Atlantic Alliance 2006

Silica and Asbestos/Non-asbestos Issues

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Silica and Asbestos/Non-asbestos Issues

• Crystalline Silica
  – Introduction
  – Background and Health Effects
  – Current Regulations and Programs
  – Results of Efforts to Control Silica Exposure
  – Agency Focus on Lowering Exposure Limits

• Asbestos/Non-asbestos
  – Asbestos: Background and Health Issues
  – Nonasbestiform Minerals
  – Analytical Method Issues

• Hanson Approach to Occupational Health
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Respirable Crystalline SILICA
Silica: A Common Material

• Present in many minerals
  – Limestone - Shale
  – Granite - Slate
  – Sandstone - Sand

• Found everywhere
  – Beaches - Roads
  – Golf courses - Agriculture

• Exists in crystalline and amorphous forms
**UPDATE: Silica**

Silicosis

- Prolonged overexposure
- Occupational illness
Other Diseases Potentially Related to Crystalline Silica Exposure

- Increased Risk of Tuberculosis
- Other Associated Conditions
  - Autoimmune disorders
  - Kidney disease
- Chronic Obstructive Pulmonary Disease*
  - Bronchitis
  - Emphysema

* Smoking continues to be the main cause of COPD in the U.S.
Potential Carcinogenic Effect of Silica

- **IARC**
  - 1987 Probable, 1996 Known
- **NTP**
  - 1992 Reasonably Anticipated, 2000 Known
- **ACGIH**
  - 1999 Suspect
- **NIOSH**
  - 1988 Potential
- **OSHA/MSHA**
  - Potential
Regulation of Crystalline Silica

OSHA

- Occupational Safety and Health Administration
- Established in early 1970’s.
- Permissible Exposure Limit
  - Dust Containing >1% Crystalline Silica
  - 10 mg/m³/(%SiO₂ + 2)

MSHA

- Mine Safety and Health Administration
- Established in late 1970’s.
- Permissible Exposure Limit
  - Same as OSHA
Hazard Communication Program

• Ensure employees know
  – Hazards of silica overexposure
  – Measures for controlling exposure
  – How to protect themselves

• MSDS
  – Required by both OSHA and MSHA

• Labeling
  – Shipped products
  – In plant hazards
Smoking Cessation Program

- Smoking responsible for 87% of lung cancers
- Smoking complicates diagnosis of lung diseases
- Smoking cessation provides health benefits to individuals
UPDATE: Silica

Significant Reduction in Silicosis Mortality Rate

1968: 1157 deaths (8.91 deaths/million people)
2002: 148 deaths (0.66 deaths/million people)

93 % decline in mortality rate

Deaths in early part of study before national exposure standards and industrial hygiene controls were implemented

NIOSH 2002

*Per million persons aged ≥15 years.
### OSHA/MSHA Silica Sample Data 1990 - 1999

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of Samples</th>
<th>GM (mg/m³)</th>
<th>% &gt; PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal mining</td>
<td>8,382</td>
<td>0.013</td>
<td>12.4</td>
</tr>
<tr>
<td>Miscellaneous nonmetallic mineral and stone products</td>
<td>391</td>
<td>0.041</td>
<td>30.2</td>
</tr>
<tr>
<td>Nonmetallic mining and quarrying, except fuel</td>
<td>99,529</td>
<td>0.008</td>
<td>7</td>
</tr>
<tr>
<td>Iron and steel foundries</td>
<td>1,766</td>
<td>0.047</td>
<td>29.3</td>
</tr>
<tr>
<td>Structural clay products</td>
<td>213</td>
<td>0.045</td>
<td>32.9</td>
</tr>
<tr>
<td>Blast furnaces, steelworks, rolling and finishing mills</td>
<td>44</td>
<td>0.011</td>
<td>2.3</td>
</tr>
<tr>
<td>Machinery, except electrical, n.e.c.</td>
<td>204</td>
<td>0.046</td>
<td>32.4</td>
</tr>
<tr>
<td>Construction</td>
<td>687</td>
<td>0.07</td>
<td>40.6</td>
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<tr>
<td>All other industries</td>
<td>2,562</td>
<td>0.026</td>
<td>19.9</td>
</tr>
<tr>
<td>TOTAL (excluding coal mining)</td>
<td>113,778</td>
<td>0.009</td>
<td>8.4</td>
</tr>
<tr>
<td>Coal mining</td>
<td>80,642</td>
<td>0.052</td>
<td>30.1</td>
</tr>
</tbody>
</table>

PEL - permissible exposure limit
GM - geometric mean
mg/m³ - milligrams per cubic meter

NIOSH 2002
UPDATE: Silica
### UPDATE: Silica

**Current U.S. Exposure Limits and Guidelines**

<table>
<thead>
<tr>
<th>Agency</th>
<th>Exposure Limit</th>
<th>Averaging</th>
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</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>~ 0.1 mg/m³</td>
<td>8-hour TWA</td>
</tr>
<tr>
<td>MSHA</td>
<td>~ 0.1 mg/m³</td>
<td>8-hour TWA</td>
</tr>
<tr>
<td>Cal / OSHA</td>
<td>0.1 mg/m³</td>
<td>8-hour TWA</td>
</tr>
<tr>
<td>NIOSH</td>
<td>0.05 mg/m³</td>
<td>8-hour TWA</td>
</tr>
<tr>
<td>ACGIH</td>
<td>0.025 mg/m³</td>
<td>8-hour TWA</td>
</tr>
</tbody>
</table>
Proposed OSHA Regulation

- Published a draft proposed standard in Oct 2003.
- SBREFA review subsequently conducted.
- Awaiting publication of Risk Assessment.
- General Industry, Maritime and Construction versions.
- Listed three possible Exposure Limits:

<table>
<thead>
<tr>
<th>PEL</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 mg/m³</td>
<td></td>
</tr>
<tr>
<td>0.075 mg/m³</td>
<td></td>
</tr>
<tr>
<td>0.05 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>
Proposed Cal/OSHA PEL Reduction

- Airborne Contaminants Advisory Committee (ACAC).
- Recommended reduction from 0.1 to 0.01 mg/m³
- Hearing in May 2005
  - controls not feasible
  - analytical methods not reliable at that level.
- Labor and Industry recommended enforcement of existing PEL.
- May be sent to Specific Substance Advisory Committee
ACGIH TLV Reduction

- Reduced TLV from 0.05 to 0.025 mg/m³.
- ACGIH not consensus group; TLV determinations closed-door meetings.
- ACGIH currently being sued over TLV process.
- Crystalline Silica Panel of ACC submitted request to OSHA to suspend obligation to reference TLV on MSDS.
- NAM, other industry groups petitioned D.C Circuit Court to review OSHA Haz Com Standard re TLV reference.
- Legislation introduced in U.S. Congress to require guidelines referenced by OSHA to be product of a transparent development process.
NSSGA Position

- Rigorous compliance with and enforcement of current PEL before reduction considered
- Implement medical surveillance program
- Meeting current PEL is believed to prevent silica-related disease
- Sound science MUST be the basis for establishing regulatory limits
ASBESTOS: ...variety of naturally occurring silicate minerals which have crystallized in the asbestiform habit causing them to be easily separated into long, thin, flexible, strong fibers when crushed or processed.
Health Hazards

• Long recognized as a severe health hazard
• Link between asbestos exposure and
  – Lung cancer
  – Mesothelioma
  – Other fibrogenic disease
  is well established and accepted.
• Highly regulated mineral
Current Issues

Current issues with “asbestos” are:

– What isn’t asbestos
  
  (and shouldn’t be regulated as such)

– How do you identify what is asbestos
  
  (and what isn’t)
Physical Characteristics

Asbestos

Non-Asbestiform Minerals
Amosite vs. Cummingtonite-grunerite

Asbestiform

Nonasbestiform

*Identical chemical compositions: different habits*
Tremolite asbestos vs. Tremolite

Asbestiform

Nonasbestiform

Identical chemical compositions: different habits
Analytical Methods

- Developed for use with commercial asbestos.
- Used for abatement projects (is it clean yet?).
- Commercial asbestos not “contaminated” with non-asbestiform minerals (cleavage fragments).
- Current methods are not good at differentiating between asbestiform and cleavage fragments.
- “Naturally occurring” asbestos contains both.
Why does it matter?

- No health studies to date have shown an association between non-asbestos minerals and asbestos-type health effects.
- In spite of the science, some in the regulatory community believe that non-asbestiform minerals should be regulated as asbestos.
Why does it matter?

- Non-asbestiform minerals are much more common than the asbestiform.
- Lack of acceptable methods for distinguishing between the two forms easily results in non-asbestiform minerals being falsely identified as asbestos.
- Regulation of and/or misidentification of non-asbestiform minerals as asbestos would significantly impact the mining of crushed stone, sand and gravel and the downstream users of these materials.
Hanson’s approach to an Occupational Health Program
IH Training for Safety Personnel

- Math
- IH Basics
- Exposure Limits
- Air Monitoring
- Noise Monitoring
- Field Exercise
- Quiz
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Sound Regulations