Health Hazard Recognition

Air Contaminants

Michigan Safety Conference

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Outline

Discuss…

- The function of the human respiratory system
- Why it is important to recognize occupational hazards
- Why it is important to protect ourselves from air contaminants
- Resources to aid us in recognizing air contaminant hazards in the workplace

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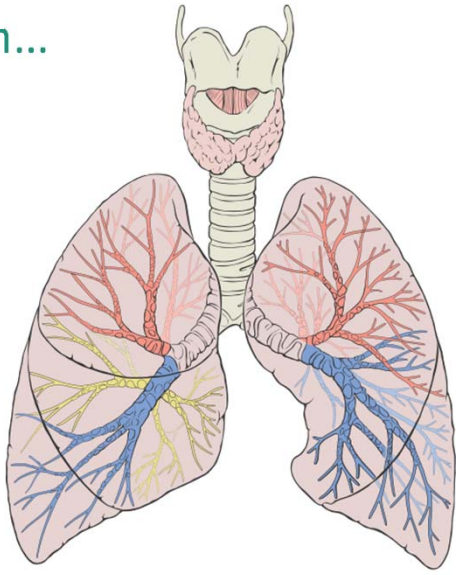
The human respiratory system…

…has several forms of natural defense mechanisms against contaminants in the air (nose hair, mucous-cilia "escalator", and macrophages). It also serves as the gateway to the body for toxins that are in the air we breathe.



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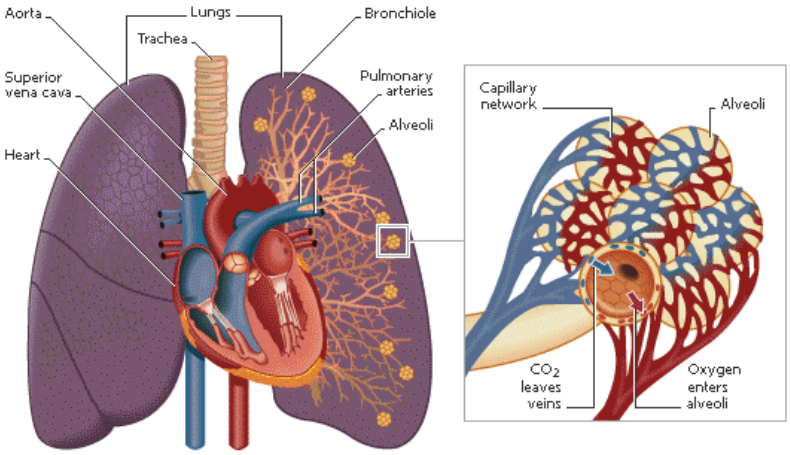
Breathe in, breathe out…



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Failure to Properly Recognize…

Environmental

Occupational

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Okay...it's important to recognize hazards. Why the focus on air contaminants? I feel fine today.
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Consider what may happen when you drop a heavy object on your toes and you are not wearing your safety shoes?
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And, consider what may happen when you cut yourself with a knife?

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So what do you think may happen if you breathe in a contaminant in a large enough dose that is capable of causing lung cancer?

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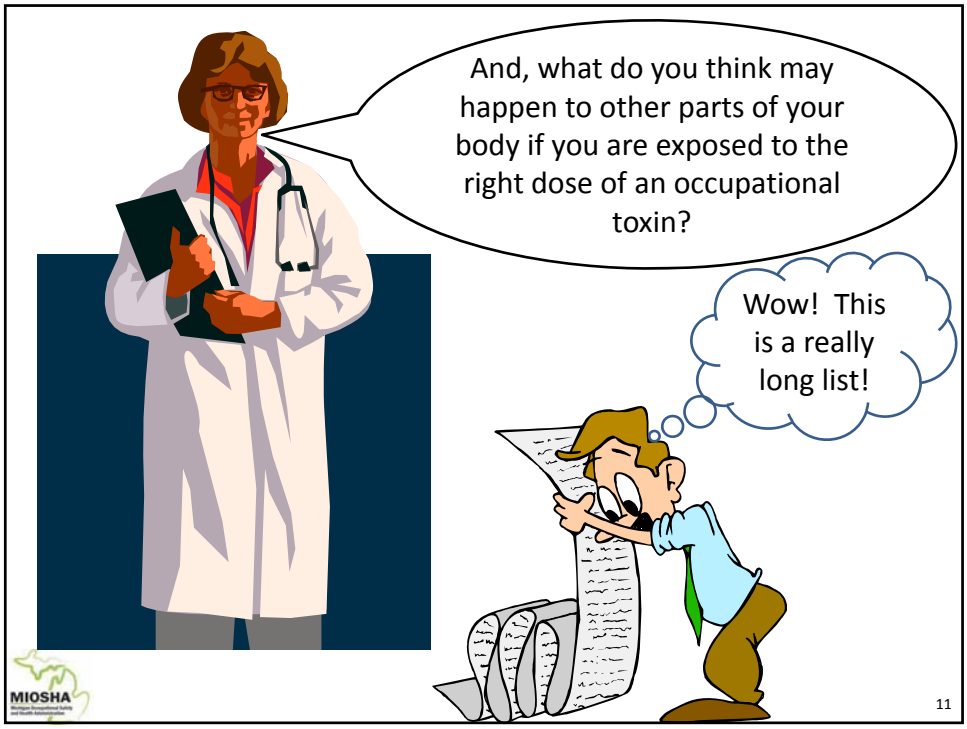
And, what do you think may happen to other parts of your body if you are exposed to the right dose of an occupational toxin?
Wow! This is a really long list!
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Whew…I never knew that! Tell me more about recognizing hazards, such as air contaminants, in the workplace…
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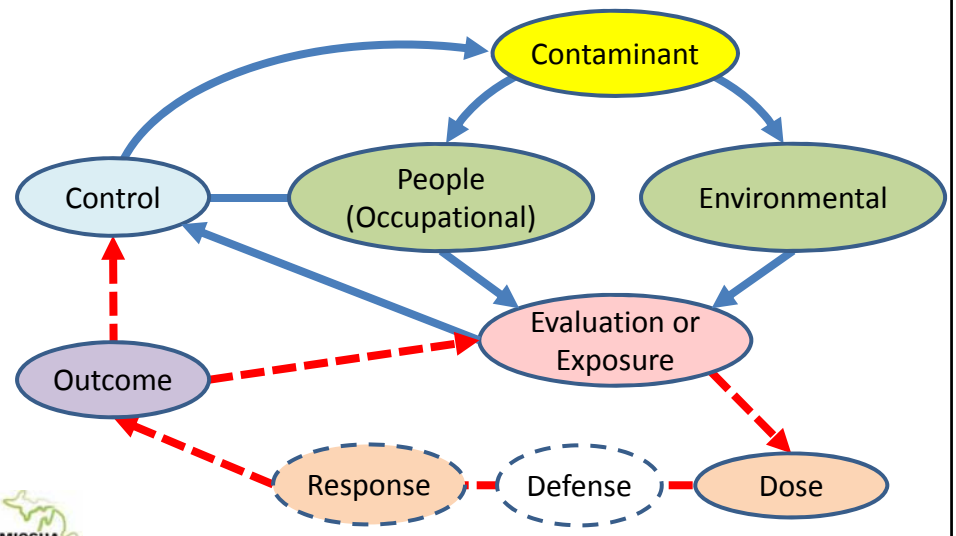
Occupational/Environmental Health Paradigm



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Industrial Hygiene Paradigm

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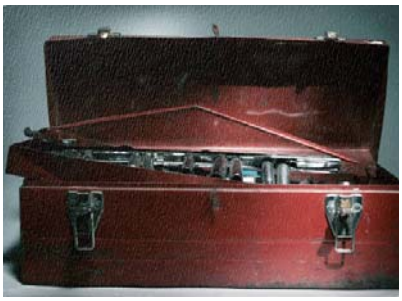
The Industrial Hygiene Toolbox

- **Anticipation**: contemplation, expectancy, foresight
- **Recognition**: distinguish, diagnose, know, notice, observe, perceive, see
- **Evaluation**: appraisal, assessment, calculation, decision, estimate, interpretation, opinion, valuation
- **Control**: containment, direction, guidance, limitation, management, oversight, regulation, rule, supervision



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Control

"containment, direction, guidance, limitation, management, oversight, regulation, rule, supervision"

Hierarchy of controls:

- Engineering controls:
  - Prevention
  - Substitution (less harmful substance)
  - Process automation, modification, or elimination
  - Isolation (of personnel or the hazard)
  - Ventilation (local exhaust or dilution)
- Administrative controls:
  - Employee rotation
  - Work practices and timing
  - Employee training
  - Oversight and supervision
  - Maintenance and housekeeping
- Personal protective equipment

Attend the Industrial Hygiene Division's, "My Ventilation System Sucks: Is That Good or Bad?," today at 1:30 PM.

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Evaluation

"appraisal, assessment, calculation, decision, estimate, interpretation, opinion, valuation"

- Sampling
- Monitoring
- Surveys, assessments, and walkthroughs

Attend the Industrial Hygiene Division's, "The Basics of IH Ventilation," today at 11:30 AM.

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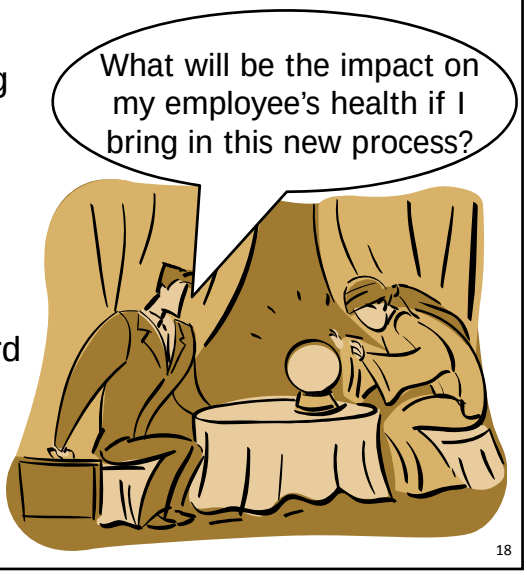
Anticipation

"contemplation, expectancy, foresight"

- Anticipation is the assessment of pending developments in the company (production, science, technology, regulatory) and there impact on employee safety and health.
- Is closely tied to hazard recognition.
- Change management



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Recognition

"distinguish, diagnose, know, notice, observe, perceive, see"

Recognition is a knowledge-based element requiring you to identify what hazards are in the workplace.

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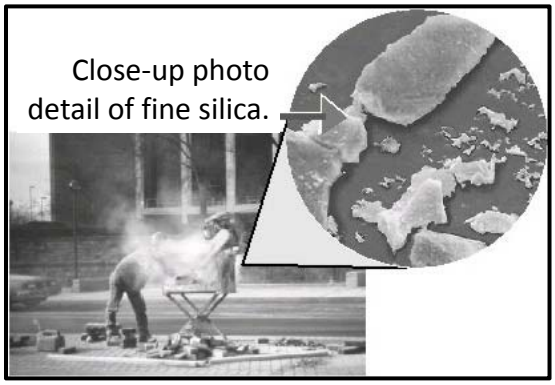
Types of Occupational Hazards

- Health (air contaminants)
- Flammability/explosiveness
- Reactivity
- Radioactivity
- Biological
- Physical



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Routes of Exposure

Ingestion

Inhalation

Injection

Absorption

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Sensory Perception

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Lack of Sensory Perception

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Dose-Response

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"All things are poisons…"

Paracelsus, 1493-1541

- Insights laid the foundation for a more dynamic approach in the medical sciences.
- "All things are poisons, for there is nothing without poisonous qualities. It is only the dose which makes a thing poison."
- Father of toxicology

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"What occupation does he follow?"

Bernardino Ramazzini, 1633-1714

- In 1713, published the first complete work addressing the principles and conclusions regarding occupational diseases.
- Father of industrial medicine

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Are **all things** really poisonous?

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Types of Air Contaminants

- Aerosols:
  - Fume: condensed vaporized metal
  - Mist: aerosolized liquid
  - Smoke: incomplete combustion product
  - Dust: results from mechanical action on solids
    - Total: looks at all dust particle sizes
    - Respirable: only concerned with that which can reach the alveoli of the lung
- Gases:
  - Gas: a material normally in the gaseous state at STP
  - Vapor: gaseous state of a substance that is normally a liquid or a solid at STP

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Dusts…

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Fumes, smoke and possibly vapors…

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Mists and vapors…

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Gases, vapors, and oxygen deficiency…

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Reasons for Recognizing Air Contaminant Exposures

- Mandate by regulatory requirement
- Response to employee complaints
- Evaluate the effectiveness of engineering controls
- Evaluate source of occupational medical concerns
- Gain background data

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Useful Information for Recognizing Air Contaminant Concerns

- Knowledge of the facility layout
- Familiarization with and knowledge of plant processes
- Inventory of materials, intermediates, by-products, and products
- Job activities and employee interaction with contaminants
- Review of plant injury and illness records and employee medical records
- Review of regulations
- Literature and Internet searches
- Networking

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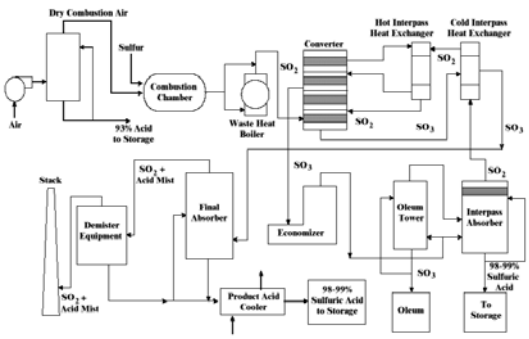
Knowledge of the Facility Layout



- General physical layout
- Location of:
  - Buildings and areas in them
  - Terrain features
  - Air intake and exhaust locations
  - Air flow patterns
- Blueprints, engineering drawings, piping and electrical schematics, ventilation system layout, etc.

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Familiarization With and Knowledge of Plant Processes

- Fundamental to correctly assessing air contaminant concerns
- Need to develop a reasonable understanding of:
  - Plant processes
  - Physical facilities
  - All chemical substances
  - Health hazards of substances
  - Nature of jobs and duties of personnel
  - Existing control measures
  - Health status of personnel
  - Results of past evaluations
  - Any other possible hazards

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Inventory

- Determine the chemicals that you:
  - Purchase and use
  - Produce
  - Are intermediates or by-products of your processes
- Procedures to track and approve all new substance purchases
- Consumption and production records
- Safety data sheets (SDSs)
- Additional information (as appropriate)
- Contractor materials
- "Greener" alternatives

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Job Activities and Employee Interaction

- Become familiar with employee job activities and the potential for exposure
- Review:
  - Job descriptions
  - Job hazard or safety analyses (JHAs and JSAs)
- Interview employees, supervisors, and contractors
- Define stresses that employees are exposed to

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Records Review

- SDSs
- Toxicology information:
  - MIOSHA (Michigan Occupational Safety and Health Admin.)
  - OSHA (Occupational Safety and Health Administration)
  - NIOSH (National Institute for Occupational Safety and Health)
  - ACGIH (American Conference of Governmental Industrial Hygienists)
  - AIHA (American Industrial Hygiene Association)
  - IARC (International Agency for Research on Cancer)
  - NTP (National Toxicology Program)
- Employee complaints and suggestions
- Injury and illness records
- Employee medical records
- Reports and publications addressing similar processes

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Regulations and Consensus Standards

- MIOSHA (Michigan Occupational Safety and Health Administration)
- OSHA (Occupational Safety and Health Administration)
- EPA (Environmental Protection Agency)
- MDEQ (Michigan Dept. of Environmental Quality)
- NIOSH (National Institute for Occupational Safety and Health)
- ACGIH (American Conference of Governmental Industrial Hygienists)
- AIHA (American Industrial Hygiene Association)

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Information and Internet Searches

- Regulatory agencies:
  - MIOSHA and OSHA
  - EPA and MDEQ
- Organizations and associations
- Manufacturer websites
- Other sources: remember, anyone can post to the Internet; use only reputable resources

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Organizations and Associations
(note that this is a very limited listing)

- ACGIH
- AIHA
- NIOSH:
  - Pocket guide to chemical hazards
  - Toxic substances list
- IARC
- NTP
- American National Standards Institute (ANSI)
- National Fire Protection Association (NFPA)
- American Society of Safety Engineers (ASSE)
- Local safety and health organizations:
  - Western Michigan Industrial Hygiene Assoc.
  - Michigan Industrial Hygiene Association
- Other state-run OSHA programs
- Colleges and Universities

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Networking

- Join local, state, and national safety and health organizations
- Attend:
  - Meetings
  - Courses:
    - College and university
    - Safety and health organizations
    - MIOSHA Training Institute (MTI)
- Volunteer with professional organizations
- Alliances and partnerships

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MIOSHA Air Contaminant Regulations, General Industry

- Part 301. Air Contaminants
- Expanded Standards:
  - Part 302. Vinyl Chloride
  - Part 303. Methylenedianiline (MDA)
  - Part 304. Ethylene Oxide
  - Part 305. Asbestos for General Industry
  - Part 306. Formaldehyde
  - Part 307. Acrylonitrile
  - Part 308. Inorganic Arsenic
  - Part 309. Cadmium
  - Part 310. Lead
  - Part 311. Benzene
  - Part 312. 1,3-Butadiene
  - Part 313. Methylene Chloride
  - Part 314. Coke Oven Emissions
  - Part 315. Chromium (VI) in General Industry
  - Part 350. Carcinogens

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MIOSHA Air Contaminant Regulations, Construction

- Part 601. Air Contaminants
- Expanded Standards:
  - Part 602. Asbestos for Construction
  - Part 603. Lead Exposure in Construction
  - Part 604. Chromium (VI) in Construction
  - Part 302. Vinyl Chloride
  - Part 303. Methylenedianiline (MDA)
  - Part 304. Ethylene Oxide
  - Part 306. Formaldehyde
  - Part 307. Acrylonitrile
  - Part 308. Inorganic Arsenic
  - Part 309. Cadmium
  - Part 311. Benzene
  - Part 312. 1,3-Butadiene
  - Part 313. Methylene Chloride
  - Part 314. Coke Oven Emissions

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MIOSHA Air Contaminant Regulations, Agriculture

- Part 700. Agriculture (air contaminants contained within)
- Expanded Standards: Part 309. Cadmium

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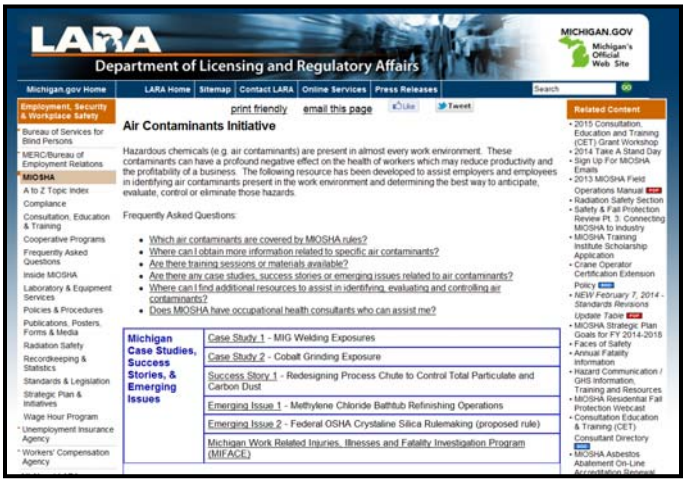
MIOSHA Strategic Plan (FY14-18)

Air Contaminants Initiative



www.mi.gov/aircontam

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Air Contaminants Outreach Opportunities

Some of the outreach opportunities identified include:

- Highlighting more health related case studies and best practices in MIOSHA communications
- Revising existing MIOSHA occupational health publications and developing new ones.
- Developing and presenting training on isocyanates and silica.
- Adding more occupational health related videos to the MIOSHA lending library.
- Offering CET assistance to Michigan workplaces on evaluating and controlling air contaminants.

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Air Contaminant National Emphasis Programs

- Combustible dust
- Isocyanates
- Primary metal industries
- Hexavalent chromium
- 1,3-Butadiene
- Methylene chloride
- Cove oven emissions
- Vinyl chloride
- Methylenedianiline (MDA)
- Ethylene oxide (EtO)
- Formaldehyde
- Acrylonitrile
- Inorganic arsenic
- Cadmium
- Lead
- Benzene

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Significant Air Contaminant Issues on the Radar

- Silica: pending regulation
- Combustible dusts: pending regulation
- Isocyanates: national emphasis program

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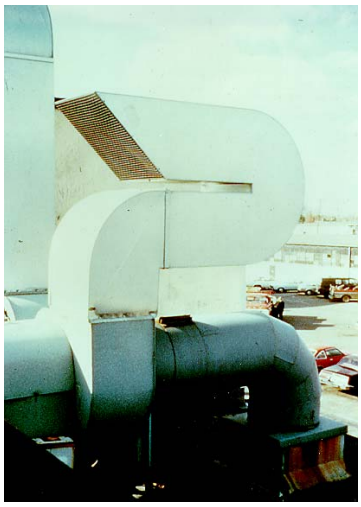
Any Questions



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