Transitioning to Safer Chemicals

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OSHA Region I
Transitioning to Safer Chemicals
A Toolkit for Employers and Workers

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Protecting Workers from Hazardous Chemicals
Protecting Workers from Hazardous Chemicals

1. Engage
2. Evaluate
3. Identify
4. Inventory & Prioritize
5. Assess & Compare
6. Select
7. Test

Steps for Transitioning to Safer Chemicals

OSHA Annotated Table Z-1

<table>
<thead>
<tr>
<th>OSHA PEL</th>
<th>CaOSHA PEL</th>
<th>NIOSH REL</th>
</tr>
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<tbody>
<tr>
<td>ppm (a2)</td>
<td>mg/m³ (a3)</td>
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<td>360</td>
<td>(C) 25 ppm</td>
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<td>2400</td>
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<tr>
<td>40</td>
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<td>40 ppm</td>
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</table>

See Section 5209

14
1 ppm
See Appendix D

0.1
0.1 ppm
0.1 ppm
0.3
0.03 mg/m³
0.03 mg/m³, See Appendix A

0.25
0.25 mg/m³
0.25 mg/m³
2
0.5 ppm
2 ppm

0.25
0.25 mg/m³
0.25 mg/m³

1
1 ppm
1 ppm

OSHA®
Protecting Workers from Hazardous Chemicals

Steps for Transitioning to Safer Chemicals

1. Engage
2. Evaluate
3. Identify
4. Inventory & Prioritize
5. Select
6. Test
7. Assess & Compare

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<tr>
<th>OSHA PEL(a) ppm (x2)</th>
<th>mg/m³ (x3)</th>
<th>CalOSHA PEL(b) ppm</th>
<th>NIOSH REL(c) mg/m³</th>
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<tr>
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<td>See Appendix A</td>
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<td>1 ppm</td>
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<td>(C) 0.1 ppm</td>
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<td>0.3</td>
<td>0.03 mg/m³</td>
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<td>0.03 mg/m³; See Appendix A</td>
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</tbody>
</table>
• Tool Development by Directorate of Standards and Guidance
  – DSG develops standards and major industry guidance
• Arises from desire to update PELs
Annotated PEL Tables

• Includes
  – OSHA Permissible Exposure Limits
  – Recommended Exposure Limits by NIOSH
    • As of 4/26/13
  – California OSHA Permissible Exposure Limits
    • As of 4/26/13
  – ACGIH Threshold Limit Values
    • 2014 Edition
Annotated PEL Tables

Note: This table only includes occupational exposure limits (OELs) for substances listed in the OSHA Z-1 Table. OELs for hundreds of additional substances have been adopted by Cal/OSHA®, NIOSH®, and ACGIH®. These organizations periodically make revisions to their OELs and so they should be consulted directly for their most current values and substances, as well as special notations such as for skin absorption. The TLVs® and BEIs® are copyrighted by ACGIH® and are not publicly available. However, they can be purchased in their entirety on the ACGIH® website at [http://www.acgih.org/store/](http://www.acgih.org/store/). Permission must be requested from ACGIH® to reproduce the TLVs® and BEIs®. Click here® for permission request form.

### OSHA Annotated Table Z-1

*Go to list of all footnotes*

<table>
<thead>
<tr>
<th>Substance</th>
<th>CAS No.</th>
<th>ppm (d)</th>
<th>mg/m³ (e)</th>
<th>8-hour TWA (ST) STEL</th>
<th>Up to 10-hour TWA (ST) STEL</th>
<th>8-hour TWA (ST) STEL</th>
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<tbody>
<tr>
<td>Acetaldehyde</td>
<td>75-07-0</td>
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<td>(C) 25 ppm</td>
<td>(C) 25 ppm</td>
<td>Ca</td>
</tr>
</tbody>
</table>

See Appendix A®

See Appendix C®
Transitioning to Safer Chemicals
Engineering Controls

• Elimination
• Substitution
• Process Redesign
  – Work practice redesign
• Isolation
• Local ventilation
• General ventilation
Substitution With OSHA

• Regulation Driven
  – Benzene has a PEL
  – Oh my, OSHA may issue citations
  – Look, methyl ethyl death does not have a PEL
  – Let’s use that!
Examples

- Methylyene chloride for Trichloroethylene
- Anything diisocyanate for 2,4 Toluene Diisocyanate
- Methyl Chloroform for Trichloroethylene
Problems

• Exchanging the devil you know for the one you don’t.
  – OSHA problems vs. EPA problems
  – More toxic

• Production problems
The Transitioning Process

1. Engage
2. Inventory & Prioritize
3. Identify
4. Assess & Compare
5. Select
6. Test
7. Evaluate

Steps for Transitioning to Safer Chemicals
Why Transition to Safer Alternatives?

- Improve worker health and safety

  - Reduce costs
  - Reduce potential for regrettable substitutions

  - Achieve compliance with laws and regulations
  - Create safer products for consumers and the environment
Resources

• Includes links to a number of
  – Toolkits
  – Frameworks
  – Methodologies
The Transitioning Process

1. Form a Team
2. Examine current chemical use.
3. Identify Alternatives
4. Assess and compare alternatives
5. Select a safer alternative
6. Pilot the alternative
7. Implement the alternative.
Form a Team to Develop a Plan

Key Questions:

How will workers be involved?
Who should develop the work plan and set goals?
What goals should be included in the plan?
Policies, tasks, responsibilities, deadlines?
What drivers (laws, consumer pressure etc.) to consider
Involvement of external stakeholders?
Form a Team to Develop a Plan

Key Examples
Examine Current Chemical Use

Key Questions:

For each Chemical

- Location of chemical being used?
- Function chemical performs?
- Is the chemical necessary?
  - Could the chemical be eliminated?
- Hazards associated with the chemical? how could its use harm workers?
- How are workers potentially exposed to the chemical?

Identify Priorities

- Hazards should be eliminated or reduced first?
- Uses of chemicals of greatest concern?
- Potential chemical exposures of greatest concern?
- Chemical or process changes that improve workplace safety and health?
- Consistency of identified priorities with the work plan for transitioning?
Examine Current Chemical Use

Inventory Hazardous Chemicals

Create List of Chemicals
- (M)SDS list
- Annotated process flow diagram
- List of chemicals

Identify hazards of chemicals
Examine Current Chemical Use

Inventory Hazardous Chemicals

Key Resources

- Restricted and Priority Substance Database
- Chemical Hazard and Alternatives Toolbox (ChemHAT)
- RISCTOX
Examine Current Chemical Use

Prioritize

- Decide order for chemicals to be considered
- Key Resources
  - European Commission's Prioritization Matrix
Examine Current Chemical Use

Further Resources

Other Tools for

– Creating Chemical Inventories
– Obtaining Product Chemical Information
– Assessing Chemical Hazard
Identify Alternatives

Key Questions:

• Already proven alternatives?
• Material or Process changes to replace chemical use?
• Opportunities for collaboration with others with similar conditions?
Identify Alternatives

Identification Process

- Broadly consider and research
  - possible chemical alternatives,
  - material alternatives,
  - process changes,
  - design changes,
  - technological solutions, or other options
Identify Alternatives

Identification Process

• Consult a wide group of sources
  – Begin with industry specific information and case examples
  – Talk to facilities that have tried alternatives
  – Talk to suppliers, employees, competitors, etc.
  – Perform research if necessary
Identify Alternatives

Further Resources

On line Resources:
– Case Studies
– Databases of Alternatives
– Completed Alternatives Assessments
– Scientific Literature
  • (Toxic Use Reduction Institute Library)
Assess and Compare Alternatives

Key Questions:

To prioritize alternatives:
• What are the performance requirements?
• ESH Risk of alternatives

When assessing and comparing alternatives:
• What tox. and physical properties need to be compared?
• Potential changes to work tasks and in exposures
• Possible new/different hazards
• Performance criteria
• Costs
Assess and Compare Alternatives

Assessment and Comparison Process

- Prioritize identified alternatives
- Assess hazards —
  - Chemical and physical
- Assess performance
  - Physical properties, performance characteristics
- Assess costs
  - Direct, Indirect, Liability,
  - Less Tangible Benefits
Assess and Compare Alternatives

Further Resources

On line Resources:

– Hazard Criteria
– Comparative Chemical Hazard Assessment Tools
– Performance Criteria
– Cost Criteria
Select a Safer Alternative

Key Questions:

- Advantages and disadvantages of each alternative
- What trade-offs exist for each alternative?
- How should the various criteria and impacts be weighed?
- Other considerations to weigh
  - energy use, water use, environmental impacts, hazardous waste management, upstream or downstream hazards to workers, etc.
Select a Safer Alternative

Selection Process:

- Display results to facilitate decision making
- Select Alternative
Select a Safer Alternative

Further Resources:

- Display results
  - Interstate Chemicals Clearinghouse (IC2). [Presenting Results](#)
- Select Alternative
  - Interstate Chemicals Clearinghouse (IC2). [Guidance for Alternatives Assessment and Risk Reduction](#)
Pilot the Alternative

Key Questions:

• Does the alternative perform well?
• Does the alternative change working conditions?
• What training do workers need to safely and effectively use the alternative?
• Are there any unforeseen effects or trade-offs of using the alternative?
• Is there a secure supply of the alternative?
• How could the alternative be implemented on a larger scale?
Key Example

Pollution Prevention-Occupational Safety and Health Work Site Assessment (P²OSH)
POSH Process

1. Establish p'OSH team
2. Identify materials / processes to be replaced (p'OSH intervention target)
3. Conduct pre-intervention worksite assessment
4. Research and screen alternatives (Potential interventions)
5. Pilot one alternative (Intervention)
6. Conduct post-intervention worksite assessment
7. Evaluate alternative
   - Acceptable
     - Implement alternative full scale
   - Unacceptable
     - Process change
     - Continuous improvement
8. No process change
Implement the Alternative

Key Questions:

• Are workers benefiting from using the alternative?
• Have customers, supply chain partners, or others provided any feedback?
• How can the use of the alternative be improved?
Implement the Alternative

Activities:

• Plan the technological and organizational changes needed to fully implement change
  – developing an implementation plan;
  – documenting the implementation plan;
  – deciding who should be involved in implementation;
  – communicating the plan to workers; and
  – developing and performing the necessary training
Implement the Alternative

Activities:

- Monitoring and evaluating the full implementation
  - Track the actual impacts on
    - Worker Health and Safety
    - Performance and efficiency of the tasks or processes
    - Sales and Service
  - Keep aware of ongoing improvements that will make your process even more safe.
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Notes:
- (a) PEL (Permissible Exposure Limit)
- (b) Ca(OSHA PEL) (California OSHA Permissible Exposure Limit)
- (c) NIOSH REL (National Institute for Occupational Safety and Health Recommended Exposure Limit)