



Health Hazards in Construction

Student Materials
MTI Level One Construction Course
Consultation Education and Training Division
Michigan Occupational Safety and Health Administration
Michigan Department of Labor and Economic Opportunity
www.michigan.gov/miosha
517-284-7720



Health Hazards in The Construction

MIOSHA Training Institute (MTI)
Level One Construction Course

Presented By:
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Michigan Occupational Safety and Health Administration
Michigan Department of Labor and Economic Opportunity

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Objectives

- Identify basic industrial hygiene principles; such as, the hierarchy of controls and proper work practices
- Describe construction worksite health hazards
- Discuss negative health effects associated with various exposures
- Identify respiratory protection requirements



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What Is the Role of an Industrial Hygienist?

An industrial hygienist in a construction setting is responsible for identifying, evaluating and controlling potential hazards like chemicals, noise, dust, and other physical stressors that workers may be exposed to on a construction sites by conducting assessments, monitoring exposure levels, and recommending preventive measures to protect worker health and safety.

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Industrial Hygiene

Occupational Health Hazards

- Anticipation
- Recognition
- Evaluation
- Control



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Hazard Anticipation and Recognition

- What are the raw materials?
- What is produced?
- Any intermediate products and by-products formed?
- Are Safety Data Sheets (SDS) available and reviewed?
- Any unusual, cleaning, and/or maintenance procedures?
- What are the health hazards of these substances?
- Are exposures impacting employees?

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Hazard Evaluation

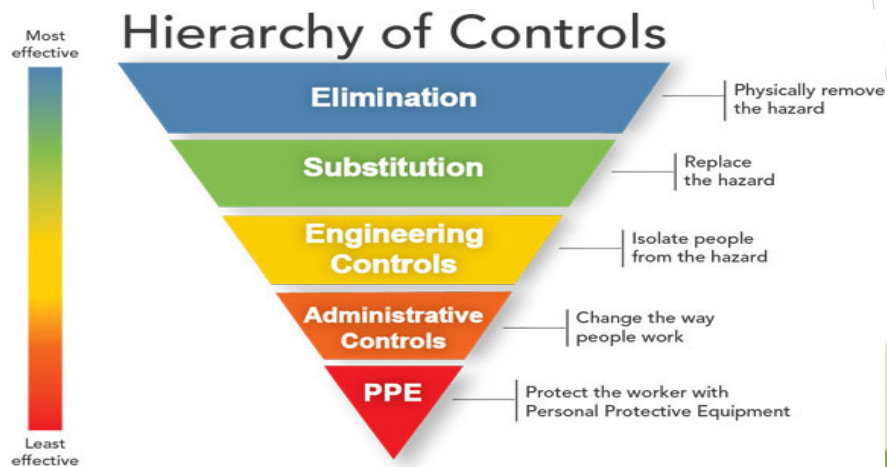
- Observation
- Interview
- Measurement
- Judgment

- Often includes exposure monitoring
 - Personal vs. Area sampling
 - Direct Read vs. Time Integrated
 - Industrial Hygienists Evaluate Risk
 - Often as percentage of an Exposure Limit



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Hazard Control



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Hazard Control in Construction

- Starts with SDS Review and Regulated Materials Surveys
- Isolation - Regulated Areas/ Scheduling
- Negative Pressure Enclosures
- Local Exhaust Ventilation
- Wet Methods
- TRAINING!

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Occupational Health Hazard Categories

- Physical
- Ergonomic
- Chemical
- Biological



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Physical Hazards

- Temperature
 - Heat
 - Cold
- Ionizing Radiation
- Nonionizing Radiation
- Noise
- Vibration
- Pressure Extremes

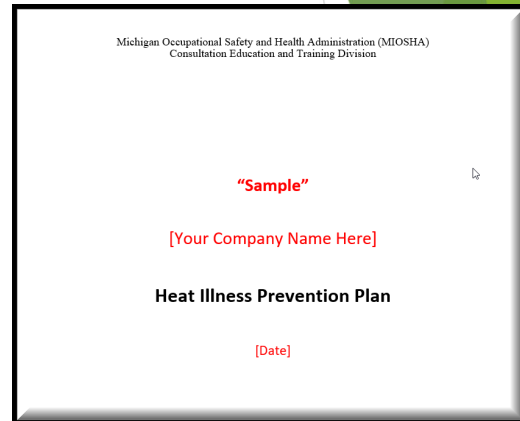


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Temperature Extremes: Heat

- Depends on work conditions:
 - Temperature
 - Humidity
 - Sun vs. shade
 - Light, moderate or strenuous work
- Heat illnesses:
 - Heat rash
 - Heat cramps
 - Heat exhaustion
 - Heat stroke (Life-threatening)



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Temperature Extremes: Heat

Avoid dehydration:

- Drink water:
 - 6 oz/20 min. = 18-20 oz/hour during strenuous work in high heat and humidity.
- Do not consume (before, during and after heat exposure):
 - Caffeine
 - Alcohol
 - Nicotine
 - Medications (antihistamines and cough/cold meds, muscle relaxers)



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Temperature Extremes: Heat

- Monitoring Instruments
- Wet Bulb Globe Temperature:
 - Ambient temperature,
 - Relative humidity,
 - Wind
 - Radiation Heat



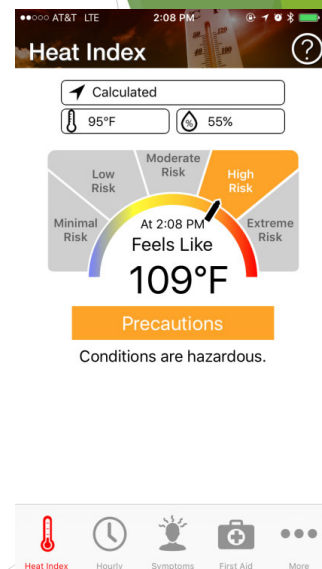
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Temperature Extremes: Heat

- Federal OSHA Heat Safety Mobile App:
 - Android
 - iPhone

There is an app, available for both [Android](#) and [iPhone](#), resulting from a collaborative effort between OSHA and NIOSH to update the OSHA Heat Safety Tool.



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Temperature Extremes: Cold

- Hypothermia:
 - Drop in body temp to 95°F or less
 - Shivering
 - Confusion, slurred speech, heart and breathing rates
 - Loss of consciousness, death
- Frostbite: body tissue freezing
- Trench Foot / Immersion Foot:
 - Non-freezing injury (redness swelling, numbness and blisters)



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NWS Windchill Chart



		Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	Cal	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	5	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	10	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	15	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	20	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	25	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	30	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	35	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	40	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	45	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
50	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97	
55	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	

Frostbite Times
 30 minutes
 10 minutes
 5 minutes

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})
 Where, T= Air Temperature (°F) V= Wind Speed (mph)

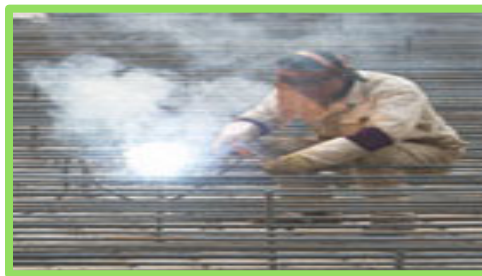
Effective 11/01/01

Courtesy of the National Weather Service: www.noaa.gov

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Non-ionizing Radiation

- Ultraviolet (UV) - skin burns, cancer and eye effects including inflammation and cataracts
- Infrared (IR)- Skin burns, cataracts, retinal and corneal burns to the eye
- Sources of UV and IR = Sun, lasers, welding arcs, furnaces

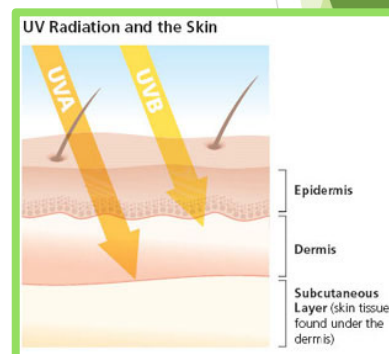


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Sunscreen and Sunglasses

- Rated according to Sun Protection Factor (SPF), an index of protection against skin erythema (reddening of the skin).
- Higher SPF = more protection from UVB radiation:
 - SPF 15 sunscreen - up to 92%
 - SPF 30 sunscreen - up to 96.7%
 - SPF 40 sunscreen - up to 97.5%
- Sunglasses: check for
 - UV rating.



Source: Skin Cancer Foundation

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Sun Exposure and Coal Tar

What is Coal Tar?

- Coal tar, is a thick black liquid used in roofing, paving and asphalt, contains carcinogens like benzene
- Increased risk of skin cancer
- Photosensitization



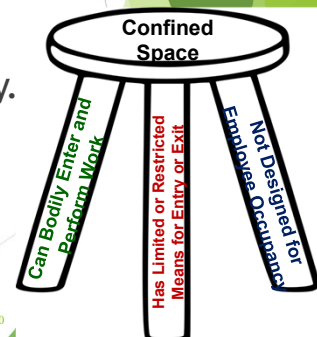
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Part 35. Confined Space in Construction

What is a Confined Space?

- Is large enough and so configured that an employee can bodily enter it;
- Has limited or restricted means for entry and exit; and,
- Is not designed for continuous employee occupancy.
- **Must have all three to be a confined space!**



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Part 35. Confined Space in Construction

TABLE 1 EXAMPLES OF LOCATIONS WHERE CONFINED SPACES MAY OCCUR	TABLE 1 EXAMPLES OF LOCATIONS WHERE CONFINED SPACES MAY OCCUR
Bins	Storm drains
Boilers	Water mains
Pits, such as elevator, escalator, pump, valve or other equipment	Precast concrete and other pre-formed manhole units
Manholes, such as sewer, storm drain, electrical, communication, or other utility	Drilled shafts
Tanks, such as fuel, chemical, water, or other liquid, solid or gas	Enclosed beams
Incinerators	Vessels
Scrubbers	Digesters
Concrete pier columns	Lift Stations
Sewers	Cesspools
Transformer vaults	Silos
Heating, ventilation, and air-conditioning (HVAC) ducts	Air receivers
	Sludge gates
	Air preheaters
	Step up transformers
	Turbines
	Chillers
	Bag houses
	Mixers, such as reactors

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What is a permit required confined space?

A confined space containing **one or more** of the following:

- ▶ Hazardous atmosphere or potential to contain a hazardous atmosphere;
- ▶ Material that has the potential for engulfing an entrant;
- ▶ An internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section; or
- ▶ Any other recognized serious safety or health hazard.



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Confined Spaces - Evaluation

Part 35 - Confined Space in Construction

- Competent Person must evaluate all confined spaces
 - Competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.
- Determine if any confined spaces meet the criteria for Permit-Required Confined Spaces



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Part 35 Requirements: Before Work Begins

If the workplace contains one or more permit spaces, the employer must:

- Inform exposed employees of the:
 - Existence;
 - Location; and,
 - Danger posed by each permit space
 - Signage may be used
- Inform employees' authorized representatives and the controlling contractor:
 - Timely manner
 - Manner other than posting
 - Existence, location of, and danger posed by each permit space.



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Part 35. Confined Space in Construction Permit Required Confined Space Program - Overview

Each Entry Employer Must:

- Prevent unauthorized entry
- I.D. and evaluate hazards
- Develop and implement safe entry means, procedures and practices
- Provide and ensure proper use of equipment
- Evaluate permit space conditions for air contaminants
- Provide attendant(s) outside space
- Manage multiple spaces in an emergency
- Assign duties to employees involved in permit space entry
- Develop and implement procedures:
 - Rescue and emergency services
 - Prep, use and cancel entry permits
 - Coordinate entry with multiple employers
 - Conclude/close entry operations
- Review entries and program; revise when needed
- Annual review using cancelled permits

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Any physical or chemical hazards?



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Part 680. Noise Exposure for Construction

- Loudness of sound is measured in decibels (dB) using the A-weighted scale
- Referred to as dBA



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Part 680. Noise Exposure for Construction

- Permissible noise exposure limit = 90 dBA, eight-hour TWA (time-weighted average)
 - Engineering and administrative controls to lower noise levels if feasible
 - PPE controls (hearing protection)
 - Hearing conservation program - no specified elements, but consider (from MIOSHA Part 380): noise monitoring, employee training, audiometric testing, provide hearing protection, post standard, and maintain records
- No action limit specified
- Impact noise: employer cannot exceed 140 dBA

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Effects of Excessive Noise

- Hearing loss
- Increase heart rate and blood pressure
- Constriction of blood vessels leading to tension and stress
- Nervousness, sleepiness, and fatigue



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Activity - Hearing Loss Demo

Instructor plays:

[Track 4](#)

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Hearing Protectors

- Required when time-weighted average (TWA) noise exposures exceed the permissible exposure limit (PEL = 90 dBA, eight-hour TWA)
 - Selection of protectors
 - Training in use of protectors
 - Fitting of hearing protectors



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Ergonomic Hazards

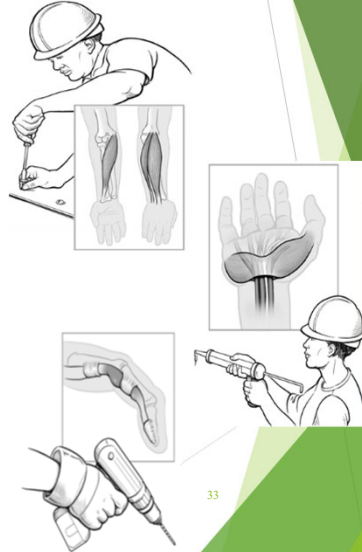
- Physical Stressors
 - Repetitive motion
 - Heavy lifting (force)
 - Awkward or static postures
 - Contact stresses
 - Duration
- Nature of the work:
 - Manual material handling
 - Work area design
 - Tools/equipment design
- Psychological stressors
- Ergonomic solutions from NIOSH



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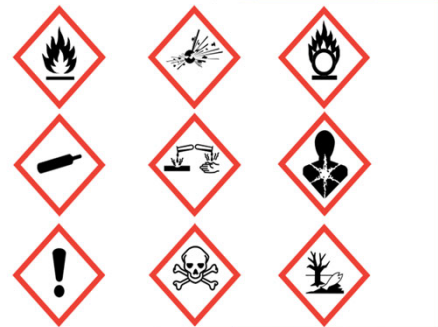
Cumulative Trauma Disorders

- Tendonitis
- Carpal tunnel syndrome
- Rotator cuff
- Tendonitis
- Tennis and golfer's elbow
- Thoracic outlet syndrome
- Raynaud's syndrome
- Trigger finger



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Chemical Hazards



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Recognition of Chemical/Toxic Hazards:

What should you determine?

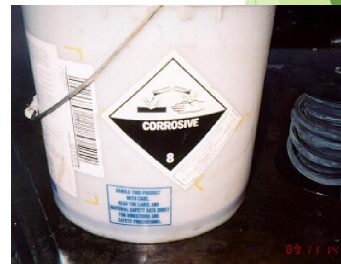
- Physical form (if appropriate)
- Toxicity (i.e., potential health effects)
- Exposure route(s)
- Exposure levels/limits
- How chemical is used in workplace

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Physical Form

- Liquid, gas, vapor, dust, mist, fume and fibers
- Examples:
 - Gasoline, paint/coatings (liquid and vapor)
 - Silica, lead, cadmium (Dust)
 - Carbon Monoxide, methane and hydrogen sulphide (gas)
 - Mist (isocyanate/2-part foam, paint/coatings)
 - Welding (fume)
 - Asbestos (fiber)



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Dose–Response Relationship

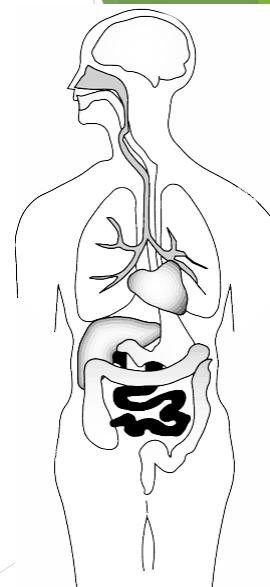
- How does the chemical enter the body?
- How toxic is the substance?
- How much of it enters the body?
 - How many minutes/hours exposed?
 - What is the concentration in the environment?
 - Acute vs Chronic exposures
- Responses will differ from person to person...why?

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Potential Routes of Exposure

- Inhalation
- Absorption
- Ingestion
- Injection



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Part 601. Air Contaminants for Construction

- Approximately 400 substances regulated
 - “A” designated - absolutely no contact whatsoever (cancer agents)
 - “S” designated - protect against skin absorption
 - “C” designated - highest concentration value

	SUBSTANCE	CAS No. ¹	MAC/Ceiling/STEL	
			ppm	mg/m ³
C	Toluene-2,4-diisocyanate	584-84-9	0.02	0.14
S	o-Toluidine	95-53-4	5	22

- Controls:
 - Implement feasible elimination, substitution, engineering or administrative controls first
 - Use personal protective equipment second

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Types of Exposure Levels

- Maximum allowable concentrations (MACs)
- Permissible exposure limits (PELs)
 - eight-hour time-weighted averages
- Short term exposure limits (STELs)
 - 15-minute TWA
- Ceiling limits (C)

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Part 430. Hazard Communication

- Written Program
- Chemical Inventory
- Safety Data Sheets (SDS)
 - 16-section format
- Labels on Shipped Containers:
 - Product name
 - Signal Word
 - Manufacturer Information
 - Hazard Statements
 - Pictograms
 - Precautionary Statement
- Secondary Labels
 - Product Identifier
- Employee training



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Safety Data Sheets (SDSs)

16-section standardized SDS format required (ANSI Z400.1)

- | | |
|---|--|
| Section 1 - Identification | Section 10 - Stability and Reactivity |
| Section 2 - Hazard(s) identification | Section 11 - Toxicological/Toxicity |
| Section 3 - Composition | Section 12 - Ecological Information* |
| Section 4 - First aid Measures | Section 13 - Disposal Consideration* |
| Section 5 - Fire fighting Measures | Section 14 - Transport Information* |
| Section 6 - Accidental Release Measures | Section 15 - Regulatory Information* |
| Section 7 - Handling and Storage | Section 16 - Other information including revision date |
| Section 8 - Exposure Controls / Personal Protection | |
| Section 9 - Physical and Chemical Properties | |

*Sections outside of MIOSHA jurisdiction but inclusion of these sections is necessary for a GHS compliant SDS

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Hazard Communication - Multi-Employer Work Sites

Multiple employers on a single work site must:

- Coordinate their Hazard Communication Programs
- Ensure each employee is informed of:
 - The hazardous chemicals they may be exposed to
 - The measures to control or eliminate exposure
 - Container and pipe labeling system used
 - Where SDSs can be reviewed or obtained

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Part 602. Asbestos for Construction

- Variety of Activities Covered under the Standard (i.e., waxing/buffing of asbestos floor tile, abatement activities, demolition activities)
- Covers majority of asbestos-related work
- Created a classification system for asbestos-related work (Class I, II, III, and IV).
- TWA = 0.1 fibers/cm³, eight-hour TWA
- Excursion Limit = 1 fibers/cm³, 30-minute TWA

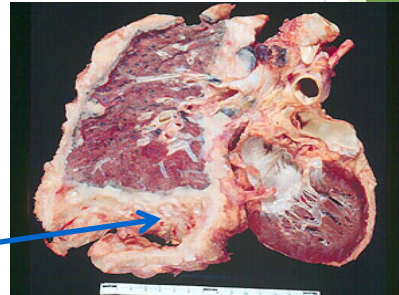
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Asbestos Health Effects

Overexposures to asbestos can result in:

- Asbestosis
- Lung Cancer
- Laryngeal Cancer
- Mesothelioma



Cross section of lung and heart

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Example of Damaged Pipe Insulation



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Asbestos - Communication of Hazards

- Presume all materials are asbestos containing materials (ACM)
- Before work - building owners must identify and quantify ACM in work areas (Building Survey)
- Specific notification requirements:
 - Contractors
 - Employees of owner
 - Tenants



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Part 603. Lead Exposure in Construction

- Applies to all construction work where an employee may be occupationally exposed to lead.
 - Demolition/salvage where lead is present.
 - Removal/encapsulation of material containing lead.
 - New construction, alteration, repair, maintenance.
 - Lead contamination/emergency cleanups.
- Transportation, disposal, storage, and containment of lead on the construction site.

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Lead Exposure Limits

- Action Level (AL):
 - $30 \mu\text{g}/\text{m}^3$ or $0.030 \text{ mg}/\text{m}^3$, eight-hour TWA
- Permissible Exposure Limit (PEL):
 - $50 \mu\text{g}/\text{m}^3$ or $0.050 \text{ mg}/\text{m}^3$, eight-hour TWA
- Extended work shifts:
 - Adjust PEL for extended work shifts
 - If exposed > eight hours per day:
 - $\text{PEL} = 400 \div \text{hours worked}$
 - For a 10-hour workday: $\text{PEL} = 40 \mu\text{g}/\text{m}^3$, 10-hr TWA
- An initial exposure assessment must be done to determine employee exposure.

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Highest airborne lead exposures created by:

- Abrasive blasting
- Welding
- Torch cutting on steel coated with lead containing paint
- Seek alternatives to reduce exposures



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Interim Controls

Until an initial exposure assessment is done, employers must implement interim controls including;

- Respiratory protection
- Personal protective clothing
- Change areas
- Hand washing facilities
- Biological monitoring
- Training

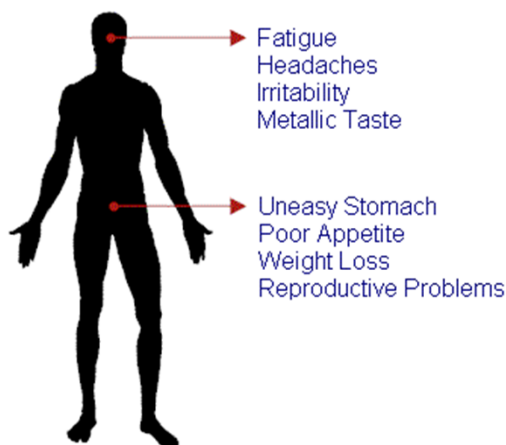


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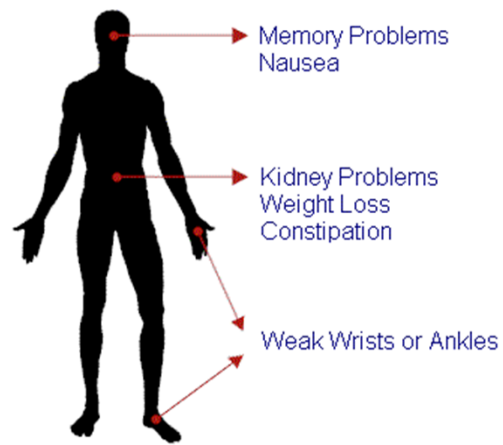
Lead Health Effects

- Exposure routes: Inhalation and Ingestion

Early Symptoms of Lead Poisoning



Later Symptoms of Lead Poisoning



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Lead-Based Paint (LBP) Abatement

Requirements: MDHHS and EPA

- MI Department of Health and Human Services (MDHHS), Lead Safe Home Program
 - Lead-based Paint Abatement: Accreditation and certification requirements, similar to asbestos
 - 866-691-LEAD (5323) www.michigan.gov/leadsafe



- EPA Renovation, Repair and Painting Program
 - Disturbing six square feet of paint in a house built before 1978
 - Certified with eight-hour training. epa.gov/lead
 - National Lead Information Center Hotline: 800-424-LEAD (5323)

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Part 309. Cadmium

Found in:

- Corrosion resistant plating (nuts, bolts, rivets)
- Pigments/stabilizers in plastic (wire insulation)
- Paint and coatings
- Various alloys
- Electrode in nickel/cadmium batteries



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Cadmium - Exposure Limits

- Action Level (AL) = 2.5 $\mu\text{g}/\text{m}^3$, eight-hour TWA
- Permissible Exposure Limit (PEL) = 5 $\mu\text{g}/\text{m}^3$, eight hour - TWA
- Must:
 - Determine if present
 - Air monitor if present
 - Train on hazards and rules if present

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Cadmium - Health Effects

- Health effects:
 - Cumulative kidney and lung damage
 - Group 1 - Carcinogenic to humans
- Symptoms include:
 - Pulmonary edema, labored breathing, coughing, tight chest, substernal pain, headaches, chills, muscle aches, nausea, diarrhea, emphysema, absence of sense of smell, and mild anemia

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Part 690. Silica in Construction

All construction employers covered by the standard are required to:

- Establish and implement a written exposure control plan
- Designate a competent person to implement the written exposure control plan
- Restrict housekeeping practices that expose workers to silica
- Offer medical exams—including chest X-rays and lung function tests—every three years for workers who are required by the standard to wear a respirator for 30 or more days per year.
- Train workers on work operations that result in silica exposure and ways to limit exposure.
- Keep records of workers' silica exposure and medical exams

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Silica Exposure Limits

- ▶ Action Level = $25 \mu\text{g}/\text{m}^3$
- ▶ PEL = $50 \mu\text{g}/\text{m}^3$



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Silicosis in Construction

Major industry types for confirmed silicosis patients:

- ▶ Primary metals
- ▶ **Construction**
- ▶ Stone, concrete products
- ▶ Transportation
- ▶ Mining
- ▶ All others

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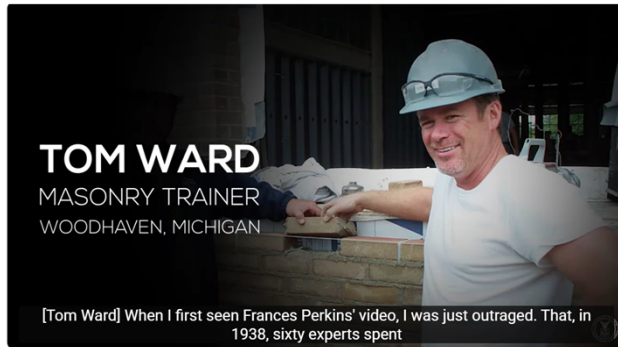
Silica - Health Impacts

- Silicosis (Grinder's Disease):
 - Fibrotic changes in both lungs (scarring)
 - The higher the concentration to which the workers are exposed and the longer the exposure, the greater is the risk of developing silicosis
- Lung cancer (Confirmed human carcinogen)

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Silica - Health Impacts Testimony of Tom Ward



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Operations Likely to Generate High Silica Exposures:

- Abrasive blasting
- Concrete cutting
- Tuck-pointing
- Drilling
- Chipping/jackhammer
- Operations associated with hydraulic fracturing (fracking)
- Grinding
- Sawing
- Shoveling
- Sweeping



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Silica - Exposure Control

- Written silica exposure control plan
- Use wet cutting or local exhaust methods
- Do not walk into “clouds”
- Avoid performing work in enclosed areas
- Provide training on hazards of silica exposure
- Use respiratory protection - especially for excessive exposures:
 - Use supplied-air abrasive blasting helmet when performing abrasive blasting
 - Must have a written respirator program

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Example of Table 1 Entry Handheld Power Saw



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Example of Table 1 Entry

Handheld Power Saw

Table 1 Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica			
Equipment/task	Engineering and work practice control methods	Required respiratory protection and minimum assigned protection factor (APF)	
		≤4 hours/shift	>4 hours/shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions	None	None
(ii) Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: —When used outdoors —When used indoors or in an enclosed area	None APF 10	APF 10 APF 10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8	For tasks performed outdoors only: Use saw equipped with commercially available	None	None

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Silica: Tuckpointing

No Controls



Local ventilation control



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Silica: Concrete Grinding

Controls:

- Shroud
- Hose
- Vacuum
- Pre-filter
- Cyclonic separator
- HEPA filter



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Resources

Silica Small Entity Compliance Guide for Construction

www.osha.gov/Publications/OSHA3902.pdf

OSHA Crystalline Silica Construction Fact Sheets

[Silica, Crystalline - Construction | Occupational Safety and Health Administration \(osha.gov\)](http://Silica, Crystalline - Construction | Occupational Safety and Health Administration (osha.gov))

NIOSH Silica Information Webpage

www.cdc.gov/niosh/topics/silica

MIOSHA Publications Webpage with Sample Silica Control Plan

<https://www.michigan.gov/leo/bureaus-agencies/miosha/resources/pub-pos-form-media>

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Resources

Center for Construction Research and Training
www.silica-safe.org

Video clips - What's Working
<http://www.silica-safe.org/whats-working/controlling-silica-dust-learning-from-each-other>

Federal Register - Silica Standard
<https://www.federalregister.gov/documents/2016/03/25/2016-04800/occupational-exposure-to-respirable-crystalline-silica>

Hollow drill bits for rotary hammers with local exhaust ventilation
<https://www.youtube.com/watch?v=iC-Ze4jTs0M>

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Carbon Monoxide (CO)

- Cause: Incomplete combustion
- Gasoline engines: Always a concern, emit more CO
 - Cracked heat exchangers
 - Back drafting

Gasoline powered pump



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CO Exposure Limits

- Construction exposure limits (Part 601)
 - MAC = 50 ppm
 - No STEL or ceiling limits
- General industry exposure limits (Part 301)
 - PEL = 35 ppm
 - Ceiling limit = 200 ppm
 - No STEL limit

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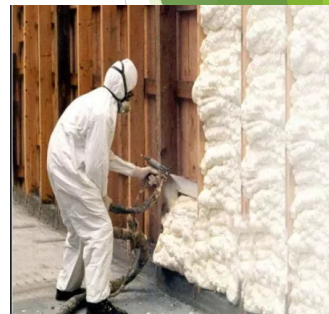
CO Health Impacts

- Symptoms include:
 - Headaches, weakness, dizziness, shallow breathing, slight red flushing of skin, nausea, confusion, and hallucinations
- Carboxyhemoglobin (COHb)
 - An indicator of exposure levels (within the past 16 hours)
 - Smokers = 5% - 6% (up to 10% immediately after smoking a cigarette)
 - Non-smokers = 1% - 2% (sometimes higher)
 - Background = 0.4% - 0.7% (biological)

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Isocyanates

- Highly reactive family of compounds.
- React readily with compounds called alcohol (hydroxyl) groups to produce polyurethane polymers.
- They are the raw materials from which all polyurethane materials are created.
- About one in every 20 people who work with isocyanates will become sensitized to them.
- Sensitized (respiratory health effect) by either inhalation or skin absorption.



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Isocyanate Cure Time

Component A
(Isocyanate)

Component B



Mix

Cure time

Cure



Isocyanate component is almost always added in excess to the mix to ensure a complete reaction

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Construction Exposure Limits Part 601

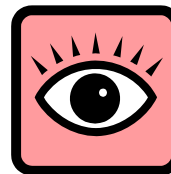
- Methylene bisphenyl isocyanate (MDI):
 - MIOSHA:
 - Ceiling limit: 0.02 ppm
- Toluene-2,4-diisocyanate (TDI):
 - MIOSHA
 - Ceiling limit: 0.02 ppm



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Short Term Health Effects



- Target organs are the skin, respiratory system, and eyes
- Causes:
 - Dermatitis,
 - Irritation or serious burns to eyes, and
 - Marked irritation of the nose and throat

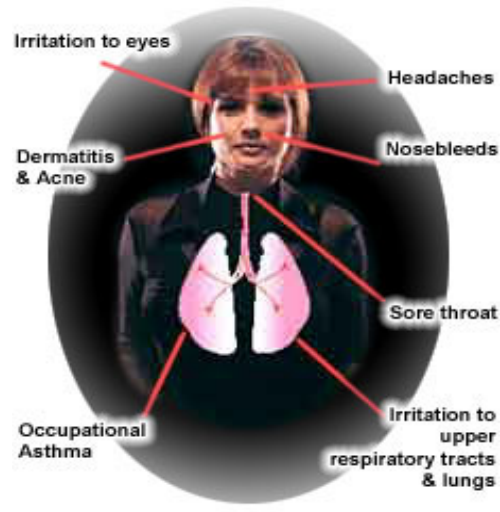
76

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Sensitization Symptoms

- Sore eyes
- Running nose
- Sore throat
- Coughing
- Wheezing (asthma)
- Chest Tightness

NOTE: Symptoms can be progressive



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Hand Protection and Skin Protection

- Personal protective equipment (PPE) and protective clothing should be made of materials resistant to isocyanates.
- Follow PPE manufacturer's recommendations for material selection.
- Even the most resistant materials may be penetrated quickly and should be replaced often.

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Respiratory Protection

- If potential exists for overexposure to isocyanates
 - A NIOSH-certified, supplied-air respirator with a full-face piece operated in a pressure-demand or other positive-pressure mode should be used.
- A written respiratory protection program shall be implemented where respirator use is required.

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Respiratory Protection

Can an air-purifying, cartridge-style respirator be used for protection against isocyanates?

- Yes, but...
- Must check with the manufacturer of your respirator for specifics.
- 3M and MSA have a respirator change out formula for some isocyanates.
- If you know the airborne concentration in parts per million (ppm), you can calculate approximately how long a cartridge will last.

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Part 604. Chromium (VI) in Construction

- Hexavalent chromium - Formed when metallic Chromium is exposed to high heat
- Most common occupational exposures to chromium (VI) in construction include:
 - Welding and torch-cutting stainless steel, high chrome alloys and chrome-coated metal
 - Applying and removing chromate-containing paints and other surface coatings

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Exposure Assessment

- If covered by the standard, determine the eight-hour TWA exposure for each employee exposed to chromium (VI).
- Determination shall be made in accordance with either of the following methods:
 - Scheduled monitoring option (air sampling)
 - Performance-oriented option (objective data)

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Chromium (VI) Exposure Limits

- Action level - 2.5 $\mu\text{g}/\text{m}^3$ (eight-hour TWA).
- Permissible Exposure Limit - 5 $\mu\text{g}/\text{m}^3$ (eight-hour TWA).

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Chromium (VI) Health Effects

Breathing or contact with dust, mist or fume

- **Lungs**
 - Cancer
 - Occupational asthma agent
- **Respiratory tract**
 - Severe irritation
 - Ulcers and perforated nasal septum
- **Skin**
 - Dermatitis / irritation
 - Skin ulcers
 - Sensitization

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Methods of Compliance

- Use engineering and work practice controls
- Personal protective equipment
- No rotation of employees to different jobs to achieve compliance with the PEL

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Hexavalent Chromium Recognition

- “What are you welding/cutting?”
 - Substrate Metal Type
 - Shop Shorthand vs. Metal Spec Sheets
- “What kind of weld process are you using?”
 - Visual, Consumable ID/SDS review
- “Was the metal coated or cleaned before you weld?”
 - Process residue, paints, polymers, primers, cladding, plating
- “Where are you going to weld?”

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Factors Affecting Exposure

- How many welders involved in the work? Helpers?
- Where will the welding take place? Indoor? Outdoor?
- What other adjacent activities?
- Is the space confined? Enclosed? Low air dispersion?
- How large is the workpiece? How many welds are needed where?
- How are the welders positioned relative to the piece?
 - Welding is somewhat unique. Workers must be at arms reach to contaminant source!

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Part 451. Respiratory Protection

- Key components
 - Selection procedure
 - Medical evaluations
 - Fit testing procedures
 - Procedures for proper use and maintenance
 - Procedures for cleaning, disinfecting, storing, etc.
 - Procedures to ensure adequate air quality, quantity, and flow
 - Employee training
 - Program evaluation
- Designate program administrator
- Provide respirators, training, and medical surveillance at no cost to employees



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Respiratory Protection

- Must have a written respiratory protection program when respirator use is required.



MIOSHA Sample written respiratory protection program

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Biological Hazards

- Microbiological
 - Bacteria
 - Viruses
 - Fungi/Molds
 - Protozoa
- Macrobiological
 - Insects
 - Parasites
 - Plants
 - Animals



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Ticks and Mosquitos

- Ticks:
 - Lyme's disease
 - Ehrlichiosis
 - Rocky Mountain Spotted Fever
 - Symptoms:
 - Body/muscle aches, fever, headaches, fatigue, joint pain, rash, stiff neck, facial paralysis
- Mosquitos:
 - West Nile
 - Symptoms: Mild illness with fever, encephalitis, meningitis



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Histoplasmosis

- Fungus/ fungal spores
- Accumulation of bird or bat droppings
- Illness:
 - Mild illness can resolve without treatment
 - Chronic lung disease resembles TB
- No disinfectant specifically approved (bleach?)
- Avoid creating dust and use wet methods
- Respiratory protection may be necessary
 - (N-95 minimum)



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Review

- Identify basic industrial hygiene principles; such as, the hierarchy of controls and proper work practices
- Describe construction worksite health hazards (e.g., asbestos, lead, carbon monoxide, cadmium, isocyanates, chromium (VI), silica, and noise)
- Discuss negative health effects associated with select chemical substances entering the body
- Identify respiratory protection requirements associated with expanded standards

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Any Questions



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Assessment

- The purpose of this assessment is to validate the knowledge learned in class.
- Passing score of 70% correct is required.
- Class reference materials/books are not allowed to be used during the assessment.
- Collaboration/discussion with others is not allowed during the assessment.
- Answers will be reviewed after everyone completes and submits their assessment.

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Thank you.

Don't Forget to Take the Survey



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Health Hazards in Construction

Student Resources

MIOSHA Standards:

[MIOSHA Occupational Health Standards for Construction](#)

MIOSHA Fact Sheets:

[Asbestos](#)

[Cadmium](#)

[Confined Spaces](#)

[Ergonomics in Construction](#)

[First Aid and Emergency Requirements for Construction](#)

[Hexavalent Chromium](#)

[Isocyanate Exposure](#)

[Lead](#)

[Noise](#)

[Respiratory Protection](#)

[Silica](#)

Other Resources:

[Federal OSHA Resources for Construction](#)

[Carbon Monoxide Fact Sheet](#)

Carbon Monoxide Poisoning QuickCard™ ([English](#) or [Spanish](#))

[Materials to Prevent Heat Illness in Outdoor Workers](#)

[Cold Stress QuickCard](#)

Heat Stress QuickCard™ ([English](#) or [Spanish](#))

[West Nile Virus QuickCard](#)

[Mold QuickCard](#)

MIOSHA Training Institute (MTI) Resources:

www.michigan.gov/mti

MIOSHA Training Calendar:

www.michigan.gov/mioshatraining

MIOSHA Homepage:

www.michigan.gov/miosha



Michigan Department of Labor and Economic Opportunity
Michigan Occupational Safety and Health Administration
Consultation Education and Training Division
525 W. Allegan St., P.O. Box 30643
Lansing, Michigan 48909-8143

For further information or to request consultation, education and training services
call 517-284-7720

or

visit our website at www.michigan.gov/miosha

www.michigan.gov/leo

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