Applying Environmental & Occupational Hazard, Exposure, and Risk Management Processes

2015 CIHC Conference  San Francisco, CA
Evaluating Worker Exposures – The Future is Here
Wednesday, December 9, 2015
David M. Zalk, PhD, CIH, FAIHA
E&ORM – The Banding of EHS

- Risk Communication through Risk Assessment
- Risk Level Based Management System (RLBMS)
- Developing and Applying RLBMS
- Risk Assessment & Control Database
- Banding Environment, Health, and Safety (EHS)
- Banding Environmental & Occupational Risk Management (E&ORM)
- Lessons Learned
- Future Vision
Risk Communication

The Stoplight Effect – What do you do at a red?
Risk Communication

The Stoplight Effect – What do *you* do at a green?

STOP!
Risk Communication

Easy worker system is green & red – is it practical?

STOP!

GO!
Risk Communication

The Stoplight Effect – What do you do at a yellow?

STOP!

GO!
The Stoplight Effect – What do you do at a yellow?

STOP!

- Stop every time?
- Go every time?
- Assess traffic, then decide?
- Speed limit vs. your speed?

GO!
The Stoplight Effect – What do you do at a yellow?

STOP!

- Stop every time?
- Go every time?
- Assess traffic, then decide?
- Speed limit vs. your speed?

... or CHECK FOR POLICE?

GO!
"Banding" splits ‘yellow’ into two risk levels (RLs)
Daily Life at a National Research Laboratory

- Mission
  - Basic Science
  - Biosecurity
  - Counterterrorism
  - Defense
  - Energy

- Research
  - Computation
  - Engineering
  - Physical and Life Sciences
  - Global Security
  - Lasers
Can Control Banding Work at a National Lab?

- Traditional Hierarchy of Exposure Control Practices
  - Elimination
  - Substitution
  - Modification
  - Containment
  - Ventilation
  - Work Practices
  - Personal Protection

- CONTROL BANDING and NANOTECHNOLOGY

- 22 Ethics and OELs
- 23 Sizing Up OSHA
- 30 Protecting the Aging Workforce
- 34 Respiratory Protection in a Pandemic
### Logic Behind Risk Level Based Management System (RLBMS)

<table>
<thead>
<tr>
<th>Probability</th>
<th>RL1</th>
<th>RL2</th>
<th>RL3</th>
<th>RL4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very High</strong></td>
<td></td>
<td></td>
<td>RL3</td>
<td>RL4</td>
</tr>
<tr>
<td>(serious injury or illness)</td>
<td></td>
<td></td>
<td>RL2</td>
<td>RL4</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td>RL2</td>
<td>RL2</td>
<td>RL3</td>
</tr>
<tr>
<td>(lost work time)</td>
<td></td>
<td>RL2</td>
<td>RL2</td>
<td>RL3</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td>RL1</td>
<td>RL1</td>
<td>RL2</td>
<td>RL3</td>
</tr>
<tr>
<td>(recordable)</td>
<td></td>
<td>RL1</td>
<td>RL2</td>
<td>RL3</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>RL1</td>
<td>RL1</td>
<td>RL1</td>
<td>RL2</td>
</tr>
<tr>
<td>(up to first aid)</td>
<td></td>
<td>RL1</td>
<td>RL1</td>
<td>RL2</td>
</tr>
</tbody>
</table>

#### RL1: OK. Employees perform work under bi-annual application or approval. No oversight by Occupational Health & Safety (H&S) disciplines necessary.

#### RL2: Log. Established tasks with approved controls, recorded by supervisor. Periodic review of tasks, procedures, and controls by H&S disciplines.

#### RL3: Permit. H&S Team/supervisor review of hazard & controls (1 page). Supervisor and cognizant H&S disciplines need to formally concur.

#### RL4: Controlling Document. A thorough review of hazards & controls with the H&S Team, workers, and supervisors is performed and documented.
Logic Behind RLBMS
Risk Level Based Management System as Risk Communication

- Benefits to RLBMS
  - Cost-Efficient
  - Calibration
  - Participatory
  - Simplified
  - Establishes Risk-to-Task

CLEAR RISK BASIS FOR WORKERS

- Contact ES&H Team
- Permit
- Supervisor Log
- Skill of the Craft
- Doc’t

R & D (IWS) {25%} 

STANDARD TASKS {75%}
Once the RL is known…

… Risk Communication flows

- What level of hazards are present
- What controls are required
- What PPE is necessary
- What level of ‘sign-off’ is expected
- What documentation is necessary
- What level of training is required
- Whether medical surveillance is necessary
- What level of assistance is necessary
- Do I need advice from an expert
- SHOULD I PICK UP A PHONE AND ASK
How to Solve Hazard Assessment Inconsistency Issues? RLBMS and Control Banding Strategies

Once the RL is known… … Risk Communication flows

Batching tasks by similar exposures / controls

Example for Beryllium

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Example Tasks</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasonable likelihood of airborne</td>
<td>CFF Chamber Entry; Large-scale D&amp;D</td>
<td>RBWA; Tyveks; Respirator; Be Workers;</td>
</tr>
<tr>
<td>Dermal, possibility of limited airborne</td>
<td>Mechanical testing; Sputtering; Large assemblies</td>
<td>BWA: Respirator; Be Workers</td>
</tr>
<tr>
<td>Dermal exposure only</td>
<td>Handling small parts (targets); Work with foils</td>
<td>Local posting / labeling; Gloves; Be Awareness</td>
</tr>
<tr>
<td>No exposure potential</td>
<td>Instrument with embedded Be window</td>
<td>Do not access components.</td>
</tr>
</tbody>
</table>
## RLBMS Outcomes: Safety Checklist

<table>
<thead>
<tr>
<th>NO</th>
<th>N/A</th>
<th>Items Assessed</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
<th>Items Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Fall Prevention and Protection</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Excavation and Trenching</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employees are utilizing 100% fall protection at/above 6 feet (2 m).</td>
<td>22</td>
<td></td>
<td></td>
<td>Before digging, “utility locates” have been performed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100% tie-off maintained at/above 6 feet (2 m) or when exposed to a fall hazard.</td>
<td>23</td>
<td></td>
<td></td>
<td>Occupied excavations are adequately protected against cave-in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fall protection is in satisfactory condition</td>
<td>24</td>
<td></td>
<td></td>
<td>“Competent Person” daily inspections are completed prior to excavation entry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employees will not contact a lower level obstruction during an arrest</td>
<td>25</td>
<td></td>
<td></td>
<td>Adjacent equipment (stationary/mobile) is controlled to prevent imminent danger to occupants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Floor/Wall openings are covered, protected and labeled (i.e., load rating)</td>
<td>26</td>
<td></td>
<td></td>
<td>Employees are hand digging with non-conductive tools while locating underground utilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Electrical Safety and Lockout/Tagout (LOTO)</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Scaffolds</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A GFCI/CB Assured Grounding/Earthing program is being used where required</td>
<td>27</td>
<td></td>
<td></td>
<td>Scaffolds are installed, maintained and inspected per requirements and possess scaffold tag</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All exposed conductors are covered by closed electrical enclosures</td>
<td>28</td>
<td></td>
<td></td>
<td>Modification, erection and dismantling are performed only by competent scaffold erectors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temporary wiring terminations are protected both dielectrically and mechanically</td>
<td>29</td>
<td></td>
<td></td>
<td>Scaffolds are grounded where exposed to induction/electrical conductors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ground prongs are present on extension cords and power tools as required</td>
<td></td>
<td></td>
<td></td>
<td><strong>Ladders</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proper PPE is being used when working on energized circuits</td>
<td>30</td>
<td></td>
<td></td>
<td>Metal ladders and multi purpose ladders are not being used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All applicable hazardous energies are isolated with an attached LOTO device and tag and all residual stored energy relieved</td>
<td>31</td>
<td></td>
<td></td>
<td>Straight/Extension ladders are secured against displacement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zero energy checks are being performed with a voltmeter</td>
<td>32</td>
<td></td>
<td></td>
<td>Ladder positioning is adequate to perform work safely (proper ladder angle)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Each exposed individual has control over the lockout device</td>
<td>33</td>
<td></td>
<td></td>
<td>Ladder is suitable for the task (e.g., extension vs. A-frame)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LOTO device emergency/absent removal protocols are being followed</td>
<td>34</td>
<td></td>
<td></td>
<td>Employees are not standing on the top two rungs of ladders</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proper insulated tools are being used for electrical work</td>
<td>35</td>
<td></td>
<td></td>
<td>Employees are maintaining 3-point contact while climbing ladders</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Confined Space</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Lifting/Rigging Operations</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A full time attendant is present during confined space entry</td>
<td>36</td>
<td></td>
<td></td>
<td>Only qualified operators are operating hosts (stationary and mobile)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confined space is being monitored for potential chemical and atmospheric hazards</td>
<td>37</td>
<td></td>
<td></td>
<td>Rigging operations are performed only by qualified riggers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequate rescue equipment is readily available</td>
<td>38</td>
<td></td>
<td></td>
<td>In-service rigging equipment is in satisfactory condition (load limit tags, inspected, defect free, hoists)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The entry permit addresses all imminent dangers for permit required confined spaces</td>
<td>39</td>
<td></td>
<td></td>
<td>All load hooks are equipped with safety latches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is the proper signage in place</td>
<td>40</td>
<td></td>
<td></td>
<td>Swing radius has been identified/barricaded with danger tape or barricaded if needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Confined Space</strong></td>
<td></td>
<td></td>
<td></td>
<td>High voltage lines are shielded when hoisting and rigging operations are within 10 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A full time attendant is present during confined space entry</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What makes an Negative Exposure Assessment?

- Quantitative Validation!
  - How many samples?
  - How often do we re-sample?
  - How broad is the task scope?
  - How narrow is the task scope?
  - How detailed are the captured parameters?
  - Other considerations?

**KEY COMPONENT**

FOR RL3 ➔ RL2
## Does Control Banding Fit with Regulations?

### Contract Management (External) – Selected from 1262 entries

<table>
<thead>
<tr>
<th>CFR Code</th>
<th>Regulation/Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 CFR 835</td>
<td>BMBL</td>
</tr>
<tr>
<td>10 CFR 850</td>
<td>BAAQMD</td>
</tr>
<tr>
<td>10 CFR 851</td>
<td>CA Health &amp; Safety</td>
</tr>
<tr>
<td>29 CFR 1910</td>
<td>CA Labor Code</td>
</tr>
<tr>
<td>29 CFR 1926</td>
<td>CA Water Code</td>
</tr>
<tr>
<td>ACGIH Ventilation Manual</td>
<td>DOE Orders</td>
</tr>
<tr>
<td>ACGIH TLVs 2005</td>
<td>DOE Guidelines</td>
</tr>
<tr>
<td>ACGIH TLVs &amp; BEIs 2008</td>
<td>Executive Orders</td>
</tr>
<tr>
<td>ANSI</td>
<td>IEEE</td>
</tr>
<tr>
<td>ASME</td>
<td>ISO 14001:2004</td>
</tr>
</tbody>
</table>

### Contractor Assurance (Internal) – Adds Policies & Processes
DOE-Related Regulations

- **DOE-STD-6005-2001**
  - Section 5.1 “...Baselines must be updated periodically with the frequency of updates being determined by risk and variability of operations…”
  - Section 5.3 “...The frequency that evaluations are updated should be proportional to the risk presented by the hazard(s), the variability of the operation, the operation frequency, and the type and dependability of the controls limiting exposures…”

- **10 CFR 851**
  - Sub-Section 851.24 (6)(a) Industrial Hygiene: {Contractors must implement...} **Initial or baseline surveys and periodic resurveys and/or exposure monitoring as appropriate of all work areas or operations** to identify and evaluate potential worker health risks;
Risk Assessment & Control (RAC) Database
(Main Menu)

FIRST Step is to Develop a Procedure:
1. Hazard ID
2. Hazard Assessment
3. Risk Assessment
4. Control Application

SECOND Step is to Develop Tool/Database:
1. Outline database processes to match procedure

NOT the other way around!
Accessing and Using the RAC Database

Worker Safety & Health Functional Area
IH Risk Assessment & Control Database

Risk Assessment
To create a new permit, first perform a risk assessment. To view or extend existing permits or HAC, enter WCD#, Type & Task, then click on AWP, LWP or HAC button. Leave fields blank to find all.

Facility Survey
Select a specific facility from the list and then click the Perform Search button. Leave the field blank to find all.

Hazard Source Documents
Risk Levels

Lawrence Livermore National Laboratory
Hazard Source Documents

The “Source” of Truth

Development

- Define Risk Levels
- Include example tasks
- Define controls per RL
- Define follow up requirements

Key Points:
- 1. Assessment & control language written for the worker
- 2. Field ESH personnel concurrence on content
# Hazard Source Documents

List developed by identifying OSHA regulated materials and LLNL specific policy. NOL-Liquid/Mist/Vapor & NOL-Solid/Dust/Fiber hazards are a catch-all for chemicals “Not Otherwise Listed” below.

## > 36 Hazard Source Documents for IH

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Hazard Category</th>
<th>Other Hazard Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Butadiene</td>
<td>Biological (BSL)</td>
<td>Hydrofluoric Acid</td>
</tr>
<tr>
<td>1-DB-3-CP</td>
<td>Bloodborne Pathogens</td>
<td>Lead</td>
</tr>
<tr>
<td>13 Carcinogens</td>
<td>Cadmium</td>
<td>Magnetic Fields</td>
</tr>
<tr>
<td>Acrylonitrile</td>
<td>Chromium +6</td>
<td>Mercury</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Cryogen</td>
<td>Metal Fume</td>
</tr>
<tr>
<td>Asbestos</td>
<td>Ethylene Oxide</td>
<td>Methylene Chloride</td>
</tr>
<tr>
<td>Benzene</td>
<td>Formaldehyde</td>
<td>Methyleneedianiline</td>
</tr>
<tr>
<td>Beryllium</td>
<td>Gas</td>
<td>Nanomaterials</td>
</tr>
<tr>
<td>Biological (ABSL)</td>
<td>Heat Stress (x2)</td>
<td>Noise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vinyl Chloride</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Perform a Risk Assessment

Everything starts with the risk assessment:

1. Start with scope of work
2. Identify tasks
3. Identify hazards

FUNDAMENTAL IH!
Perform a Risk Assessment

The IH Control Panel:

1. ID Location
2. ID Task (define them!)
3. ID Hazard
4. ID Risk Level via example tasks or built-in algorithms

What appears is the standard hazard assessment language, minimum controls and required follow up actions (surveillance requirements)
Perform a Risk Assessment

Risk Levels for Particular Hazards Determined by:

1. The definition of the hazard’s risk levels
2. Example tasks by risk level
3. Built-in algorithms:
   - CB NanoTool
   - Chemical Use Tool
   - Oxygen Deficiency Tool
   - Toxic Gas Tool
   - Welding Tool
Risk Assessment Algorithms – CB NanoTool

The CB NanoTool:

• Developed with Sam Paik
• Used world-wide

Select items from dropdown lists in yellow highlighted fields to determine probability and severity.

Click the Assign Risk Level button to automatically generate the RL along with minimum hazard assessment language, controls and follow up actions.
Risk Assessment: Tools

ChemTool

- Based on EMKG Risk Assessment Tool, Federal Institute for Occupational Safety & Health, Germany (BAuA)

- For NOL – Solid/Dust/Fiber or NOL – Liquid/Mist/Vapor
  - Define Hazard Group, Dispersion Potential and Quantity to obtain RL

**INSTRUCTIONS:** Specify the chemical hazard list (i.e., ethanol, IPA, acetone, metalworking fluids, etc.). You can also specify classes of chemicals (i.e., acids, bases, carcinogens, etc.). Then make your chemical state selection. Fill in the remaining yellow highlighted fields based on the definitions provided. Click the “Assign Risk Level” button when complete.

- Dermal and respiratory irritant. May cause lung damage. Vapor may cause drowsiness or dizziness.
- Harmful by inhalation and ingestion. Risk of irreversible effects.
- Acutely toxic. Causes burns. Suspect carcinogen. May cause sensitisation upon inhalation. Possible risk of impaired fertility, mutagen or teratogen.
- Very toxic by inhalation and ingestion. Contact with acids liberates extremely toxic gas. Carcinogen, mutagen, and/or teratogen. Danger of very serious irreversible effects.
Risk Assessment: Tools

Peroxide Formers

- LLNL Institutional guidance for peroxide forming chemicals
Eye & Face Protection

- ANSI Z87.1-2010 compliant
- Considerations for what type of eye/face protection to prescribe based on splash potential
- Includes requirements for when respirators are worn too
Risk Assessment: Tools

IH Tools

- Quick method to calculate rationale for selection of risk levels
- Conversions
- Calculations
  - LCL & UCL
  - OELs for Extended Shifts
  - Add SPLs
  - Noise Hazard Zones
  - Percent Dose
Risk Assessment: Tools

Statistics

- Calculate LCL and UCL for single data points using Sampling & Analytical Errors (SAE)

![Image of software interface for calculating confidence limits]

The calculation of a confidence limit or interval is a statement of probability. In application, this equation is used to calculate the one-sided upper or lower confidence limit. The upper confidence limit (UCL) is calculated to determine the exposure reporting route for the exposure result(s) you collected. OSHA will not issue a citation unless the exposure sampling results obtained by their industrial hygienist exceed the 95% UCL for that method and PEL. What they are saying is that they are relatively confident that the result they obtained did not occur by chance.

\[ LCL \text{ or } UCL = \frac{\text{Measured Exposure}}{OEL} \pm SAE \]

**Personal Air Sampling:**

For reporting route determination, the Action Level or 50% of the OEL in absence of an Action Level, must be inputted into the OEL field.

- **Agent**
- **SAE**
- **Measured Exposure** (without units)
- **OEL** (without units)

**Personal Noise Dosimetry:**

Enter the time weighted average result into the field to the right.

- **Measured Exposure** $dBA \text{ TWA}$
- **LCL**
- **UCL**

Results are NOT saved.
Risk Assessment: Reports

Individual RA Report

- Generates PDF with standard naming convention
- Works with email software to automatically attach to outgoing message
### Risk Assessment Determination – Example Tasks

<table>
<thead>
<tr>
<th>Task Specific Requirements for Risk Level</th>
<th>Risk Level Selection Tools</th>
<th>Risk Level Selection Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asbestos</strong></td>
<td>Note from SME:</td>
<td></td>
</tr>
<tr>
<td>Respiratory exposure to airborne asbestos fibers.</td>
<td>Any qualified LLNL IH can review and approve an AWP if the proposed work scope is small and does not exceed any of the following three conditions:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Level Descriptions</th>
<th>Example Tasks</th>
<th>Hazard Language</th>
<th>Controls</th>
<th>Follow-Up</th>
<th>References</th>
<th>Hazard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Level 1:</strong></td>
<td>These activities include the handling of ACM that is substantially intact and not likely to become friable (i.e. subject to dispersal of airborne fibers).</td>
<td>Risk Level 2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Risk Level 2:</strong></td>
<td>Include, but are not limited to, the following: 1. Wall Penetrations; 2. Floor Penetrations; 3. ACM Gasket/Seal removal and replacement.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contact the Asbestos SME for guidance as to whether other tasks fit into this Risk Level.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Risk Level 3:</strong></td>
<td>Tasks include but are not limited to: 1. Wallboard removal or demolition; 2. Transite removal; 3. Linoleum removal (with paper backing) 4. Cleanup of friable ACM 5. Vinyl Asbestos Tile (VAT) removal; and 6. Asbestos Containing Roofing Material (ACRM) removal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Abatement</td>
</tr>
<tr>
<td><strong>Risk Level 4:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk Level 4:** Abatement
### Risk Assessment Determination – Hazard Language

**Asbestos**

- Respiratory exposure to airborne asbestos fibers.

**Risk Level Descriptions**

<table>
<thead>
<tr>
<th><strong>Risk Level 1:</strong></th>
<th><strong>Risk Level 2:</strong></th>
<th><strong>Risk Level 3:</strong></th>
<th><strong>Risk Level 4:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazard in WCD?</strong></td>
<td>Inhalation of airborne asbestos fibers can lead to lung cancer or mesothelioma. Cleaning up small amounts of non-friable asbestos containing material (ACM) from surfaces with a HEPA vacuum and wet wiping will not generate airborne asbestos fibers regardless of task frequency and duration. Exposure to asbestos fibers is</td>
<td>Inhalation of airborne asbestos fibers can lead to lung cancer or mesothelioma. Operations and Maintenance (O&amp;M) tasks including [TASKS] will disturb asbestos containing material causing it to become airborne and available for inhalation. The material that will be disturbed contains approximately [%] [TYPE OF ASBESTOS] asbestos.</td>
<td>Inhalation of airborne asbestos fibers can lead to lung cancer or mesothelioma. Deliberately removing [AMOUNT OF MATERIAL] [MATERIAL TO BE REMOVED] will release asbestos fibers into the air. The material that will be removed contains approximately [%] [TYPE OF ASBESTOS] asbestos. Removal of this material will be performed</td>
</tr>
<tr>
<td><strong>Hazard Assessment Language</strong></td>
<td>Materials of special concern (e.g., alkali metals, fluorine, asbestos)</td>
<td>Materials of special concern (e.g., alkali metals, fluorine, asbestos)</td>
<td>Materials of special concern (e.g., alkali metals, fluorine, asbestos)</td>
</tr>
</tbody>
</table>

**Note from SME:**

Any qualified LLNL IH can review and approve an AWP if the proposed work scope is small and does not exceed any of the following three conditions:
## Risk Assessment Determination – References

<table>
<thead>
<tr>
<th>Task Specific Requirements for Risk Level</th>
<th>Risk Level Selection Tools</th>
<th>Risk Level Selection Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory exposure to airborne asbestos fibers</td>
<td>Note from SME: Any qualified LLNL IH can review and approve an AWP if the proposed work scope is small and does not exceed any of the following three conditions:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Level Descriptions</th>
<th>Example Tasks</th>
<th>Hazard Language</th>
<th>Controls</th>
<th>Follow-Up</th>
<th>References</th>
<th>Hazard Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>References:</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ESH Manual Document 14.9 (New Revision Title): Asbestos Abatement and Operations and Maintenance (O&amp;M) Safety Program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Asbestos Program website</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk Level Determination Document:**
## Risk Assessment Determination – Hazard Description

### Asbestos

**Task Specific Requirements for Risk Level**

Respiratory exposure to airborne asbestos fibers.

**Risk Level Selection Tools**

Note from SME:

Any qualified LLNL IH can review and approve an AWP if the proposed work scope is small and does not exceed any of the following three conditions:

1. **Risk Level Descriptions**
2. **Example Tasks**
3. **Hazard Language**
4. **Controls**
5. **Follow-Up**
6. **References**
7. **Hazard Description**

Respiratory exposure to airborne asbestos fibers. Intact Asbestos Containing Material (ACM) is not hazardous unless the material is disturbed or deteriorates, causing loose fibers to become airborne and respirable. Inhalation of asbestos fibers may increase the risk of developing lung cancer or mesothelioma, a cancer of the lining of the lungs and abdominal area. Inhalation of airborne asbestos fibers may also cause asbestosis, a scarring of the lungs. Concurrent exposure to asbestos and cigarette smoke may greatly increase the risk of lung cancer because the two substances act synergistically.
Perform a Risk Assessment

Quality and Consistency Check with the Assessment Viewer:

- Sort according to user defined variables (e.g., task, hazard, RL, IH, location, etc.)
- Allows an IH to view similar risk assessments made by other IHs for the same task and hazard

VERY POWERFUL!
Perform a Risk Assessment

Quantitative Follow up Actions as a Result of the Risk Assessment (Typically Begins at RL3):

Could include any one or a combination of the following:

1. Respirator Permit (HAC)
2. Voluntary Use of Filtering Facepieces
3. Asbestos Work Permit
4. Lead Work Permit
5. Sampling Plan for Air (personal or area)
6. Sampling Plan for Surface (swipe, wipe, bulk)
7. Inclusion of a particular periodic surveillance requirement (IH DAP)
8. Analytical Lab RUSH Analysis Form
Hazard Assessment & Control (HAC) Form:

- Lists all applicable hazards associated with the TASK along with their minimum respirator requirements.

- IH selects the required type and configuration based on all the hazards involved in the task.
Follow Up Requirements – Asbestos Work Permit

Asbestos Work Permit (AWP)

• LLNL policy for asbestos-related tasks that are not covered by a Negative Exposure Assessment (NEA)
Follow Up Requirements – Sampling Plan for Air (Personal or Area)

### Sampling Plan (Personal or Area)

**INSTRUCTIONS:** Complete to request personal or area air samples be collected by an H&S Tech. Click the “Preview & Email” button to email this form to the H&S Tech. & the Tech. Supervisor.

<table>
<thead>
<tr>
<th>Preparation Date / Rev #:</th>
<th>Agent(s) / Hazard(s):</th>
<th>Risk Level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates Sampling Must be Performed:</td>
<td>Sampling Purpose:</td>
<td></td>
</tr>
<tr>
<td>Requesting IH:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technician Supervisor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H&amp;S Technician:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RI or Field Contact:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building(s):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room or Location:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sample Type:** Specify personal or area; TWA, STEL, Ceiling, etc.

**Minimum # of Samples:**

- # Field Blanks:
- # Media Blanks:

**Sampling Procedure:** Specify NIOSH, OSHA, ASTM, etc. method.

**Results Decision Criteria:**

Specify the decision criteria you will use to evaluate the sampling results. This is based on your sampling objective including, but not limited to:

- NIOSH Methods
- OSHA Methods
- SKC Inc.

**Turnaround Time:**

**Special Sampling Instructions:** Specify personal or area pump, flow rates, media, equipment names, etc. Be specific so the H&S Technician can order the appropriate supplies from IHIL or obtain them from the Team locker.

**Sampling Equipment:**

1. Preview & Email
Follow Up Requirements – Sampling Plan for Surface (Swipe, Wipe, Bulk)

<table>
<thead>
<tr>
<th>Assessment Viewer</th>
<th>HACs, RPs, Asbestos &amp; Lead Work Permits</th>
<th>DAPs &amp; Sampling Plans</th>
<th>Previous Revision Requirements (History)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update DAP Inventory List</td>
<td>Sampling Plan (Personal or Area)</td>
<td>Sampling Plan (Swipe, Wipe or Bulk)</td>
<td></td>
</tr>
</tbody>
</table>

**INSTRUCTIONS:** Complete to request swipe, wipe or bulk samples be collected by an H&S Tech. Click the “Preview & Email” button to email this form to the H&S Tech. & the Tech. Supervisor.

- **Preparation Date / Rev #:**
- **Dates Sampling Must be Performed:**
- **Requesting IH:**
- **Technician Supervisor:**
- **H&S Technician:**
- **Building(s):**
- **Room or Location:**
- **Hazard / Agent:**
- **Sampling Purpose:**

**Sample Type:**
- **Sample Media:**

**Results**
- **Decision Criteria:** Specify the decision criteria you will use to evaluate the sampling results. This is based on your sampling objective including, but not limited to, known limits.

**Judgmental Samples**
- **Specify Item(s) / Area(s) & # of Samples:** Specify in the format: “Item/Area = #Swipes”

**Random Samples**
- **Areas / Items:**
  - **Floor:**
  - **Furniture / Equipment:**
  - **Facility Systems / Structures < 8 Feet:**
  - **Facility Systems / Structures > 8 Feet:**
- **# of Field Blanks:**
- **# of Media Blanks:**

| Total # Random Samples Including Blanks | Processing Time:
|----------------------------------------|-------|
| ALAB Analysis:                         | Turnaround Time:
| # Field Blanks:                        | ALAB Analysis:
| # Media Blanks:                        | Turnaround Time:
| Total # Samples:                       | ALAB Analysis:

**Laboratory Analysis:**
Follow Up Requirements –
IH Discipline Action Plan (DAP)

**INSTRUCTIONS:** Select which DAP the new inventory item belongs or which DAP needs to be updated. An email will be generated with all of the applicable fields that are needed for the particular inventory list. Address each item in the email and address the email to the person who is responsible for updating the DAP. Push Send Email and consider this follow-up requirement COMPLETE!

**Evaluation of Hazards**
- Chemical Exposure Assessment (IH DAP 2)
- Physical Agent Exposure Assessment (IH DAP 3)

**Control of Hazards**
- Biohazards & Biological Toxins (IH DAP 8)
- Non-Ionizing Radiation (IH DAP 9)
- Surface Contamination Assessment (IH DAP 21)
- Beryllium (IH DAP 22)
- Lead (IH DAP 24)
- Noise (IH DAP 40)
- Local Exhaust Ventilation (IH DAP 45)
- Biosafety Cabinets (IH DAP 46)

**Previous Revision Requirements (History)**
Follow Up Requirements – Analytical Laboratory Rush Request Form

Analytical Laboratory Sample RUSH Request Form:

- Used for our on-site IH Analytical Lab
- IH completes and submits form to lab if a RUSH analysis is needed
Facility Survey Through the RAC Database
Facility Information

Facility Overview
- Condition
- Operational Status
- Security Level
- Hazard Classification
- Predominant Use
- Age
- Resident population
- Historical Summary
Facility Information

**Facility Overview**

- Construction Type & # of units
- Square footage distribution

<table>
<thead>
<tr>
<th>Facility #</th>
<th>Facility Type</th>
<th>Summary Condition</th>
<th>Operational Status</th>
<th>Excess</th>
<th>Security Level</th>
<th>Hazard Classification</th>
<th>Predominant Use</th>
<th>Historical Use</th>
<th>Facility Age (years)</th>
<th>Resident Population</th>
<th>Occupied</th>
<th>Responsible IH</th>
<th>Construction Details</th>
<th>Net</th>
<th>Gross</th>
<th>Computer</th>
<th>Storage</th>
<th>Lab</th>
<th>Office</th>
<th>Industrial Shop</th>
<th>Service Shop</th>
<th>Square Footage Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PERMANENT BUILDING</td>
<td>FAIR</td>
<td>OPERATING</td>
<td>N</td>
<td>BLOCKED</td>
<td></td>
<td></td>
<td></td>
<td>59</td>
<td>76</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BLOCKED</td>
</tr>
<tr>
<td></td>
<td>STEEL FRAMED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/1/1954</td>
<td></td>
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<td></td>
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<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LLNL-PRES-669839
Facility Information

Hazards by Room

- Aids in identifying location specific controls for RA
  - Room
  - Hazards
  - Description
Facility Information

Similar Exposure Groups

- Lists SEGs in facility
  - Task +
  - Hazard +
  - Risk Level

- Lists Activity Title for each SEG

<table>
<thead>
<tr>
<th>Task</th>
<th>Hazard</th>
<th>Risk Level</th>
<th>Location(s)</th>
<th>IWS #</th>
<th>IWS Activity Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering</td>
<td>Lead</td>
<td>2</td>
<td></td>
<td></td>
<td>BLOCKED: general electronic maintenance, fabrication and stallation and repair.</td>
</tr>
<tr>
<td>Soldering</td>
<td>Lead</td>
<td>2</td>
<td></td>
<td></td>
<td>BLOCKED: Project Work Spaces</td>
</tr>
<tr>
<td>Testing, Destructive</td>
<td>Beryllium</td>
<td>3</td>
<td></td>
<td></td>
<td>BLOCKED: Beryllium Testing of Hazardous Materials</td>
</tr>
<tr>
<td>Testing, Destructive</td>
<td>Chemical Use Metal Fume</td>
<td>1</td>
<td></td>
<td></td>
<td>BLOCKED: User heating of mechanical test samples</td>
</tr>
<tr>
<td>Testing, Destructive</td>
<td>Chemical Use Hexavalent Chromium</td>
<td>2</td>
<td></td>
<td></td>
<td>BLOCKED: User heating of mechanical test samples</td>
</tr>
<tr>
<td>Testing, Destructive</td>
<td>Cryogen Not Specified</td>
<td>1</td>
<td></td>
<td></td>
<td>BLOCKED: Chemical Testing of Hazardous Materials</td>
</tr>
<tr>
<td>Testing, Destructive</td>
<td>Lead</td>
<td>2</td>
<td></td>
<td></td>
<td>BLOCKED: Chemical Testing of Hazardous Materials</td>
</tr>
<tr>
<td>Testing, Destructive</td>
<td>Nanomaterials</td>
<td>2</td>
<td></td>
<td></td>
<td>BLOCKED: Chemical Testing of Hazardous Materials</td>
</tr>
<tr>
<td>Welding (GTAW / TIG / Hel-Arc)</td>
<td>Metal Fume</td>
<td>4</td>
<td></td>
<td></td>
<td>BLOCKED: or Decommissioning contaminated</td>
</tr>
<tr>
<td>Welding (Resistance)</td>
<td>Chemical Use Welding Fumes</td>
<td>1</td>
<td></td>
<td></td>
<td>BLOCKED: Beryllium Testing of Hazardous Materials</td>
</tr>
<tr>
<td>Welding (Resistance)</td>
<td>Metal Fume</td>
<td>3</td>
<td></td>
<td></td>
<td>BLOCKED: Soldering</td>
</tr>
</tbody>
</table>

LLNL-PRES-668839
## RAC Database Reports – Main Menu

### Reports

<table>
<thead>
<tr>
<th>Task</th>
<th>Hazard</th>
<th>Risk Level</th>
<th>Similar Exposure Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task Distribution (overall)</strong>&lt;br&gt;Lists the number of risk assessments performed by task. This report provides an important metric for understanding the distribution of tasks across the laboratory.&lt;br&gt;&lt;br&gt;<strong>Task Distribution (by IH)</strong>&lt;br&gt;Lists the tasks in which individual IHs have performed a risk assessment. It also lists the number of risk assessments performed per task per IH. This provides an important metric to understand if IHs are too focused on certain tasks.&lt;br&gt;&lt;br&gt;<strong>Task Distribution (by Hazard)</strong>&lt;br&gt;Lists tasks and their corresponding IH hazards. It also lists the number of risk assessments performed per IH hazard by task. This provides an understanding of what are our most common hazards are per task.</td>
<td><strong>Hazard Distribution (overall)</strong>&lt;br&gt;Lists the number of risk assessments performed by IH hazard. This report provides an important metric for knowing what the most common IH hazards are across the laboratory.&lt;br&gt;&lt;br&gt;<strong>Hazard Distribution (by IH)</strong>&lt;br&gt;Lists the IH hazards in which individual IHs have performed a risk assessment. It also lists the number of risk assessments performed per IH hazard. This provides an important metric to understand if IHs are too focused on a single hazard.&lt;br&gt;&lt;br&gt;<strong>Hazard Distribution (by Risk Level)</strong>&lt;br&gt;Lists the IH hazards according to risk level. It also lists the number of risk assessments performed per IH hazard by risk level. This provides an important metric to understand what are our highest risk hazards.</td>
<td><strong>Risk Level Distribution (overall)</strong>&lt;br&gt;Lists the number of risk assessments performed by risk level. This report provides an important metric for understanding the distribution of risk across the laboratory.&lt;br&gt;&lt;br&gt;<strong>Risk Level Distribution (by IH)</strong>&lt;br&gt;Lists the risk levels in which individual IHs have performed a risk assessment. It also lists the number of risk assessments performed per risk level per IH. This provides an important metric to understand an IHs workload.&lt;br&gt;&lt;br&gt;<strong>Risk Level Distribution (by Hazard)</strong>&lt;br&gt;Lists the IH hazards and their corresponding risk level. It also lists the number of risk assessments performed per IH hazard by risk level. This provides an important metric to understand what are our highest risk hazards.</td>
<td><strong>Similar Exposure Group (SEG)</strong>&lt;br&gt;Lists the similar exposure groups at the laboratory.&lt;br&gt;&lt;br&gt;<strong>Similar Exposure Group (by IH)</strong>&lt;br&gt;Lists IHs and each SEG in which they have made an assessment. It also lists the number of assessments that each IH has performed on a given SEG.</td>
</tr>
</tbody>
</table>
RAC Database Reports – RL Distribution

> 2000 Reports
RAC Database Reports – Hazard Distribution

Main Menu | Reports Menu

Hazard Distribution

6/27/2013 at 5:40:54 PM

# of Assessments

- Ionizing Radiation
- Risk Level Source Document not yet Created
- None (no HH hazards found)
- Radiofrequency / Microwave
- Rodent and/or Bird Droppings
- Biological Materials (ABSL-1, 2, 3, 4)
- Nanomaterials
- Silica
- Valley Fever
- Asbestos
- Heat Stress (Normal Work Clothing)
- Biological Materials (BSL-1, 2, 3, 4)
- Oxygen Deficiency
- Beryllium
- Noise
- Lead
- Chemical Use (Hazard Communication Activities)
- Chemical Use (Chemical Hygiene Activities)
RAC Database Reports – Task Distribution

Task Distribution (overall)

- Coating (Powder Coating)
- Grinding, Scabbling, Scouring
- Installing / Removing Electrical
- Installing / Removing Concrete
- Machining / 3D Printing
- Machining (Welding)
- Machining (Plumbing)
- Polishing with a vapor
- Removing Equipment
- Welding (Resistance)
- Welding (Sub-Arc / Plasma)
- Cleaning (custodial)
- Filling Compressed Gas Containers
- Replacing HEPA Filters
- Servicing Equipment
- Welding / Cutting (Oxy Fuel)
- Demolition
- Exercising with Firearms
- Machining (Laser Cutting)
- Maintaining Motor Vehicles
- Electroplating / Electroforming
- Entering a Confined Space
- Operating Heavy Equipment
- Researching / Testing / Analyzing
- Blasting
- Inspecting
- Benchtop Work
- Welding (GTA / MIG)
- Maintaining HVAC & Refrigeration
- Collecting Samples (ESH)
- Servicing Laboratory Equipment
- Testing, Non-Destructive
- Researching (Non-Solidification)
- Researching using Lasing
- Handling Materials
- Developing Instrumentation
- Cleaning (non-custodial)
- Researching w/ Biological Agents

# of Assessments
RAC Database Reports – Similar Exposure Group (SEG) Summary

**SEGs:**

- Defined by TASK – HAZARD – RISK LEVEL

<table>
<thead>
<tr>
<th>Inspecting Facilities</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Use</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Heat Stress</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Rodent</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Valley Fever</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installing / Removing Electrical</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Level Source Document not yet Created</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installing / Removing Tile</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installing Concrete</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jack Hammering</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Landscaping</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Stress</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Noise</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machining</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beryllium</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Chemical Use</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Chemical Hygiene</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Lead</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Noise</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Silica</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machining (3D Printing)</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Use</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machining (Laser Cutting)</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Use</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nanomaterials</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Noise</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machining (Traditional)</th>
<th>Risk Level</th>
<th># at Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Lessons Learned – Time to Expand RLBMS

SUCCESS
Because you too can own this face of pure accomplishment

DIY.DESPAIR.COM
Combining Facility Baselines and RLBMS

A Basis For E&ORM Expansion

- Facility Baselines Effort *Alone*
  - Reduced work by ~ 2 re-surveys per IH per year.
  - Saves ~ $250K
  - Benefits clients
  - Benefits us
Future Of E&ORM Is Almost Here

- EHS Ready – Approved for OHSAS 18001, ISO 14001 & ISO 9001
- RL Approach in Industrial Safety – 12 Source documents in RAC
  - Electrical Safety
  - Laser Safety
  - Liquid Nitrogen
  - Barriers
  - Fall Protection
  - Ladders
  - Fall Protection
  - Ergonomics
  - Cranes & Rigging
  - Cryogens
  - Pressure Safety
  - Industrial Trucks
- Expanding the RL Approach into Health Physics
  - Regulations in RL Format and to be Finalized in 3 Source Documents
- Expanding the RL Approach into Explosives Safety
  - Fits Well into RL Format and Avoids Classic RL4 Default Approach
- Expanding the RL Approach for Environmental Analysts
  - Culture Shift, but RL Process Already in Development
RLBMS – Environmental Approach

- Probability Levels (P1 – 4)
  - P1 – Extremely Unlikely
  - P2 – Less Likely
  - P3 – Likely
  - P4 – Probable
# RLBMS – Environmental Approach

## Probability Component of Environmental Contamination; 3 Factors

<table>
<thead>
<tr>
<th>Probability Level</th>
<th>Quantity</th>
<th>Location</th>
<th>Hazardous Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;RQ</td>
<td>≥RQ</td>
<td>Controlled</td>
</tr>
<tr>
<td>P1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>P1</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>P2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>P2</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>P3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>P3</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>P4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

## Severity Component

### Long-Term Effect
- Reportable

### Short-Term Effect
- Reportable
- Non-reportable

### Minimal Effect
# RLBMS – Environmental Risk Matrix

<table>
<thead>
<tr>
<th>Severity (Consequence to the Environment)</th>
<th>Probability</th>
<th>Control Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely Unlikely (P1)</td>
<td>Less Likely (P2)</td>
</tr>
<tr>
<td>Long-term damage (reportable)</td>
<td>RL3</td>
<td>RL3</td>
</tr>
<tr>
<td>Short-term damage (reportable)</td>
<td>RL2</td>
<td>RL2</td>
</tr>
<tr>
<td>Short-term damage (non-reportable)</td>
<td>RL1</td>
<td>RL1</td>
</tr>
<tr>
<td>Minimal damage / Nuisance/ Not immediately reportable event</td>
<td>RL1</td>
<td>RL1</td>
</tr>
</tbody>
</table>

**Control Outcomes:**
- **RL1**: Administrative controls only.
- **RL2**: Basic Engineering and Administrative controls.
- **RL3**: Requires EA involvement for a documented review and signature with controls specified.
- **RL4**: Complex work for EA evaluation, often requiring other ES&H disciplines.
Integrating RLBMS with LLNL Work Control

RLBMS into E&ORM

Once EHS Risk Levels are known the worker knows:
• Hazards Present
• Controls Needed
• PPE Necessary
• Sign-Off Expectations
• Documentation Required
• Level of Training Needed
• Medical Surveillance
• Assistance Needed
• Expertise Required
• ES&HHS Team Assistance

Current Process Status
➢ RLs by Discipline
➢ Update EHS Manual
➢ Update EHS Training

Work Control Process

Minimize Worker Level Documents
Maximize Competent Worker Categories
Standardize EHS Risk Communication
Implementation Priority and Timeline

Priority 1
- Develop Hazard Risk Levels, Standard Control Language, and Pre-Job Brief Talking Points
- Develop More Consistent Work Scheduling and Release Processes
- Develop Lab-wide Method to Identify, Analyze and Communicate Facility Area Hazards
- Develop Competent Worker Qualifications
- Develop General Worker Safety Quals
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Priority 2
- Develop Work Planner Qualification
- Develop General Worker Safety Quals
- Develop Work Planner Qualification
- Develop General Worker Safety Quals

Priority 3
- Develop & Test
- Permit Tool
- Permit Non-Routine Work
- Develop and Test
- Work Control Tool
- Institutionalize
- Develop & Test
- Permit Tool
- Permit Non-Routine Work
- Develop and Test
- Work Control Tool
- Institutionalize

Today
- Develop Work Planner Qualification
- Develop General Worker Safety Quals
- Develop & Test
- Permit Tool
- Permit Non-Routine Work
- Develop and Test
- Work Control Tool
- Institutionalize

Time
Future Vision for RLBMS & E&ORM

Q: Why do you spend your free time on this?
Future Vision for RLBMS & E&ORM

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A: 2.3 million work-related deaths annually
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Future Vision for RLBMS & E&ORM

Q: Why do you spend your free time on this?
A: 2.3 million work-related deaths annually.
What’s in my Toolbox Today?

What hazards do you see?

Is it risky?

How would you communicate hazards & risk?
Future Vision for RLBMS & E&ORM

- Safety: RL3
- Industrial Hygiene: RL3
- Ergonomics: RL4
- Environment: RL2
- Fire Protection: RL1
- Project: RL3
Future Vision for RLBMS & E&ORM

- Safety: RL3
- Industrial Hygiene: RL2
- Ergonomics: RL3
- Environment: RL2
- Fire Protection: RL1
- Project: RL3
Future Vision for RLBMS & E&ORM

RL3

RL2

RL3

RL2

RL1

RL3
What’s in my toolbox today?
What’s in my toolbox today?
Future Vision for RLBMS & E&ORM
E&ORM – The Banding of EHS

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- Ryan Kamerzell - RAC
- Sabre Coleman – Env’l CB
E&ORM – The Banding of EHS

Questions?

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