this lift easier on your back by:

- Getting down on one knee
- Hoisting the object to your knee and getting it close to your body
- Keeping the natural curve of your back, looking up and then lifting

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Think before you LIFT!

- Assess the Situation
  - Is the Load Big, Bulky, Heavy?
  - Do You Need Help?
- Remember- No Single Technique Will Work in All Circumstances

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### THE SAFE LIFTING ZONE

- Between the Knees and Shoulders
- Below Knee Level?
  - Bend With Your Knees and Lift With Your Legs
- Above Your Shoulders?
  - Use a Step Stool or Ladder

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### Evaluating Push/Pull Tasks

- Hand height (mid-thigh/waist/shoulder)
- Initial and sustained force requirements
- How often is push/pull task performed
- Posture (static/repetitive motion)
- Wrist position (rotation/extension/flexion)

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### PUSH-- DON'T PULL

Can you slide it instead of lifting it?

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**Do you need equipment to help move it?**

**Use Proper Equipment**

- Hand Trucks
- Forklifts
- Dollies

**Readjust the Load or Your Position Before You Lift**

-- Get Help!

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**PREPARING TO LIFT OR MOVE**

- Have You Stretched Your Muscles or Warmed up Before Lifting?
- Are You Wearing Slip Resistant Shoes?
- Have You Cleared a Pathway Before You Move the Item?

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**WHEN YOU LIFT**

Do

- 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

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**WHEN YOU LIFT**

Do

- Keep the Load Close to Your Body
- Use Your Leg Muscles As You Lift
- Keep Your Back Upright, Keep It in Its Natural Posture
- Lift Steadily and Smoothly Without Jerking

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**WHEN YOU LIFT**

Do Not

- Lift From the Floor
- Twist and Lift
- Lift With One Hand (Unbalanced)
- Lift Loads Across Obstacles

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**WHEN YOU LIFT**

Do Not

- Lift While Reaching or Stretching
- Lift From an Uncomfortable Posture
- Try to Recover a Dropped Object

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### Lifting: common mistakes

- Back bent forward & legs straight
- Using fast, jerking motions.
- Bending & twisting
- Load too far away
- Insufficient strength
- Poor planning
- Poor communication

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### Avoiding Overreaching

- Slide the object
- Straddle the corner so your knees are out of the way
- Use your whole hand to get a good grip, not just your fingertips
- Look up and lift

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### Bridging

- Using a fixed object or placing your hand on your knee to provide support when lifting.
- In some situations, bridge against something for support, slide the object toward you and then lift.

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### Putting An Object Down

- Keep the object close to your body.
- Keep your shoulders aligned over your hips.

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### Safely Moving Materials Off a Pallet or Stack

- Work off the corners.
- Extend one foot slightly.
- Either lift or lower the object between your knees.

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### Heavy Loads

- Always check the weight of the load before lifting.
- Ask for help when you need it.

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**Evaluate possible improvements options...**

- Reduce / eliminate risks
  - what new risk factors were introduced
- Costs involved...
- Affect on efficiency & productivity
- Temporary or permanent fix
- Accepted by employees (improved morale)
- Able to fully implement in a timely manner
- Affect the rate of pay or any collective bargaining agreements

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**Evaluate new equipment options... will the equipment:**

- Reach far enough to cover work
- Handle the weight...
- Re-orientate the load as needed
- Be easy to load/unload
- Require much force or energy to operate
- Handle the load in a controlled manner
- Allow an adequate field of view
- Slow workers down much
- Interfere with existing equipment
- Need additional power supply

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**Manual material handling solutions**

- Eliminate need to lift.
- Keep material off floor.
- Keep material below shoulder.
- Keep material close to body.
- Reduce weight of lifted packages.

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## Manual material handling solutions

- Reduce size.
- Provide handles.
- Use mechanical assists.
- Eliminate twisting & awkward positions.

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## REMEMBER!

### USE PROPER LIFTING TECHNIQUES WHEN LIFTING

Your Workday Is One Third of Your Total Day  
Plan Your Tasks Carefully to Avoid a Painful Back  
Managing Your Back Is Your Responsibility

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## Summing it up...

Keep your spine balanced in a neutral position  
Eat nutritiously  
Exercise  
Warm up before physical activity  
Practice proven lifting techniques

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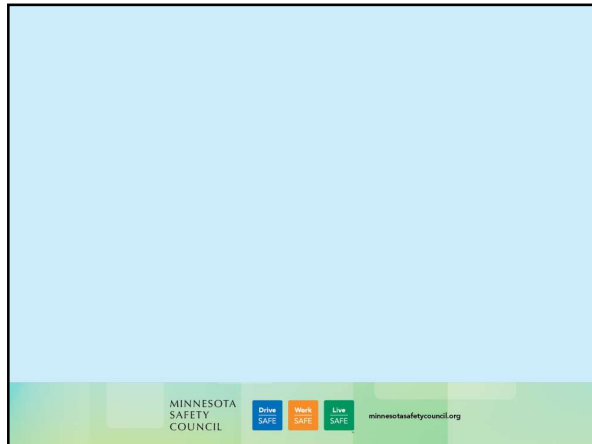
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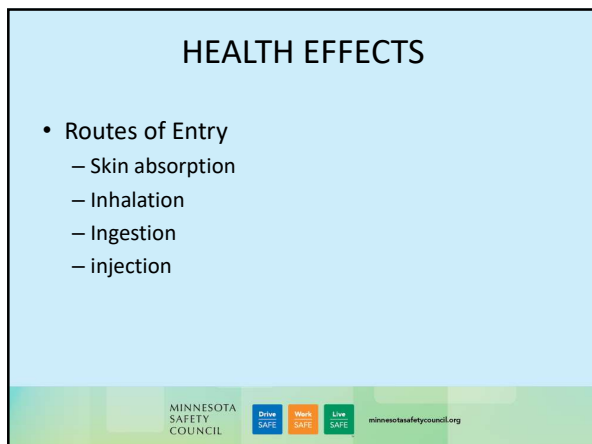
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## Skin Absorption

- Actually moves through intact skin
  - Some Solvents
  - Some Pharmaceuticals

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## Inhalation

**Skin**  
20 Square Feet

**Lungs**  
300 Square Feet at Rest  
1000 Square Feet at Inspiration

\* In the course of a moderate work day a person breathes about 300 cubic feet of air

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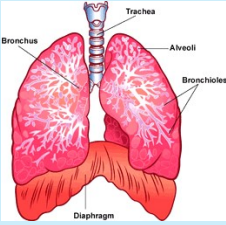
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## Inhalation

- Target organ is respiratory tract
- Or
- Contaminant passed through the lungs, into the blood stream, and toward a target organ
  - Gases, Vapors, Aerosols



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## Ingestion

- Personal hygiene factors to consider
- Occasionally intentional, sometimes not

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## Injection

- Through a cut or tear in skin
  - More than solvents

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## Two Types of Exposures

- Acute 
- Chronic 

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### Acute Health Effects

- Typical Exposure over a short period of time
- When the exposure goes away, so does the health effect
- Typically involves a relatively higher concentration

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### Chronic Health Effects

- Typical Exposure over a long period of time - months or years
- The health effect outlasts the exposure
- Typically involves a relatively lower concentration

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### Local Health Effects

- Happen at point of contact
  - Irritation
  - Chemical Burns
  - Lung Damage

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## Systemic Health Effects

- Exposure of chemical targets specific organs
  - In general, solvents target skin (local effect) and also liver (systemic effect).





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## Dose Response

- The higher the dose, The more the response
  - Body Weight
  - Gender
  - Physical Condition
  - Personal Habits
  - Heredity
  - Age
  - Heath Status





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## Atmospheric Hazards

<p><b><u>Oxygen</u></b></p> <ul style="list-style-type: none"> <li>• Deficiency – Less than 19.5 %</li> <li>• Enrichment – More than 23.5%</li> </ul> <p><b><u>Hydrogen Sulfide</u></b></p> <ul style="list-style-type: none"> <li>• Toxic, PEL 10 ppm</li> </ul>	<p>• <b><u>Carbon Monoxide</u></b></p> <ul style="list-style-type: none"> <li>• Asphyxiant, PEL 35 ppm</li> </ul> <p>• <b><u>Flammable Gas</u></b></p> <ul style="list-style-type: none"> <li>• 10 percent Lower Explosive Limit (LEL)</li> <li>• Methane gas</li> </ul>
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## Carbon Monoxide (CO)

- Byproduct of combustion
- No odor
- No color
- No taste
- Evenly Distributed
- Sometimes no symptoms





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## Carbon Monoxide

- Odorless, Colorless Gas
- Combustion By-Product
- Quickly collapse at high concentrations

PPM	Effect	Time
35	Permissible Exposure Level	8 Hours
200	Slight headache, discomfort	3 Hours
600	Headache, discomfort	1 Hour
1000-2000	Confusion, nausea, headache	2 Hours
1000-2000	Tendency to stagger	1 1/2 Hours
1000-2000	Slight heart palpitation	30 Min.
2000-2500	Unconsciousness	30 Min.





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## CO Exposure Symptoms

- Weakness
- Fatigue
- Nausea
- Headaches
- Dizziness
- Rapid breathing
- Confusion
- Hallucinations
- Vomiting
- Severe pain
- Bluish discoloration
- Fainting





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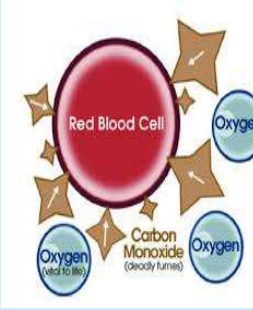
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Carbon Monoxide binds to the blood **250 times** better than oxygen!



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### Flammable Atmospheres

- Flammable and combustible gases or vapors are present
- Proper air/gas mixture can lead to explosion
- Typical Ignition Sources:
  - Sparking or electric tool
  - Welding / cutting operations
  - Smoking

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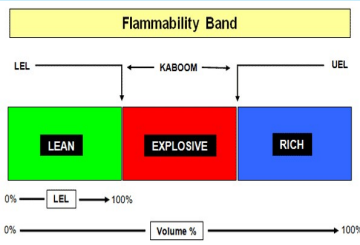
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### 10% Lower Explosive Limit (LEL)



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## H2S Exposure Symptoms

- Sense of smell gets rapidly fatigued
  - Cannot be relied upon
- Low blood pressure and slow respiration
- Eye, nose and throat irritation
- Nausea, Dizziness, Headaches
- Loss of consciousness





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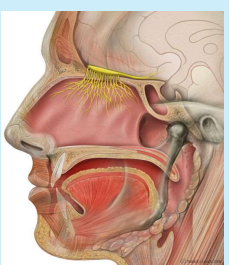
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## H2S Affects Olfactory Nerves

- Ability to smell is paralyzed







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## Effect of Various H2S Levels

H <sub>2</sub> S	Effects of human
0.13	Odor threshold
10	PEL
100	Coughing, eye irritation, loss of sense of smell after 2 to 5 minutes.
500-700	Loss of consciousness and possible death in 30 minutes to one hour.
1000-2000	Unconsciousness at once and death in a few minutes. <b>Death</b> may occur even if individual is moved to fresh air.





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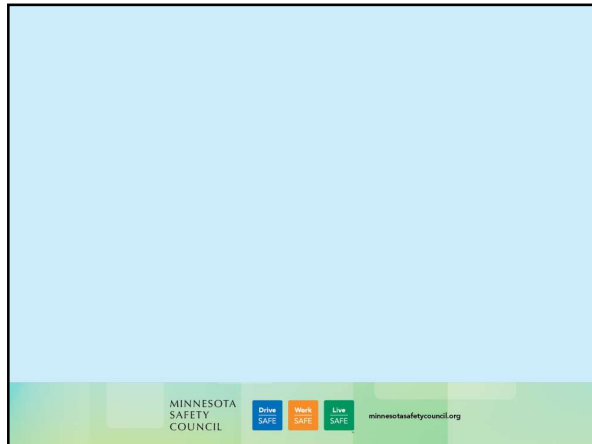
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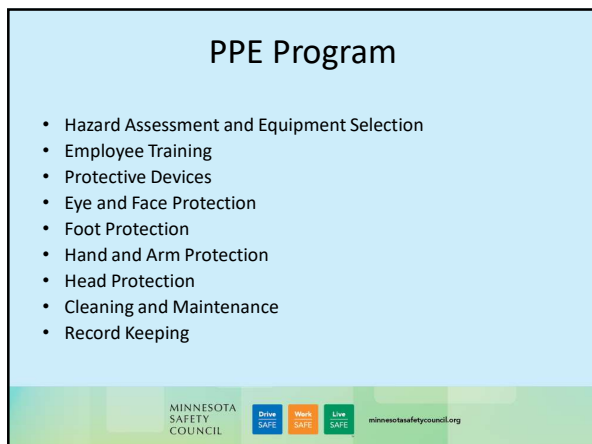
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### Criteria for PPE

- All PPE shall be maintained in a sanitary and reliable condition
- The employer shall assure that PPE provided by employer is adequate for the protection of the worker

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### What is mandatory PPE

- safety glasses, goggles, or equivalent eye protection
- footwear with reinforced toe or toe caps or equivalent foot protection
- appropriate protective gloves
- long-sleeved shirt and long pants, or equivalent, Tyvek or equivalent
- respirator use (only if Facility has respirator program, see *SOP 2.5 Respirator Program*).

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### What PPE do I need for: Traffic Control

- reflective vests for staff in traffic hazard areas - Class 2 High Visibility Vest
- traffic cones
- “No Smoking” signs
- applicable signage

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**What PPE do I need for:  
Receiving or Sorting Wastes?**

- safety glasses with side shields or goggles
- footwear with reinforced toe protection or protective toe caps
- protective gloves
- long-sleeved shirt and pants or the equivalent
- protective apron or equivalent
- reflective vests for event collections
- respirator (if Facility has written respirator plan)

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**What PPE do I need for:  
Bulking flammables, solvents or  
Aerosols?**

- poly-coated-tyvek coverall or apron
- safety glasses with side shields or goggles
- latex or nitrile gloves
- footwear protection
- chemically resistant gloves (if bulking flammables or aerosols)
- respiratory protection according to respiratory protection plan (if bulking flammables or aerosols).

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**What PPE do I need for:  
Bulking Latex Paint?**

- Long sleeves
- Long pants
- Safety Toed shoes/boots
- Apron or coveralls
- Safety glasses

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**What PPE do I need for:  
Lab Packing?**

- safety glasses, goggles, or equivalent eye protection
- footwear with reinforced toe or toe caps or equivalent foot protection
- appropriate protective gloves
- long-sleeved shirt and long pants, or equivalent, Tyvek or equivalent
- respirator use (only if Facility has respirator program, see *SOP 2.5 Respirator Program*).

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**What PPE do I need for:  
ID Unknowns**

- safety glasses with side shields, goggles, or equivalent
- foot protection
- protective gloves
- long-sleeved shirt and long pants or equivalent
- protective apron or equivalent
- respirator (if Facility has written respirator plan)

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**What PPE do I need for:  
INCIDENTAL Spill Clean up**

- Poly-coated Tyvek coverall or equivalent
- safety glasses or goggles
- chemical resistant gloves
- chemical resistant boot covers
- respiratory protection according to Facility respiratory protection plan

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## Other Optional PPE

- Tyvek suit
- Chemical resistant suit
- Face shields
- Tyvek boot covers
- Chemical resistant boots/covers
- Hard hats

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## RESPIRATORY PROTECTION



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## Filtering Facepiece Respirator

A negative pressure particulate respirator with the entire facepiece composed of the filtering medium.



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### Half Mask Respirator w/ cartridges



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### Selection of Respirators

- Employer must select and provide an appropriate respirator based on the respiratory hazards to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.



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### Medical Evaluation

- Must provide a medical evaluation to determine employee's ability to use a respirator, **before fit testing and use**
- Must identify a PLHCP to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information

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## Fit Testing

Before an employee uses any respirator with a **negative or positive pressure tight-fitting facepiece**, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.



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## Qualitative Fit Test (QLFT)

A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.



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## User Seal Pressure Check

An action conducted by the respirator user to determine if the respirator is properly seated to the face.



**Positive Pressure Check**



**Negative Pressure Check**

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## Training and Information

- Employers must provide effective training to employees who are required to use respirators.



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## Training and Information

- Employees who are required to use respirators must be **trained** such that they can demonstrate **knowledge** of at least:
  - **why** the respirator is necessary and how improper fit, use, or maintenance can compromise its protective effect
  - limitations and capabilities of the respirator
  - effective use in **emergency** situations



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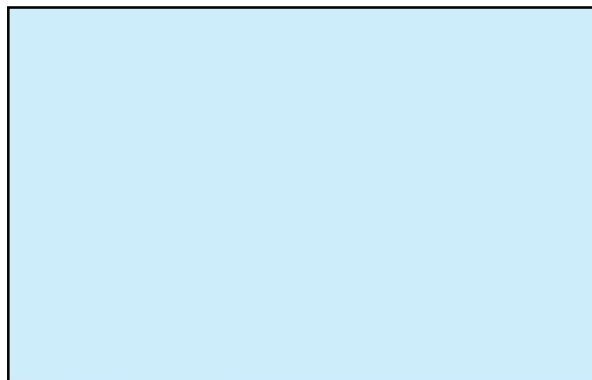
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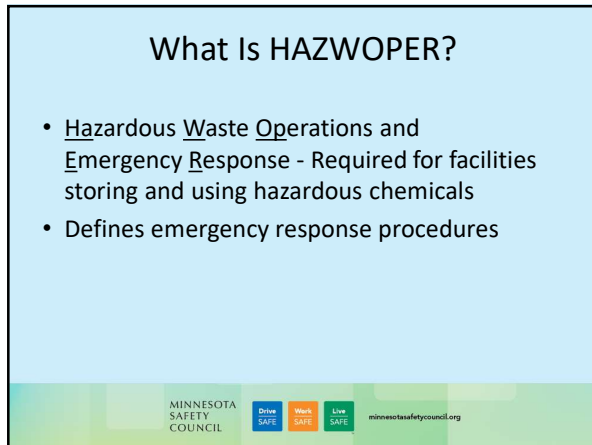
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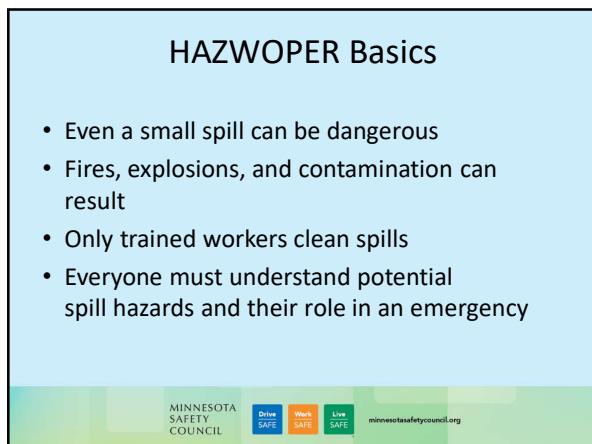
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### Spill Prevention

- Understand chemical hazards
- Follow safe storage and handling procedures
- Read and follow the instructions on labels and safety data sheets
- Don't use chemicals in unlabeled containers

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### Spill Prevention

- Inspect chemical containers for damage or leaks
- Don't handle or open chemical containers without PPE
- Don't leave containers open
- Report potential hazards to your supervisor



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### Emergency Response Plan

- Pre-emergency planning and training
- Emergency recognition
- Evacuation procedures
- Emergency alerting and response
- PPE and emergency equipment
- Decontamination and medical treatment

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### Levels of Training

- First responder: awareness level
- First responder: operations level
- Hazardous materials technician
- Hazardous materials specialist
- Incident commander

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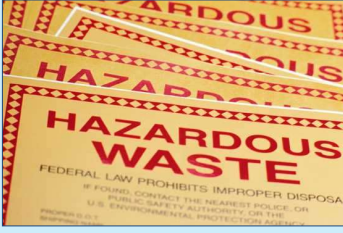
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### Hazardous Substance?

- Includes pure or mixed chemicals and hazardous wastes
- Potential health hazards
- Could damage the environment



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### Recognize Chemical Substances

- Danger, warning signs
- NFPA or HMIS labels
- DOT placards

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### Types of Chemicals

- Flammable or explosive
- Reactive
- Corrosive
- Toxic



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### Dangers of a Release

- Flammable liquids or gases
- Toxic cloud
- Reaction with nearby chemicals
- Irritants

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### Chemical Exposure

- Skin or eye contact
- Inhalation
- Swallowing
- Avoid contact and evacuate immediately

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### Awareness Level Role

- Recognize a chemical release
- Determine chemical's identity
- Self-protection and protection of others
- Know how to get assistance
- Secure the area

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### Recognizing a Chemical Release

- Dripping or pool of liquid
- Unusual smell
- Unusual sound
- Loss of pressure or flow

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### Non-Hazardous Spills

- Incidental or small
- Handled by the employees in immediate area
- Get help if you're unsure

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### Identifying the Chemical

- Where is it coming from?
- Is the container labeled?
- Is it a liquid, gas, or solid?
- What does it smell like?
- What color is it?

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### Protect Yourself and Others

- Report the release to others in the immediate area
- Retreat to a safe distance, place of refuge, or evacuation assembly area

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### Reporting the Spill

- Contact the emergency response coordinator
- Provide information:
  - Location of release
  - Identity and quantity of spilled material
  - Evacuation status
- Ask for instructions

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### Secure the Area

- Keep people a safe distance from the spill
- Use caution tape, rope, cones, etc.
- Stand guard of the controlled area

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### Response Personnel

- Analyze the incident
- Use proper PPE and equipment
- Contain the spill
- Stop the leak
- Clean up the spill
- Decontaminate
- Report the incident

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### Summary

- HAZWOPER is for facilities storing or using hazardous chemicals
- Practice spill prevention techniques
- Recognize the chemicals used at your facility and know their hazards
- Awareness Level personnel must:
  - Recognize a spill or release
  - Know how to initiate a response

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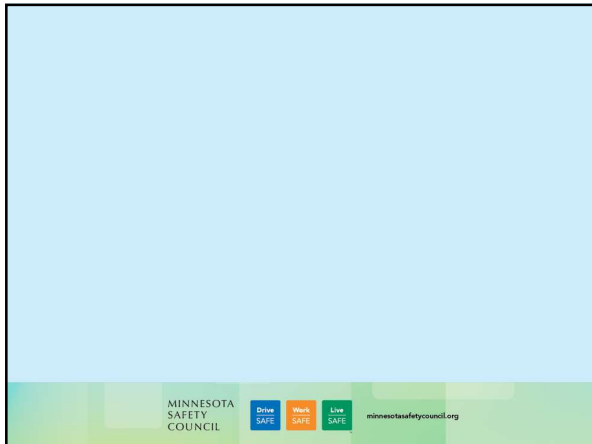
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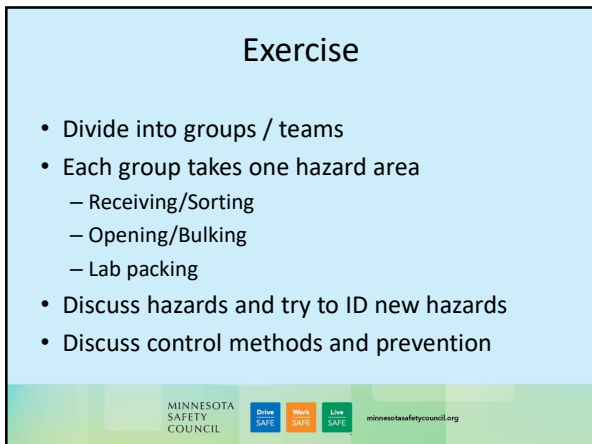
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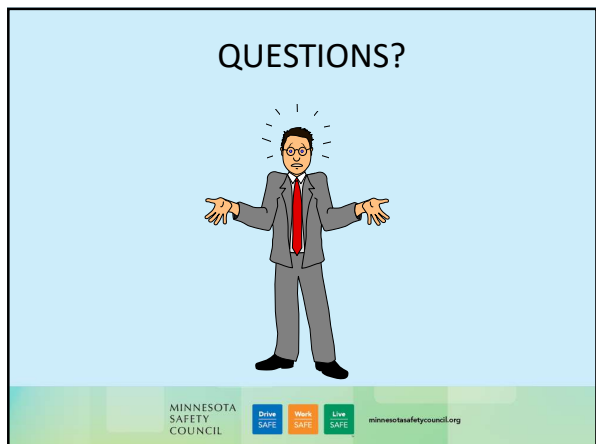
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