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

2015 CIHC Conference San Francisco, CA

Evaluating Worker Exposures – The Future is Here

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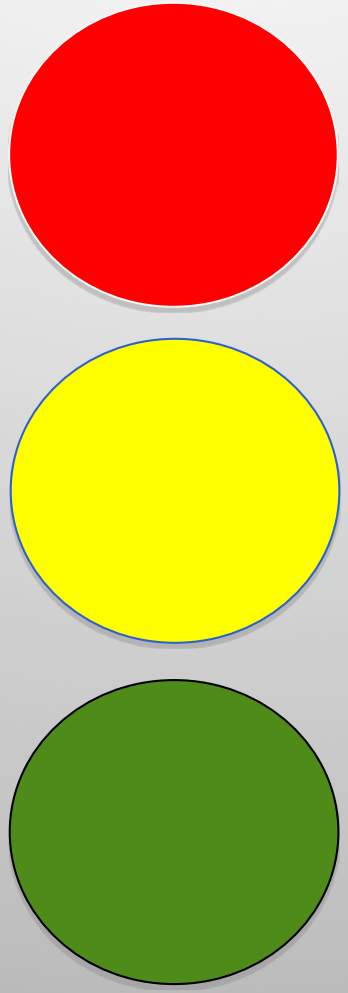
E&ORM – The Banding of EHS

- 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

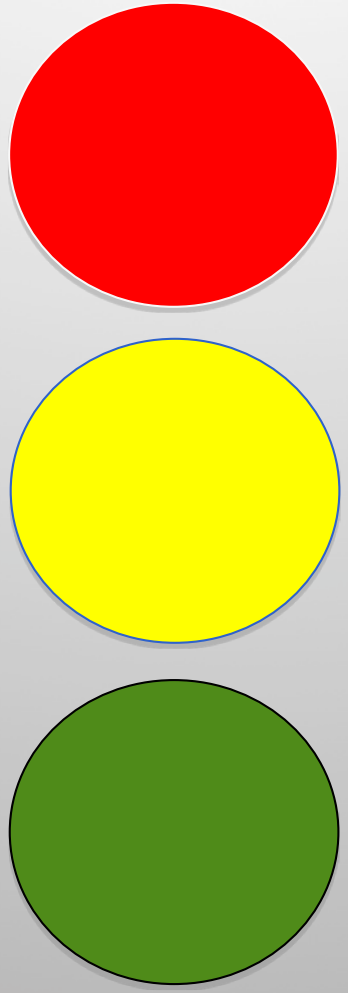
Risk Communication

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

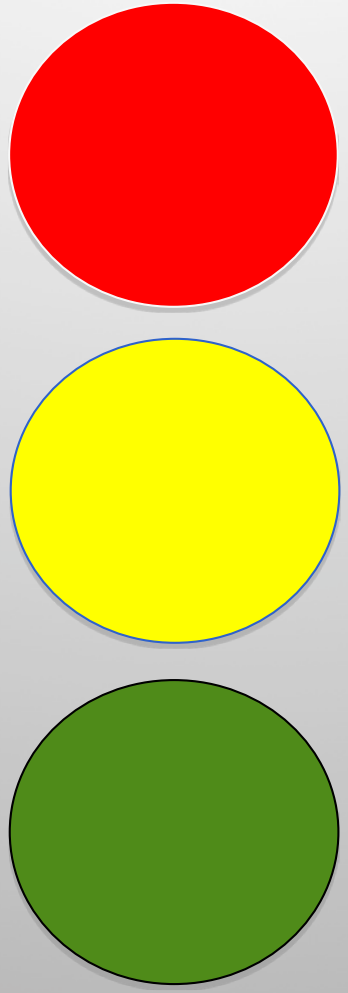
Easy worker system is green & red – is it practical?

STOP!

GO!

Risk Communication

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

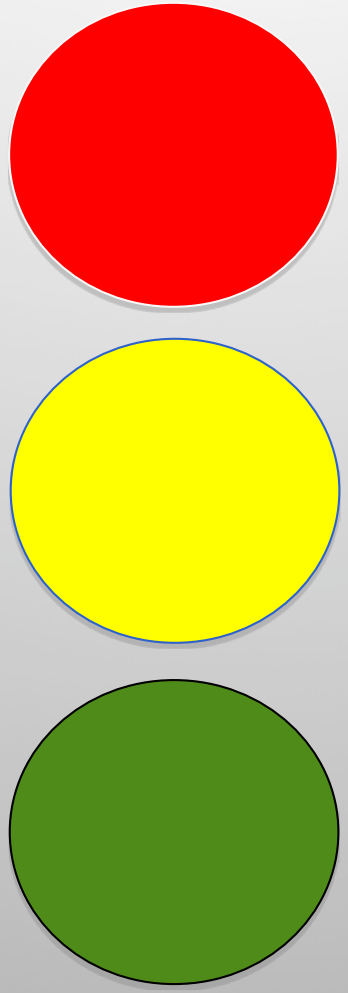


STOP!

GO!

Risk Communication

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



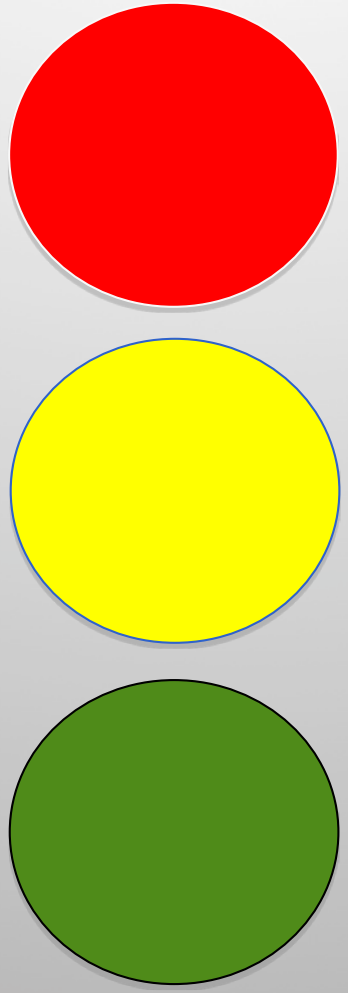
STOP!

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

GO!

Risk Communication

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



STOP!

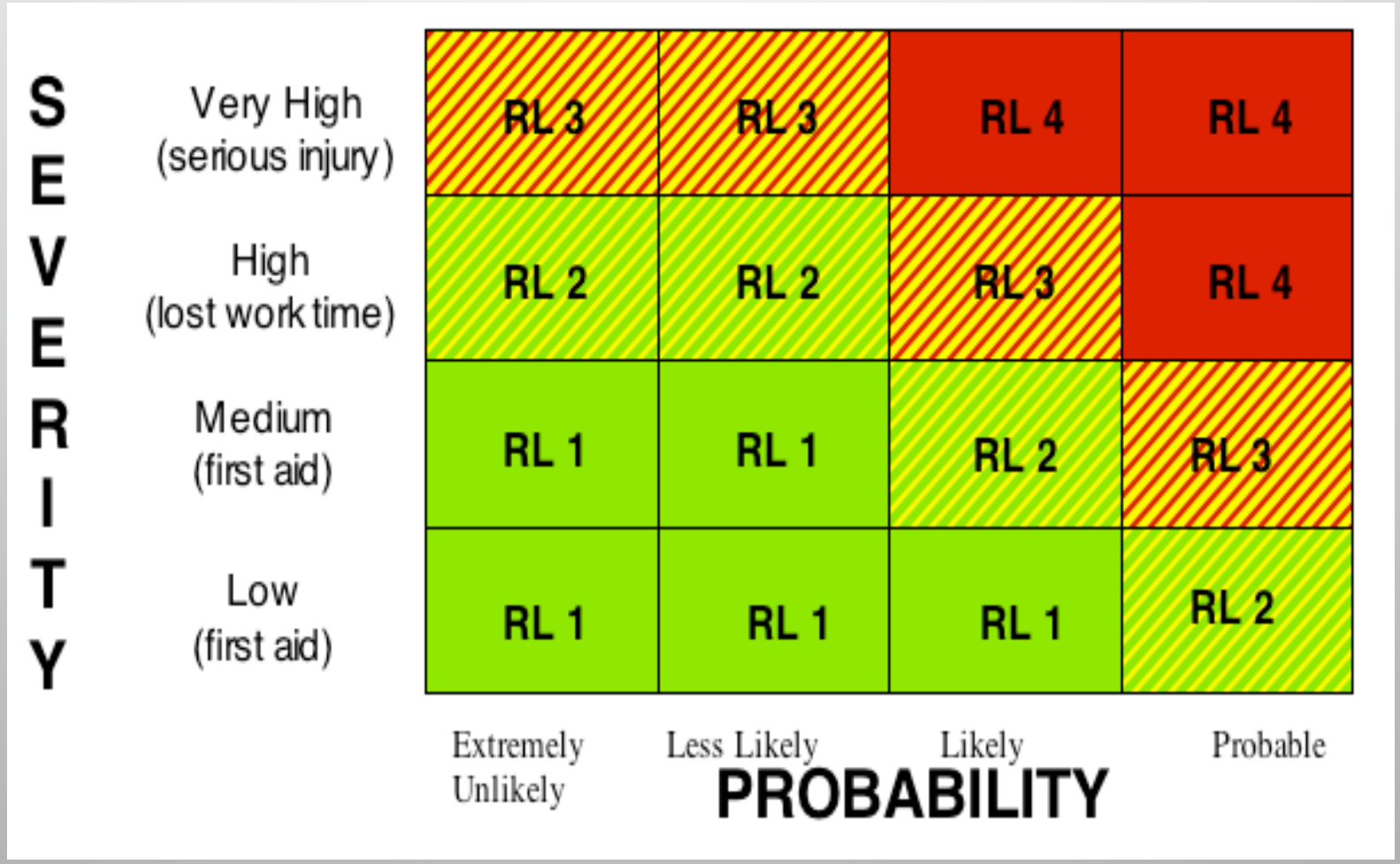
- Stop every time?
- Go every time?
- Assess traffic, then decide?
- Speed limit vs. your speed?

... **or CHECK FOR POLICE?**

GO!

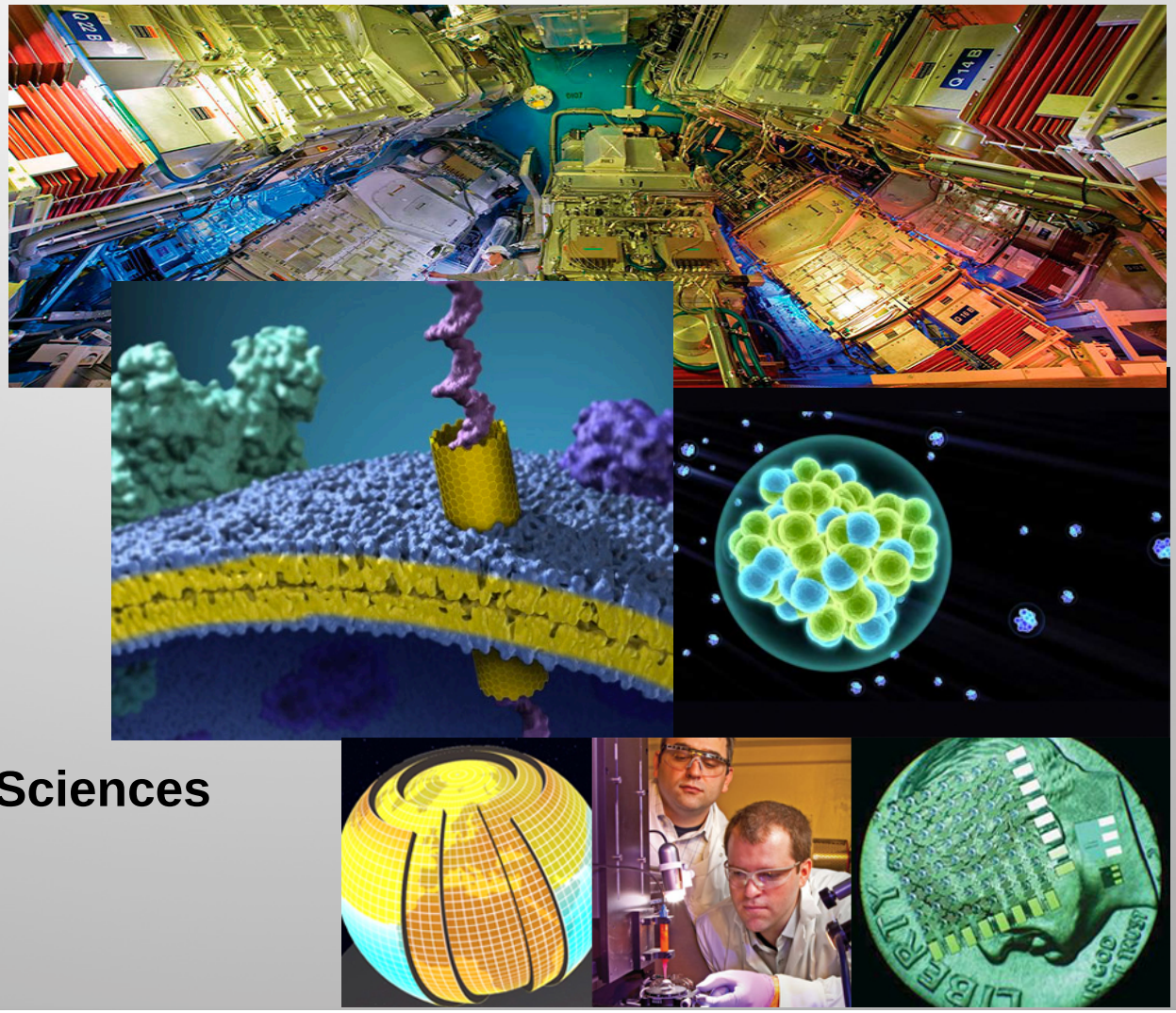
Risk Communication

"Banding" splits 'yellow' into two risk levels (RLs)

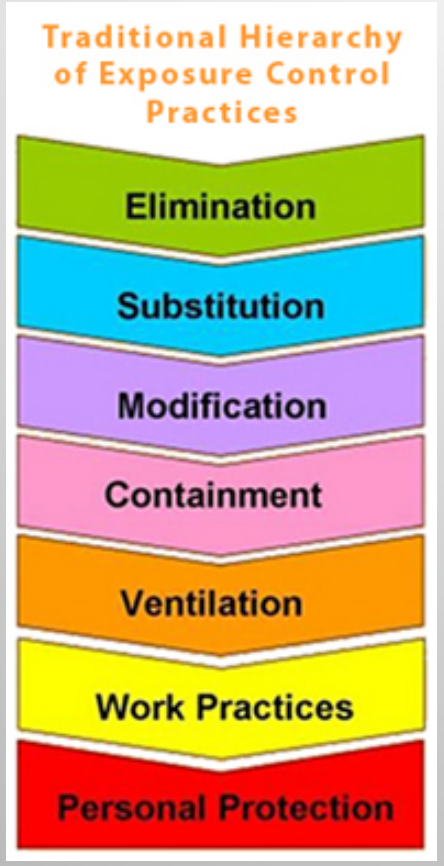


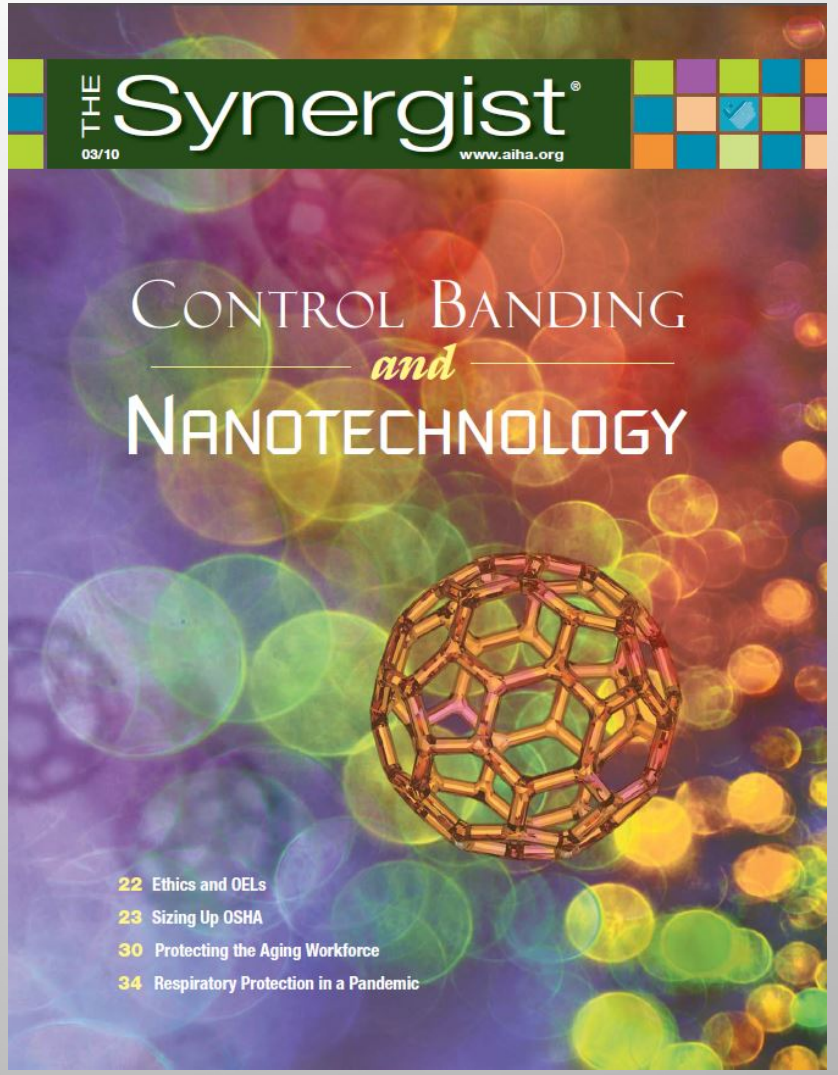
Daily Life at a National Research Laboratory

- **Mission**
  - Basic Science
  - Biosecurity
  - Counterterrorism
  - Defense
  - Energy
- **Research**
  - Computation
  - Engineering
  - Physical and Life Sciences
  - Global Security
  - Lasers

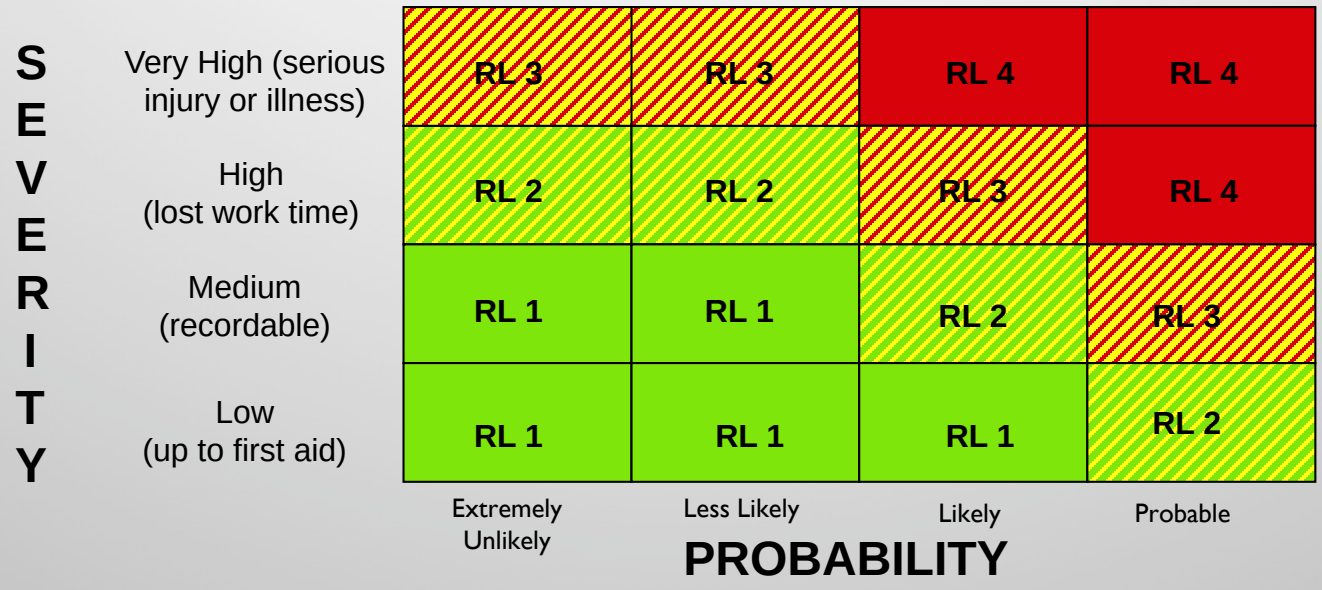


Can Control Banding Work at a National Lab?





Logic Behind Risk Level Based Management System (RLBMS)



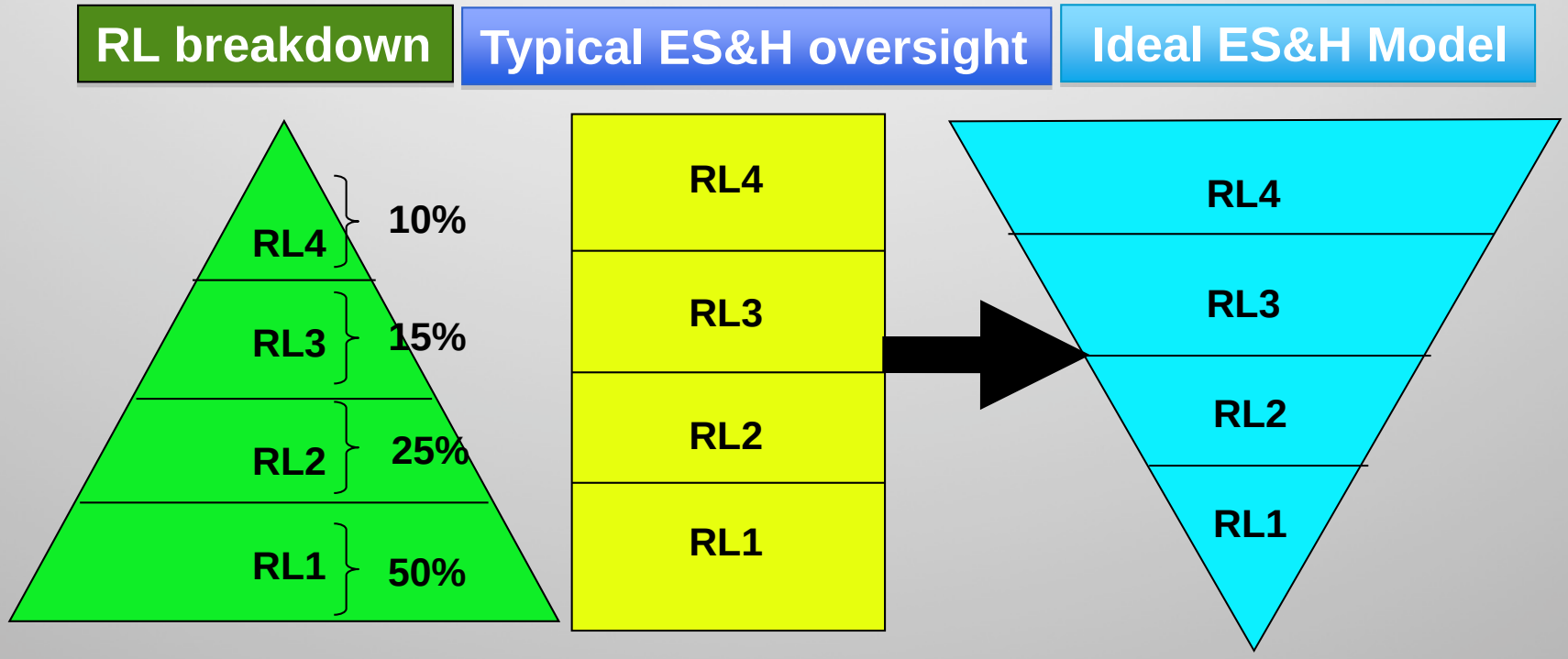
RL1: **OK**. Employees perform work under bi-annual application or approval. No oversight by Occupational Health & Safety (H&S) disciplines necessary.

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.

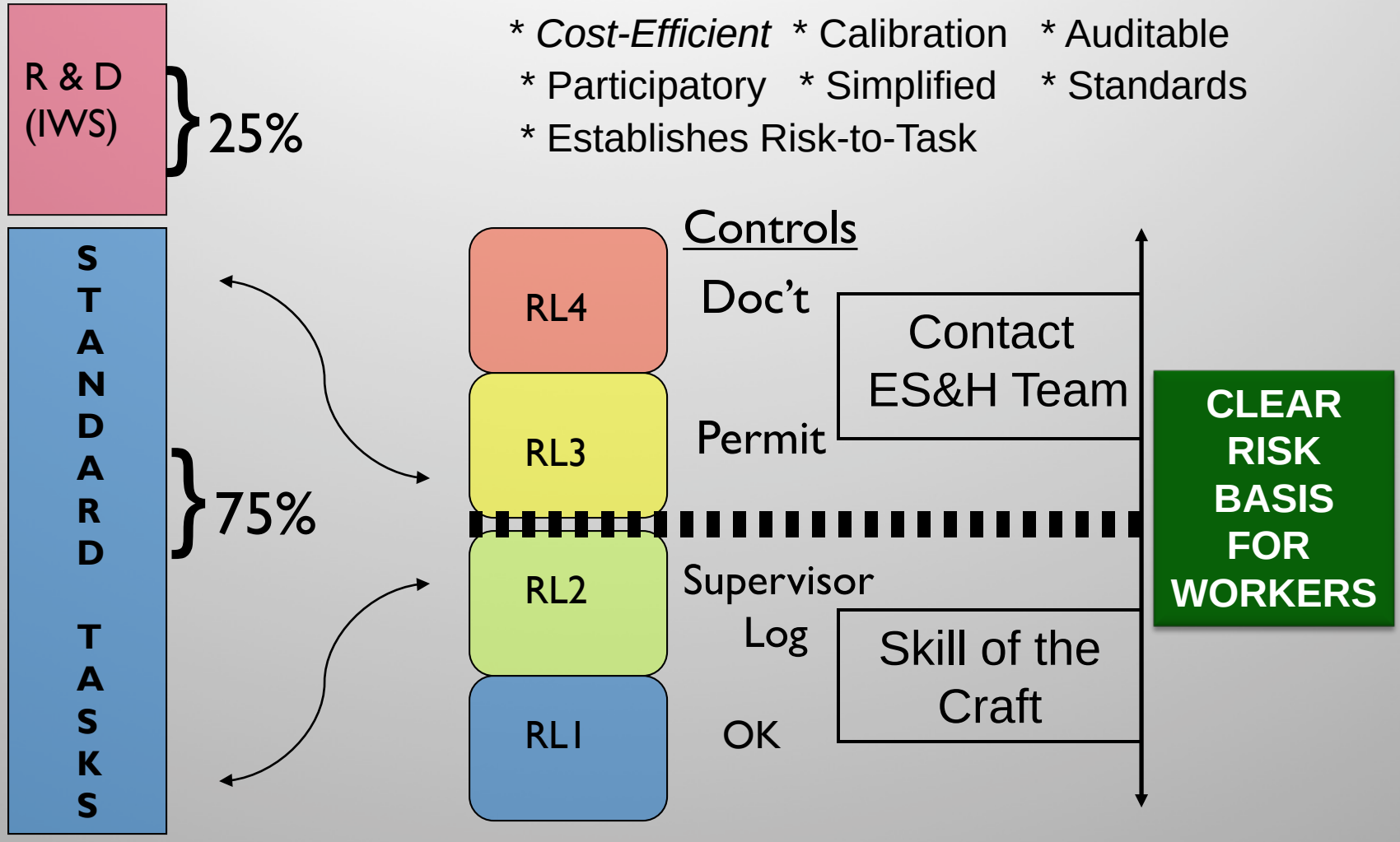
Logic Behind RLBMS



Risk Level Based Management System as Risk Communication

- Benefits to RLBMS

  * *Cost-Efficient* * Calibration * Auditable
  * Participatory * Simplified * Standards
  * Establishes Risk-to-Task



Risk Level Based Management System as Risk Communication

Once the RL is known…
… Risk Communication flows

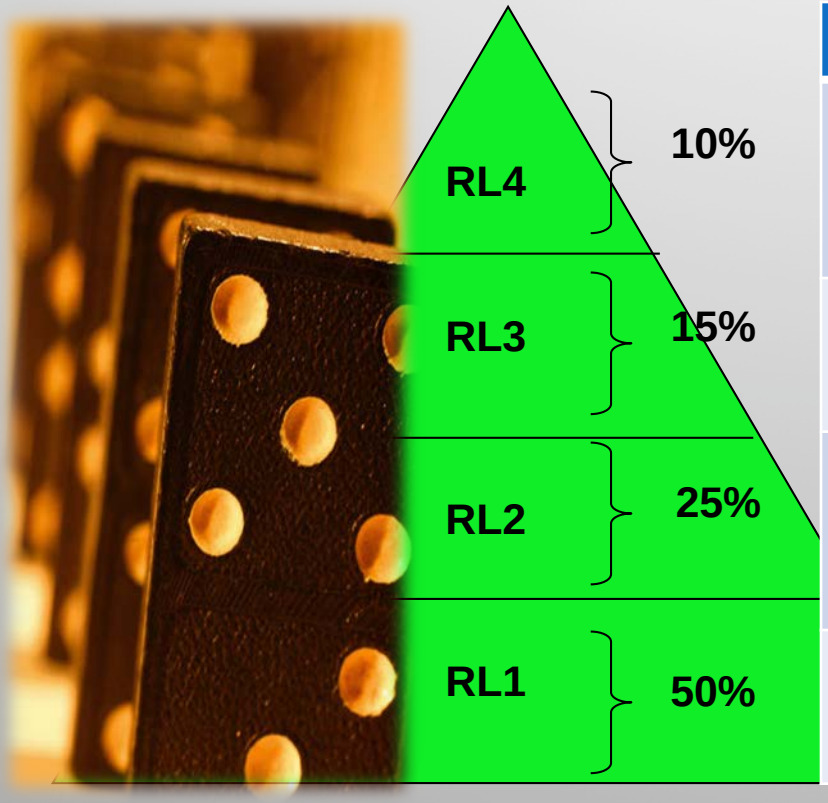
- What level of hazards are present
- What controls are required
- What PPE is necessary
- What level of ‘sign-off’ is expected
- What documentation is necessary
- What level of training is required
- Whether medical surveillance is necessary
- What level of assistance is necessary
- Do I need advice 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



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

RLBMS Outcomes: Safety Checklist

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

ALL ITEMS

Potential RL3
- RL2 if:
  + In Place
  + Identified
  + Assessed

Expert-Based Calibration is Essential

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

10 CFR 835	BMBL
10 CFR 850	BAAQMD
10 CFR 851	CA Health & Safety
29 CFR 1910	CA Labor Code
29 CFR 1926	CA Water Code
ACGIH Ventilation Manual	DOE Orders
ACGIH TLVs 2005	DOE Guidelines
ACGIH TLVs & BEIs 2008	Executive Orders
ANSI	IEEE
ASME	ISO 14001:2004
BS OHSAS 18001:2007	ISO 9001:2008

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!

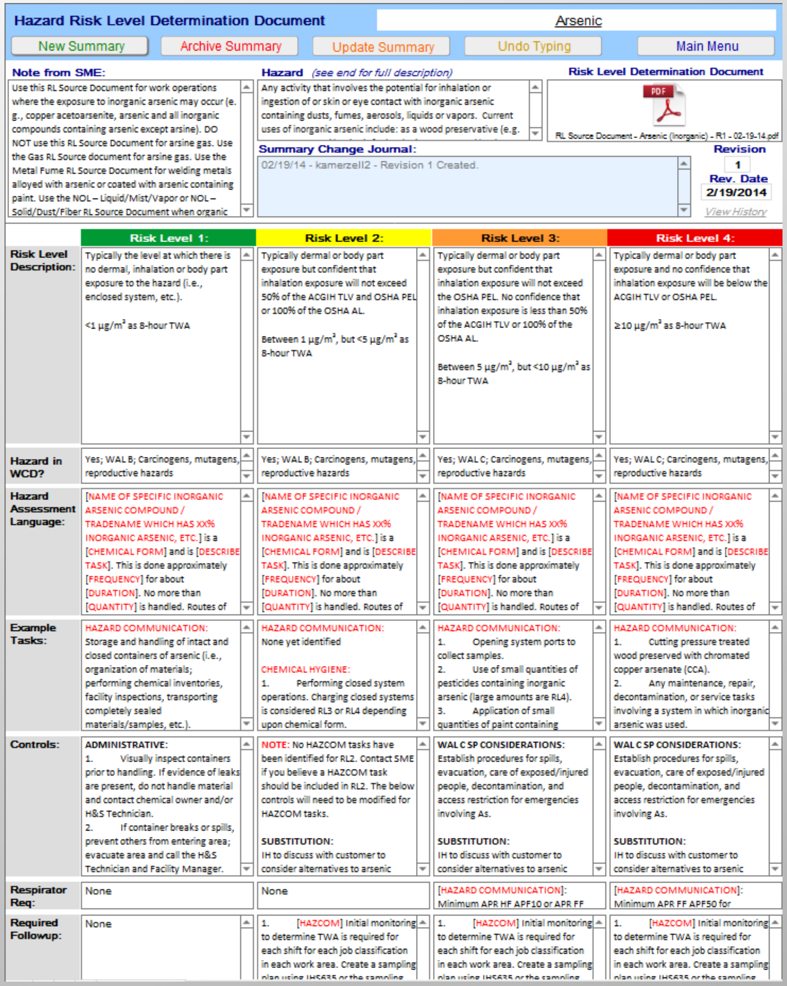
Accessing and Using the RAC Database

Hazard Source Documents

The "Source" of Truth

Development

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



Hazard Risk Level Determination Document — Arsenic

New Summary | Archive Summary | Update Summary | Undo Typing | Main Menu

Note from SME: Use this RL Source Document for work operations where the exposure to inorganic arsenic may occur (e.g., copper acetoarsenite, arsenic and all inorganic compounds containing arsenic except arsine). DO NOT use this RL Source Document for arsine gas. Use the Gas RL Source document for arsine gas. Use the Metal Fume RL Source Document for welding metals alloyed with arsenic or coated with arsenic containing paint. Use the NOL – Liquid/Mist/Vapor or NOL – Solid/Dust/Fiber RL Source Document when organic

Hazard *(see end for full description)*: Any activity that involves the potential for inhalation or ingestion of or skin or eye contact with inorganic arsenic containing dusts, fumes, aerosols, liquids or vapors. Current uses of inorganic arsenic include: as a wood preservative (e.g.

Risk Level Determination Document: RL Source Document - Arsenic (Inorganic) - R1 - 02-19-14.pdf

Summary Change Journal: 02/19/14 - kamerzell2 - Revision 1 Created.

Revision: 1 **Rev. Date:** 2/19/2014 *View History*

	Risk Level 1:	Risk Level 2:	Risk Level 3:	Risk Level 4:
Risk Level Description:	Typically the level at which there is no dermal, inhalation or body part exposure to the hazard (i.e., enclosed system, etc.). $<1\ \mu g/m^3$ as 8-hour TWA	Typically dermal or body part exposure but confident that inhalation exposure will not exceed 50% of the ACGIH TLV and OSHA PEL or 100% of the OSHA AL. Between $1\ \mu g/m^3$, but $<5\ \mu g/m^3$ as 8-hour TWA	Typically dermal or body part exposure but confident that inhalation exposure will not exceed the OSHA PEL. No confidence that inhalation exposure is less than 50% of the ACGIH TLV or 100% of the OSHA AL. Between $5\ \mu g/m^3$, but $<10\ \mu g/m^3$ as 8-hour TWA	Typically dermal or body part exposure and no confidence that inhalation exposure will be below the ACGIH TLV or OSHA PEL. $\geq 10\ \mu g/m^3$ as 8-hour TWA
Hazard in WCD?	Yes; WAL B; Carcinogens, mutagens, reproductive hazards	Yes; WAL B; Carcinogens, mutagens, reproductive hazards	Yes; WAL C; Carcinogens, mutagens, reproductive hazards	Yes; WAL C; Carcinogens, mutagens, reproductive hazards
Hazard Assessment Language:	[NAME OF SPECIFIC INORGANIC ARSENIC COMPOUND / TRADENAME WHICH HAS XX% INORGANIC ARSENIC, ETC.] is a [CHEMICAL FORM] and is [DESCRIBE TASK]. This is done approximately [FREQUENCY] for about [DURATION]. No more than [QUANTITY] is handled. Routes of	[NAME OF SPECIFIC INORGANIC ARSENIC COMPOUND / TRADENAME WHICH HAS XX% INORGANIC ARSENIC, ETC.] is a [CHEMICAL FORM] and is [DESCRIBE TASK]. This is done approximately [FREQUENCY] for about [DURATION]. No more than [QUANTITY] is handled. Routes of	[NAME OF SPECIFIC INORGANIC ARSENIC COMPOUND / TRADENAME WHICH HAS XX% INORGANIC ARSENIC, ETC.] is a [CHEMICAL FORM] and is [DESCRIBE TASK]. This is done approximately [FREQUENCY] for about [DURATION]. No more than [QUANTITY] is handled. Routes of	[NAME OF SPECIFIC INORGANIC ARSENIC COMPOUND / TRADENAME WHICH HAS XX% INORGANIC ARSENIC, ETC.] is a [CHEMICAL FORM] and is [DESCRIBE TASK]. This is done approximately [FREQUENCY] for about [DURATION]. No more than [QUANTITY] is handled. Routes of
Example Tasks:	HAZARD COMMUNICATION: Storage and handling of intact and closed containers of arsenic (i.e., organization of materials; performing chemical inventories, facility inspections, transporting completely sealed materials/samples, etc.).	HAZARD COMMUNICATION: None yet identified CHEMICAL HYGIENE: 1. Performing closed system operations. Charging closed systems is considered RL3 or RL4 depending upon chemical form.	HAZARD COMMUNICATION: 1. Opening system ports to collect samples. 2. Use of small quantities of pesticides containing inorganic arsenic (large amounts are RL4). 3. Application of small quantities of paint containing	HAZARD COMMUNICATION: 1. Cutting pressure treated wood preserved with chromated copper arsenate (CCA). 2. Any maintenance, repair, decontamination, or service tasks involving a system in which inorganic arsenic was used.
Controls:	ADMINISTRATIVE: 1. Visually inspect containers prior to handling. If evidence of leaks are present, do not handle material and contact chemical owner and/or H&S Technician. 2. If container breaks or spills, prevent others from entering area; evacuate area and call the H&S Technician and Facility Manager.	NOTE: No HAZCOM tasks have been identified for RL2. Contact SME if you believe a HAZCOM task should be included in RL2. The below controls will need to be modified for HAZCOM tasks. SUBSTITUTION: IH to discuss with customer to consider alternatives to arsenic	WAL C SP CONSIDERATIONS: Establish procedures for spills, evacuation, care of exposed/injured people, decontamination, and access restriction for emergencies involving As. SUBSTITUTION: IH to discuss with customer to consider alternatives to arsenic	WAL C SP CONSIDERATIONS: Establish procedures for spills, evacuation, care of exposed/injured people, decontamination, and access restriction for emergencies involving As. SUBSTITUTION: IH to discuss with customer to consider alternatives to arsenic
Respirator Req:	None	None	[HAZARD COMMUNICATION]: Minimum APR HF APF10 or APR FF	[HAZARD COMMUNICATION]: Minimum APR FF APF50 for
Required Followup:	None	1. [HAZCOM] Initial monitoring to determine TWA is required for each shift for each job classification in each work area. Create a sampling	1. [HAZCOM] Initial monitoring to determine TWA is required for each shift for each job classification in each work area. Create a sampling	1. [HAZCOM] Initial monitoring to determine TWA is required for each shift for each job classification in each work area. Create a sampling

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			
1,3-Butadiene	Biological (BSL)	Hydrofluoric Acid	NOL-Liquid/Mist/Vapor
1-DB-3-CP	Bloodborne Pathogens	Lead	NOL-Solid/Dust/Fiber
13 Carcinogens	Cadmium	Magnetic Fields	Peroxidizables
Acrylonitrile	Chromium +6	Mercury	Refrigerants
Arsenic	Cryogen	Metal Fume	RF/Microwave
Asbestos	Ethylene Oxide	Methylene Chloride	Rodent Droppings
Benzene	Formaldehyde	Methylenedianiline	Silica
Beryllium	Gas	Nanomaterials	Valley Fever
Biological (ABSL)	Heat Stress (x2)	Noise	Vinyl Chloride

Perform a Risk Assessment

Everything starts with the risk assessment:

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

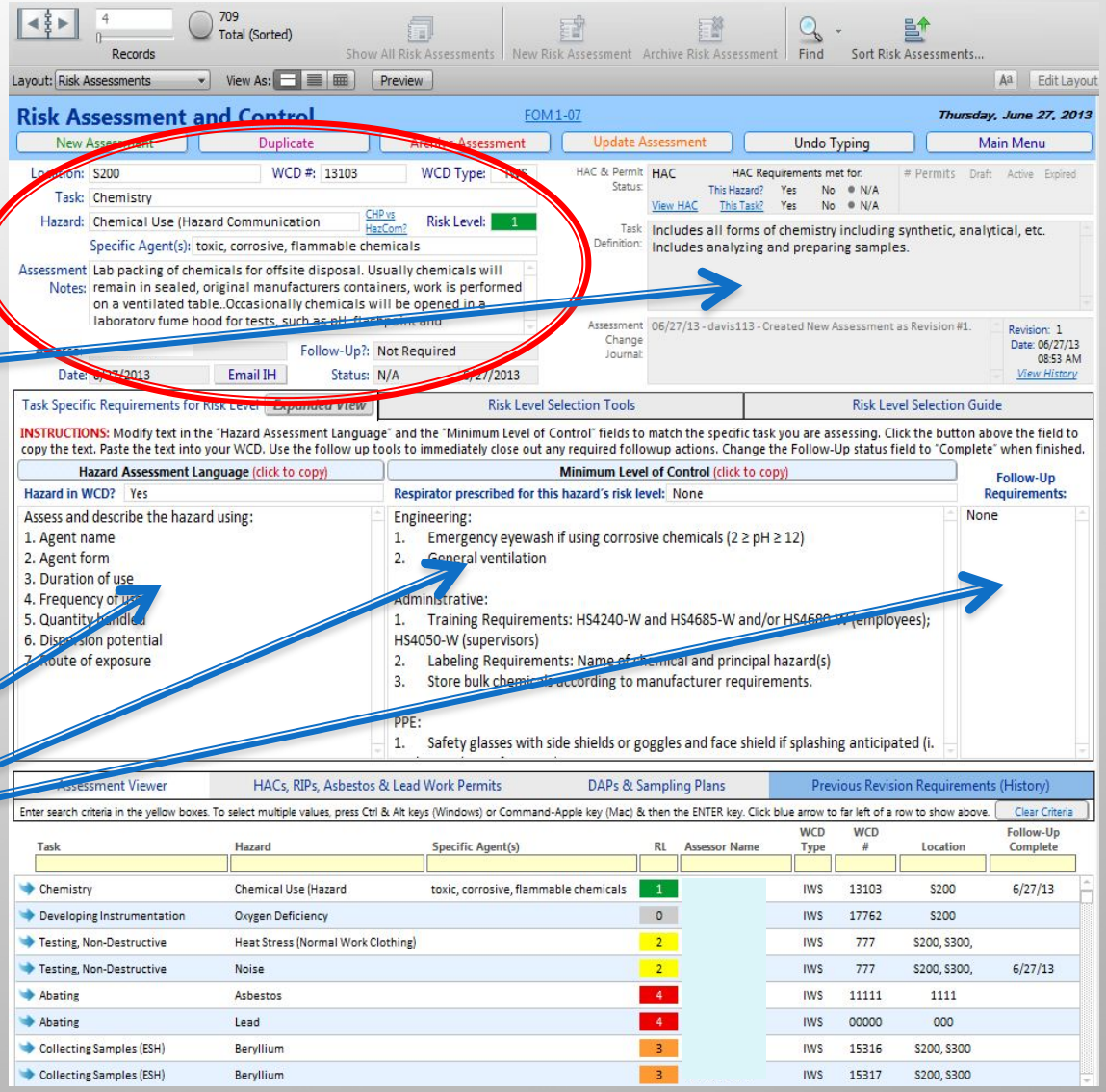
FUNDAMENTAL IH!

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

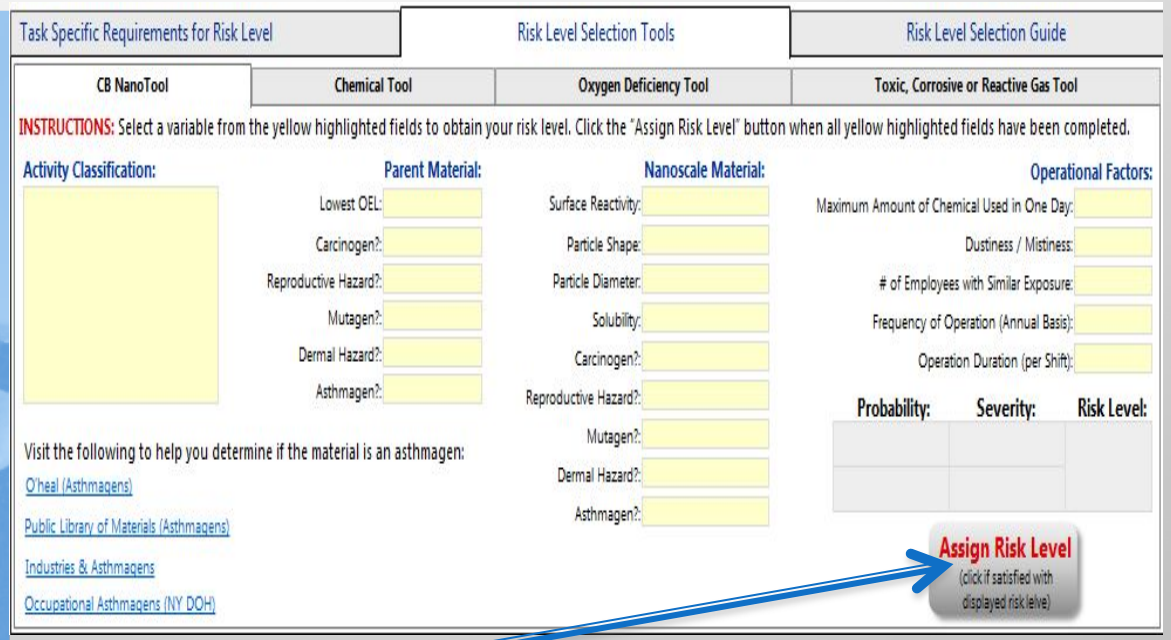
Risk Assessment Algorithms – CB NanoTool

The CB NanoTool:

- Developed with Sam Paik
- Used world-wide

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

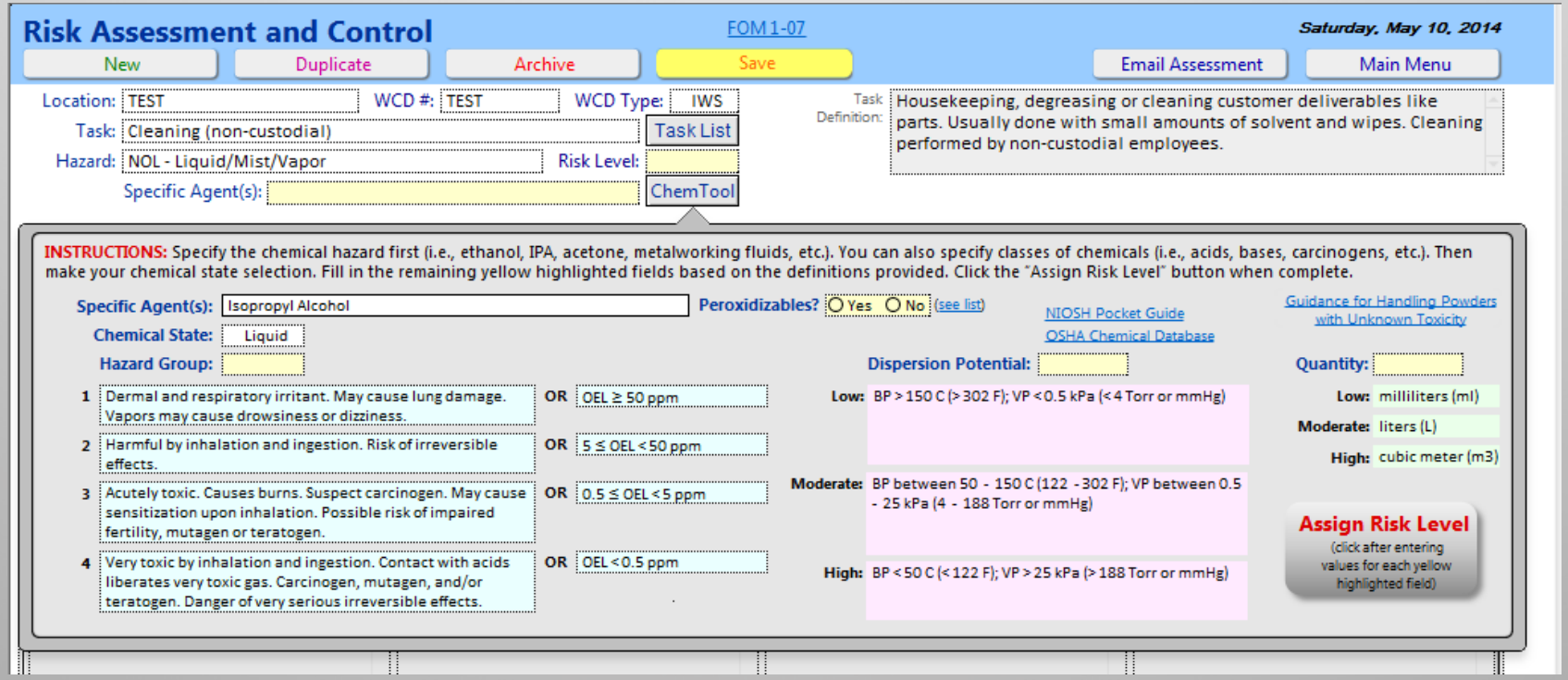
Click the Assign Risk Level button to automatically generate the RL along with minimum hazard assessment language, controls and follow up actions.



Risk Assessment: Tools

ChemTool

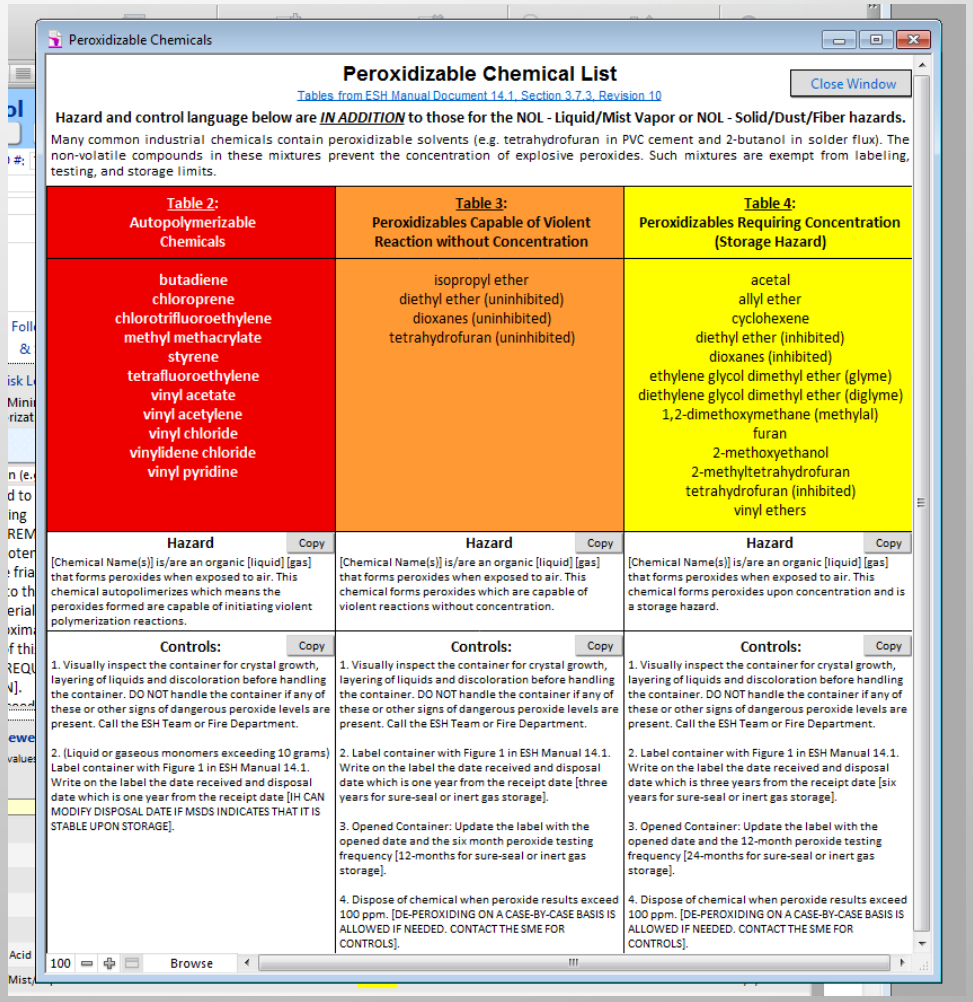
- Based on EMKG Risk Assessment Tool, Federal Institute for Occupational Safety & Health, Germany (BAuA)
- For NOL – Solid/Dust/Fiber or NOL – Liquid/Mist/Vapor
  - Define Hazard Group, Dispersion Potential and Quantity to obtain RL



Risk Assessment: Tools

Peroxide Formers

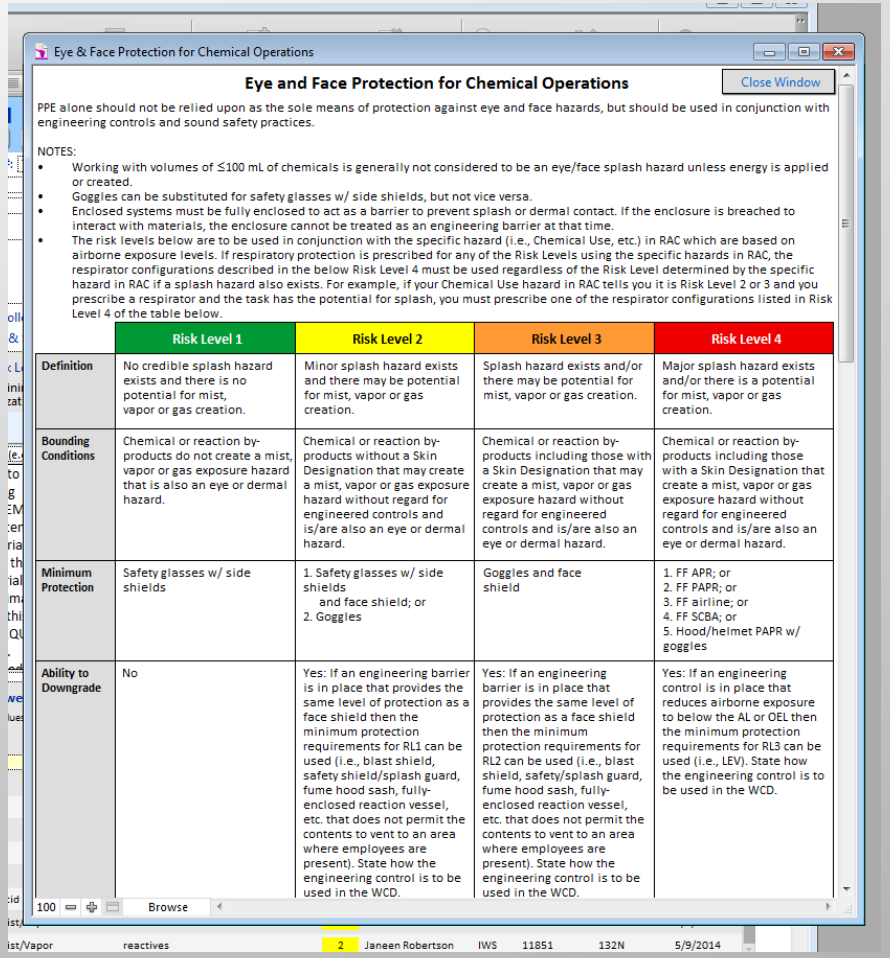
- LLNL Institutional guidance for peroxide forming chemicals



Risk Assessment: Tools

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



Eye & Face Protection for Chemical Operations

Eye and Face Protection for Chemical Operations

Close Window

PPE alone should not be relied upon as the sole means of protection against eye and face hazards, but should be used in conjunction with engineering controls and sound safety practices.

NOTES:

- Working with volumes of ≤100 mL of chemicals is generally not considered to be an eye/face splash hazard unless energy is applied or created.
- Goggles can be substituted for safety glasses w/ side shields, but not vice versa.
- Enclosed systems must be fully enclosed to act as a barrier to prevent splash or dermal contact. If the enclosure is breached to interact with materials, the enclosure cannot be treated as an engineering barrier at that time.
- The risk levels below are to be used in conjunction with the specific hazard (i.e., Chemical Use, etc.) in RAC which are based on airborne exposure levels. If respiratory protection is prescribed for any of the Risk Levels using the specific hazards in RAC, the respirator configurations described in the below Risk Level 4 must be used regardless of the Risk Level determined by the specific hazard in RAC if a splash hazard also exists. For example, if your Chemical Use hazard in RAC tells you it is Risk Level 2 or 3 and you prescribe a respirator and the task has the potential for splash, you must prescribe one of the respirator configurations listed in Risk Level 4 of the table below.

	Risk Level 1	Risk Level 2	Risk Level 3	Risk Level 4
Definition	No credible splash hazard exists and there is no potential for mist, vapor or gas creation.	Minor splash hazard exists and there may be potential for mist, vapor or gas creation.	Splash hazard exists and/or there may be potential for mist, vapor or gas creation.	Major splash hazard exists and/or there is a potential for mist, vapor or gas creation.
Bounding Conditions	Chemical or reaction by-products do not create a mist, vapor or gas exposure hazard that is also an eye or dermal hazard.	Chemical or reaction by-products without a Skin Designation that may create a mist, vapor or gas exposure hazard without regard for engineered controls and is/are also an eye or dermal hazard.	Chemical or reaction by-products including those with a Skin Designation that may create a mist, vapor or gas exposure hazard without regard for engineered controls and is/are also an eye or dermal hazard.	Chemical or reaction by-products including those with a Skin Designation that create a mist, vapor or gas exposure hazard without regard for engineered controls and is/are also an eye or dermal hazard.
Minimum Protection	Safety glasses w/ side shields	1. Safety glasses w/ side shields and face shield; or 2. Goggles	Goggles and face shield	1. FF APR; or 2. FF PAPR; or 3. FF airline; or 4. FF SCBA; or 5. Hood/helmet PAPR w/ goggles
Ability to Downgrade	No	Yes: If an engineering barrier is in place that provides the same level of protection as a face shield then the minimum protection requirements for RL1 can be used (i.e., blast shield, safety shield/splash guard, fume hood sash, fully-enclosed reaction vessel, etc. that does not permit the contents to vent to an area where employees are present). State how the engineering control is to be used in the WCD.	Yes: If an engineering barrier is in place that provides the same level of protection as a face shield then the minimum protection requirements for RL2 can be used (i.e., blast shield, safety/splash guard, fume hood sash, fully-enclosed reaction vessel, etc. that does not permit the contents to vent to an area where employees are present). State how the engineering control is to be used in the WCD.	Yes: If an engineering control is in place that reduces airborne exposure to below the AL or OEL then the minimum protection requirements for RL3 can be used (i.e., LEV). State how the engineering control is to be used in the WCD.

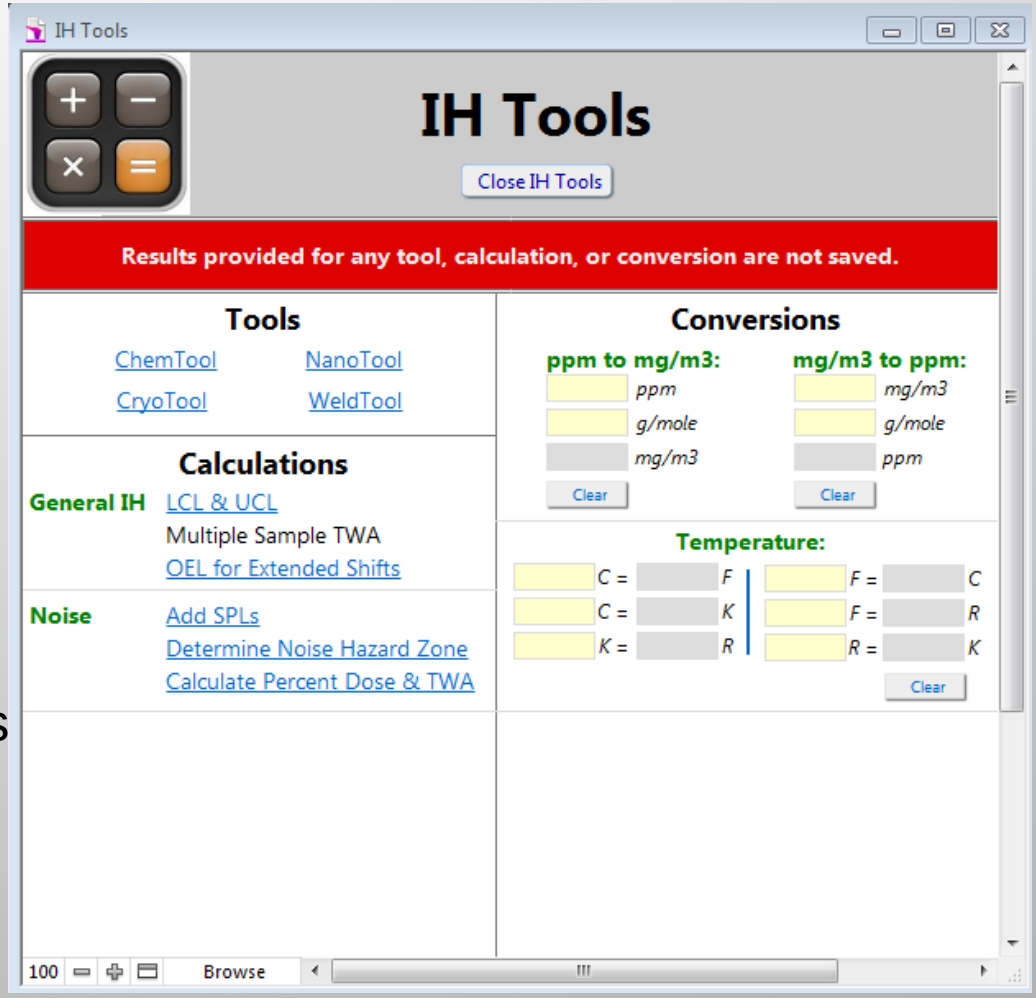
100 Browse

ist/Vapor reactives 2 Janeen Robertson IWS 11851 132N 5/9/2014

Risk Assessment: Tools

IH Tools

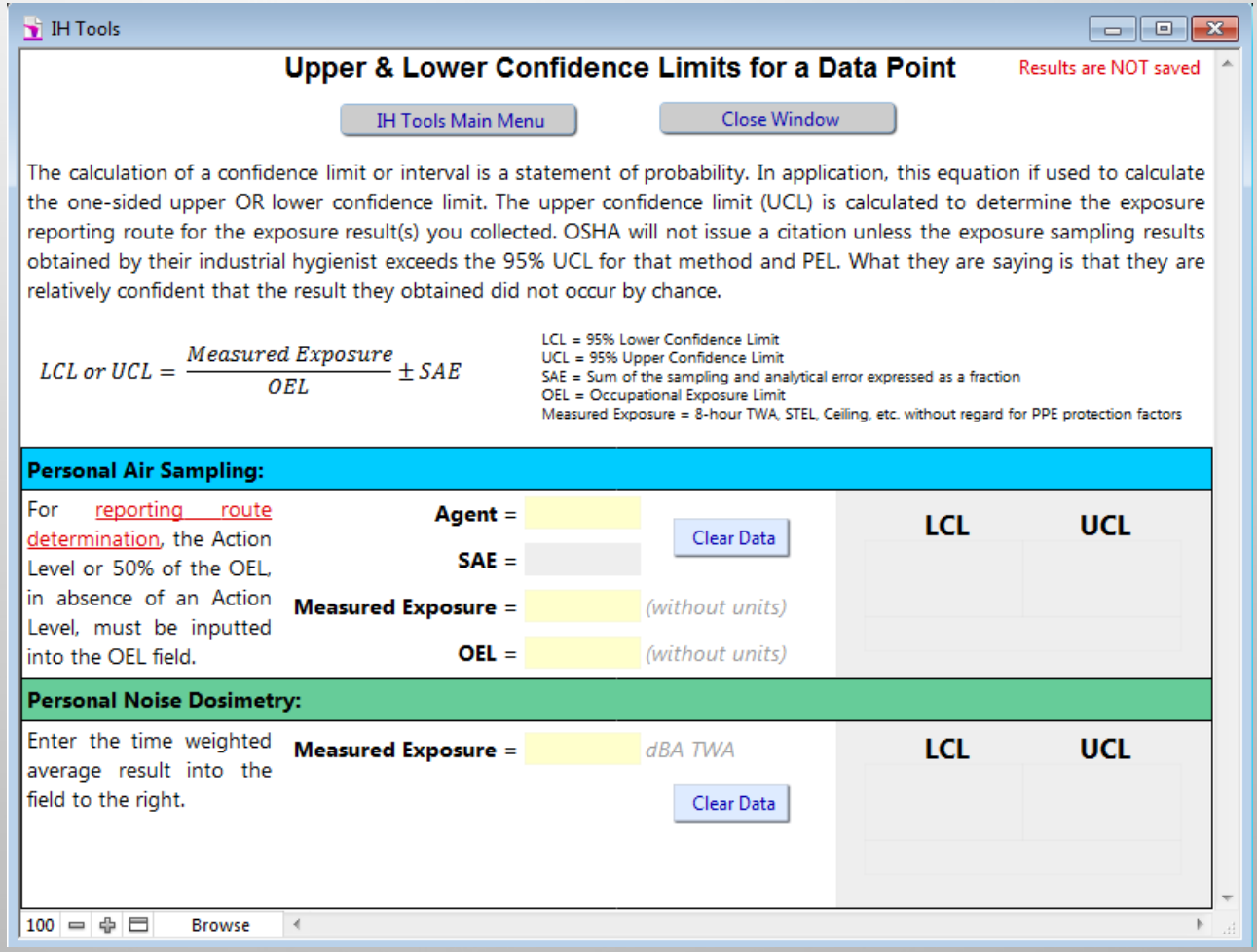
- Quick method to calculate rationale for selection of risk levels
- Conversions
- Calculations
  - LCL & UCL
  - OELs for Extended Shifts
  - Add SPLs
  - Noise Hazard Zones
  - Percent Dose



Risk Assessment: Tools

Statistics

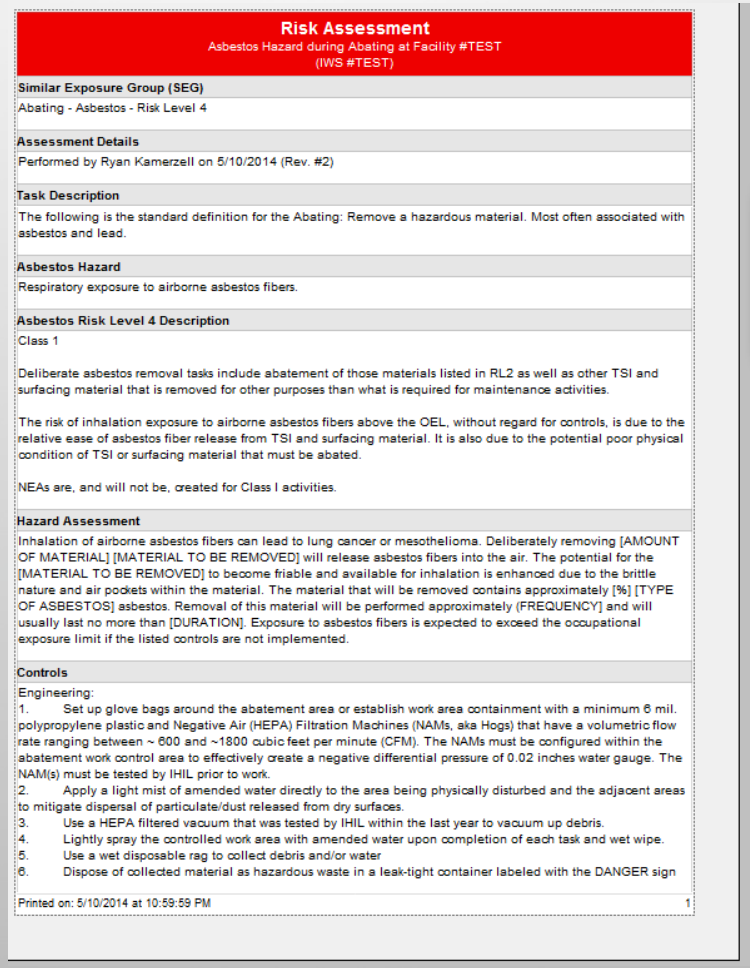
- Calculate LCL and UCL for single data points using Sampling & Analytical Errors (SAE)



Risk Assessment: Reports

Individual RA Report

- Generates PDF with standard naming convention
- Works with email software to automatically attach to outgoing message



Risk Assessment
Asbestos Hazard during Abating at Facility #TEST
(IWS #TEST)

Similar Exposure Group (SEG)

Abating - Asbestos - Risk Level 4

Assessment Details

Performed by Ryan Kamerzell on 5/10/2014 (Rev. #2)

Task Description

The following is the standard definition for the Abating: Remove a hazardous material. Most often associated with asbestos and lead.

Asbestos Hazard

Respiratory exposure to airborne asbestos fibers.

Asbestos Risk Level 4 Description

Class 1

Deliberate asbestos removal tasks include abatement of those materials listed in RL2 as well as other TSI and surfacing material that is removed for other purposes than what is required for maintenance activities.

The risk of inhalation exposure to airborne asbestos fibers above the OEL, without regard for controls, is due to the relative ease of asbestos fiber release from TSI and surfacing material. It is also due to the potential poor physical condition of TSI or surfacing material that must be abated.

NEAs are, and will not be, created for Class I activities.

Hazard Assessment

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 potential for the [MATERIAL TO BE REMOVED] to become friable and available for inhalation is enhanced due to the brittle nature and air pockets within the material. The material that will be removed contains approximately [%] [TYPE OF ASBESTOS] asbestos. Removal of this material will be performed approximately (FREQUENCY) and will usually last no more than [DURATION]. Exposure to asbestos fibers is expected to exceed the occupational exposure limit if the listed controls are not implemented.

Controls

Engineering:
1. Set up glove bags around the abatement area or establish work area containment with a minimum 6 mil. polypropylene plastic and Negative Air (HEPA) Filtration Machines (NAMs, aka Hogs) that have a volumetric flow rate ranging between ~ 600 and ~1800 cubic feet per minute (CFM). The NAMs must be configured within the abatement work control area to effectively create a negative differential pressure of 0.02 inches water gauge. The NAM(s) must be tested by IHIL prior to work.
2. Apply a light mist of amended water directly to the area being physically disturbed and the adjacent areas to mitigate dispersal of particulate/dust released from dry surfaces.
3. Use a HEPA filtered vacuum that was tested by IHIL within the last year to vacuum up debris.
4. Lightly spray the controlled work area with amended water upon completion of each task and wet wipe.
5. Use a wet disposable rag to collect debris and/or water
6. Dispose of collected material as hazardous waste in a leak-tight container labeled with the DANGER sign

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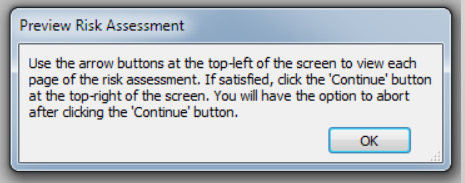


Risk Assessment Determination – Example Tasks

Task Specific Requirements for Risk Level | Risk Level Selection Tools | Risk Level Selection Guide

Asbestos

Respiratory exposure to airborne asbestos fibers.

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 Level Descriptions | Example Tasks | Hazard Language | Controls | Follow-Up | References | Hazard Description

Risk Level 1:	Risk Level 2:	Risk Level 3:	Risk Level 4:
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).	Include, but are not limited to, the following: 1. Wall Penetrations; 2. Floor Penetrations; 3. ACM Gasket/Seal removal and replacement. Contact the Asbestos SME for guidance as to whether other tasks fit into this Risk Level. Tasks 1 & 2, above are currently	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. Contact the Asbestos SME for guidance	Abatement

Risk Assessment Determination – Hazard Language

Task Specific Requirements for Risk Level | Risk Level Selection Tools | Risk Level Selection Guide

Asbestos

Respiratory exposure to airborne asbestos fibers.

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 Level Descriptions | Example Tasks | Hazard Language | Controls | Follow-Up | References | Hazard Description

	Risk Level 1:	Risk Level 2:	Risk Level 3:	Risk Level 4:
Hazard in WCD?	Materials of special concern (e.g., alkali metals, fluorine, asbestos	Materials of special concern (e.g., alkali metals, fluorine, asbestos	Materials of special concern (e.g., alkali metals, fluorine, asbestos	Materials of special concern (e.g., alkali metals, fluorine, asbestos
Hazard Assessment Language:	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	Inhalation of airborne asbestos fibers can lead to lung cancer or mesothelioma. Operations and Maintenance (O&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.	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	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 potential for the [MATERIAL TO BE REMOVED] to become friable and available for inhalation is enhanced due to the brittle nature

Risk Assessment Determination – References

Task Specific Requirements for Risk Level | Risk Level Selection Tools | Risk Level Selection Guide

Asbestos

Respiratory exposure to airborne asbestos fibers.

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 Level Descriptions | Example Tasks | Hazard Language | Controls | Follow-Up | References | Hazard Description

Policy:

References:

1. ESH Manual Document 14.9 (New Revision Title): Asbestos Abatement and Operations and Maintenance (O&M) Safety Program
2. Asbestos Program website

Risk Level Determination Document:

Asbestos - RL Determination - R7 - 05-15-13 pab.pdf

Save a Copy to Your Computer

Risk Assessment Determination – Hazard Description

Task Specific Requirements for Risk Level | Risk Level Selection Tools | Risk Level Selection Guide

Asbestos

Respiratory exposure to airborne asbestos fibers.

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 Level Descriptions | Example Tasks | Hazard Language | Controls | Follow-Up | References | Hazard Description

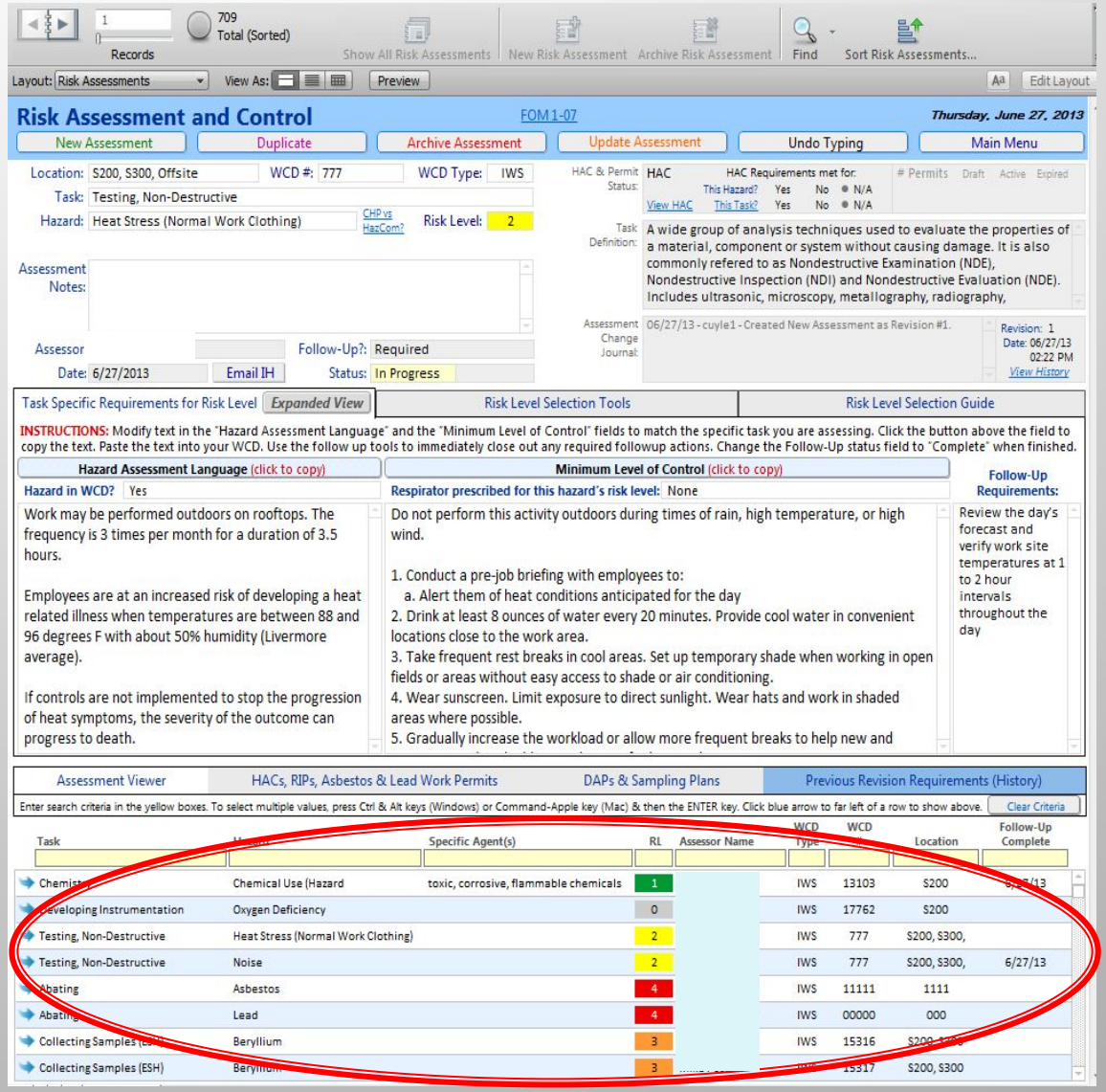
Respiratory exposure to airborne asbestos fibers. Intact Asbestos Containing Material (ACM) is not hazardous unless the material is disturbed or deteriorates, causing loose fibers to become airborne and respirable. Inhalation of asbestos fibers may increase the risk of developing lung cancer or mesothelioma, 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:

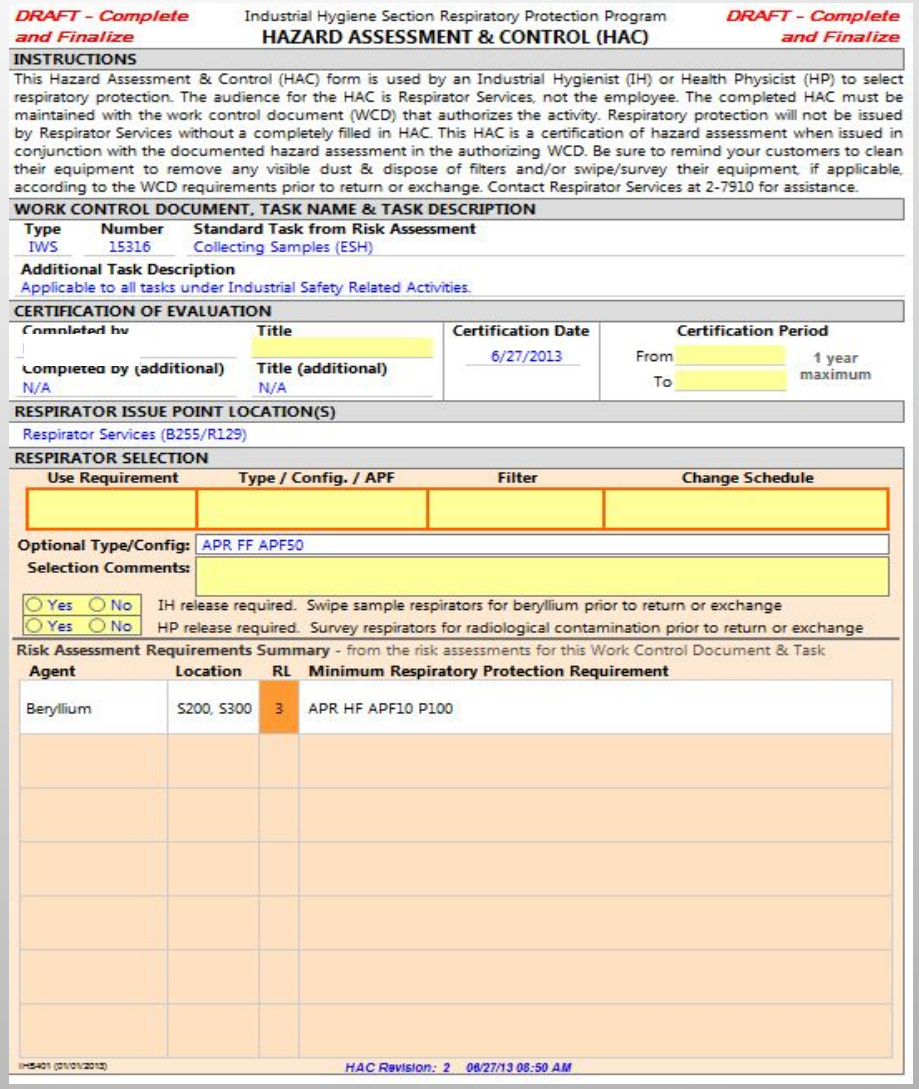
1. Respirator Permit (HAC)
2. Voluntary Use of Filtering Facepieces
3. Asbestos Work Permit
4. Lead Work Permit
5. Sampling Plan for Air (personal or area)
6. Sampling Plan for Surface (swipe, wipe, bulk)
7. Inclusion of a particular periodic surveillance requirement (IH DAP)
8. Analytical Lab RUSH Analysis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

Follow Up Requirements – Respirator Permit

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.



DRAFT - Complete and Finalize

Industrial Hygiene Section Respiratory Protection Program

HAZARD ASSESSMENT & CONTROL (HAC)

DRAFT - Complete and Finalize

INSTRUCTIONS

This Hazard Assessment & Control (HAC) form is used by an Industrial Hygienist (IH) or Health Physicist (HP) to select respiratory protection. The audience for the HAC is Respirator Services, not the employee. The completed HAC must be maintained with the work control document (WCD) that authorizes the activity. Respiratory protection will not be issued by Respirator Services without a completely filled in HAC. This HAC is a certification of hazard assessment when issued in conjunction with the documented hazard assessment in the authorizing WCD. Be sure to remind your customers to clean their equipment to remove any visible dust & dispose of filters and/or swipe/survey their equipment, if applicable, according to the WCD requirements prior to return or exchange. Contact Respirator Services at 2-7910 for assistance.

WORK CONTROL DOCUMENT, TASK NAME & TASK DESCRIPTION

Type	Number	Standard Task from Risk Assessment
IWS	15316	Collecting Samples (ESH)

Additional Task Description

Applicable to all tasks under Industrial Safety Related Activities.

CERTIFICATION OF EVALUATION

Completed by	Title	Certification Date	Certification Period
		6/27/2013	From: To: (1 year maximum)
Completed by (additional): N/A	Title (additional): N/A		

RESPIRATOR ISSUE POINT LOCATION(S)

Respirator Services (B255/R129)

RESPIRATOR SELECTION

Use Requirement	Type / Config. / APF	Filter	Change Schedule

Optional Type/Config: APR FF APF50

Selection Comments:

○ Yes ○ No IH release required. Swipe sample respirators for beryllium prior to return or exchange

○ Yes ○ No HP release required. Survey respirators for radiological contamination prior to return or exchange

Risk Assessment Requirements Summary - from the risk assessments for this Work Control Document & Task

Agent	Location	RL	Minimum Respiratory Protection Requirement
Beryllium	S200, S300	3	APR HF APF10 P100

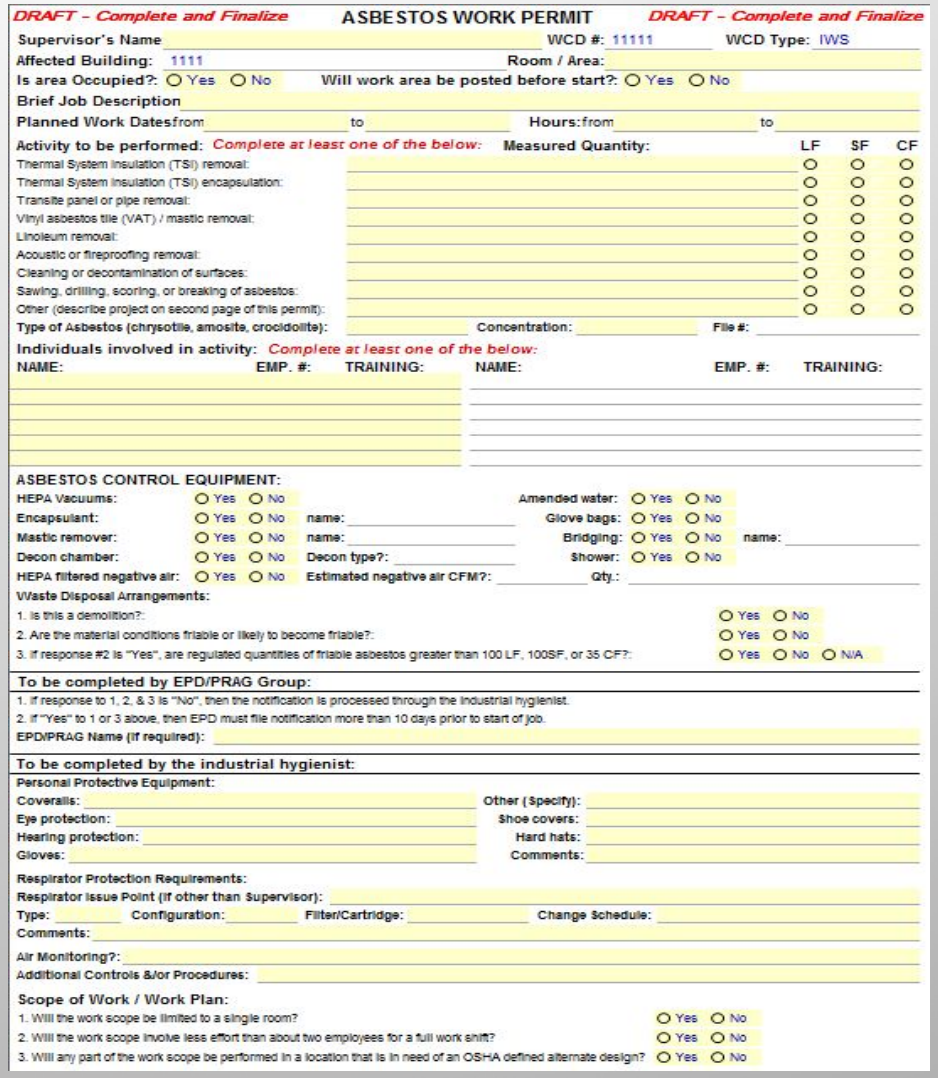
IH5401 (01/01/2013)

HAC Revision: 2 06/27/13 08:50 AM

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)



DRAFT – Complete and Finalize **ASBESTOS WORK PERMIT** *DRAFT – Complete and Finalize*

Supervisor's Name _____ WCD #: 11111 WCD Type: IWS

Affected Building: 1111 Room / Area: _____

Is area Occupied?: ○ Yes ○ No Will work area be posted before start?: ○ Yes ○ No

Brief Job Description _____

Planned Work Dates from _____ to _____ Hours: from _____ to _____

Activity to be performed: *Complete at least one of the below:*	Measured Quantity:	LF	SF	CF
Thermal System Insulation (TSI) removal:		○	○	○
Thermal System Insulation (TSI) encapsulation:		○	○	○
Transite panel or pipe removal:		○	○	○
Vinyl asbestos tile (VAT) / mastic removal:		○	○	○
Linoleum removal:		○	○	○
Acoustic or fireproofing removal:		○	○	○
Cleaning or decontamination of surfaces:		○	○	○
Sawing, drilling, scoring, or breaking of asbestos:		○	○	○
Other (describe project on second page of this permit):		○	○	○

Type of Asbestos (chrysotile, amosite, crocidolite): _____ Concentration: _____ File #: _____

Individuals involved in activity: *Complete at least one of the below:*

NAME:	EMP. #:	TRAINING:	NAME:	EMP. #:	TRAINING:

ASBESTOS CONTROL EQUIPMENT:

HEPA Vacuums: ○ Yes ○ No

Encapsulant: ○ Yes ○ No name: _____

Mastic remover: ○ Yes ○ No name: _____

Decon chamber: ○ Yes ○ No Decon type?: _____

HEPA filtered negative air: ○ Yes ○ No Estimated negative air CFM?: _____ Qty.: _____

Amended water: ○ Yes ○ No

Glove bags: ○ Yes ○ No

Bridging: ○ Yes ○ No name: _____

Shower: ○ Yes ○ No

Waste Disposal Arrangements:

1. Is this a demolition?: ○ Yes ○ No
2. Are the material conditions friable or likely to become friable?: ○ Yes ○ No
3. If response #2 is "Yes", are regulated quantities of friable asbestos greater than 100 LF, 100SF, or 35 CF?: ○ Yes ○ No ○ N/A

To be completed by EPD/PRAG Group:

1. If response to 1, 2, & 3 is "No", then the notification is processed through the industrial hygienist.
2. If "Yes" to 1 or 3 above, then EPD must file notification more than 10 days prior to start of job.

EPD/PRAG Name (if required): _____

To be completed by the industrial hygienist:

Personal Protective Equipment:

Coveralls: _____ Other (Specify): _____

Eye protection: _____ Shoe covers: _____

Hearing protection: _____ Hard hats: _____

Gloves: _____ Comments: _____

Respirator Protection Requirements:

Respirator Issue Point (if other than Supervisor): _____

Type: _____ Configuration: _____ Filter/Cartridge: _____ Change Schedule: _____

Comments: _____

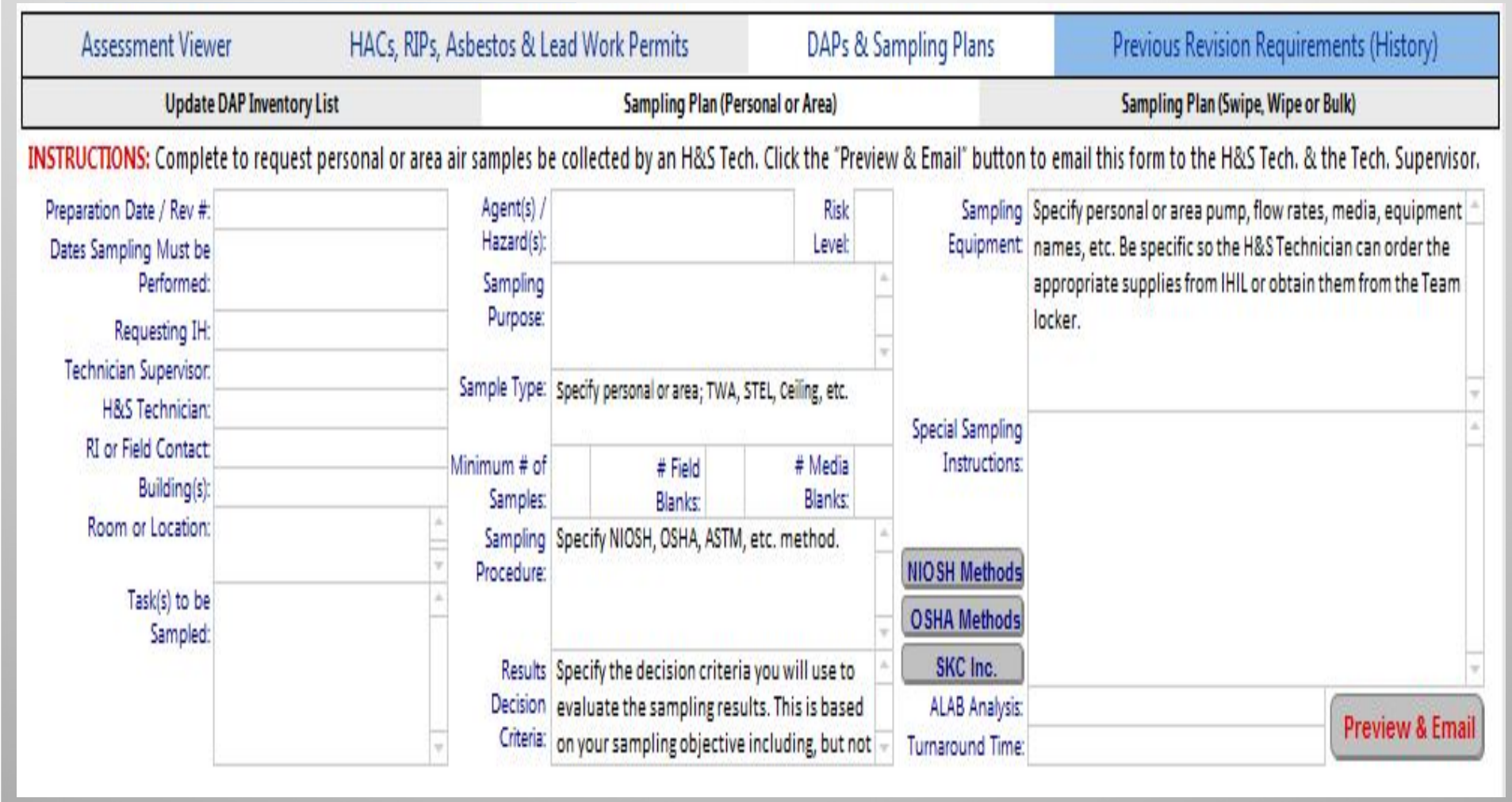
Air Monitoring?: _____

Additional Controls &/or Procedures: _____

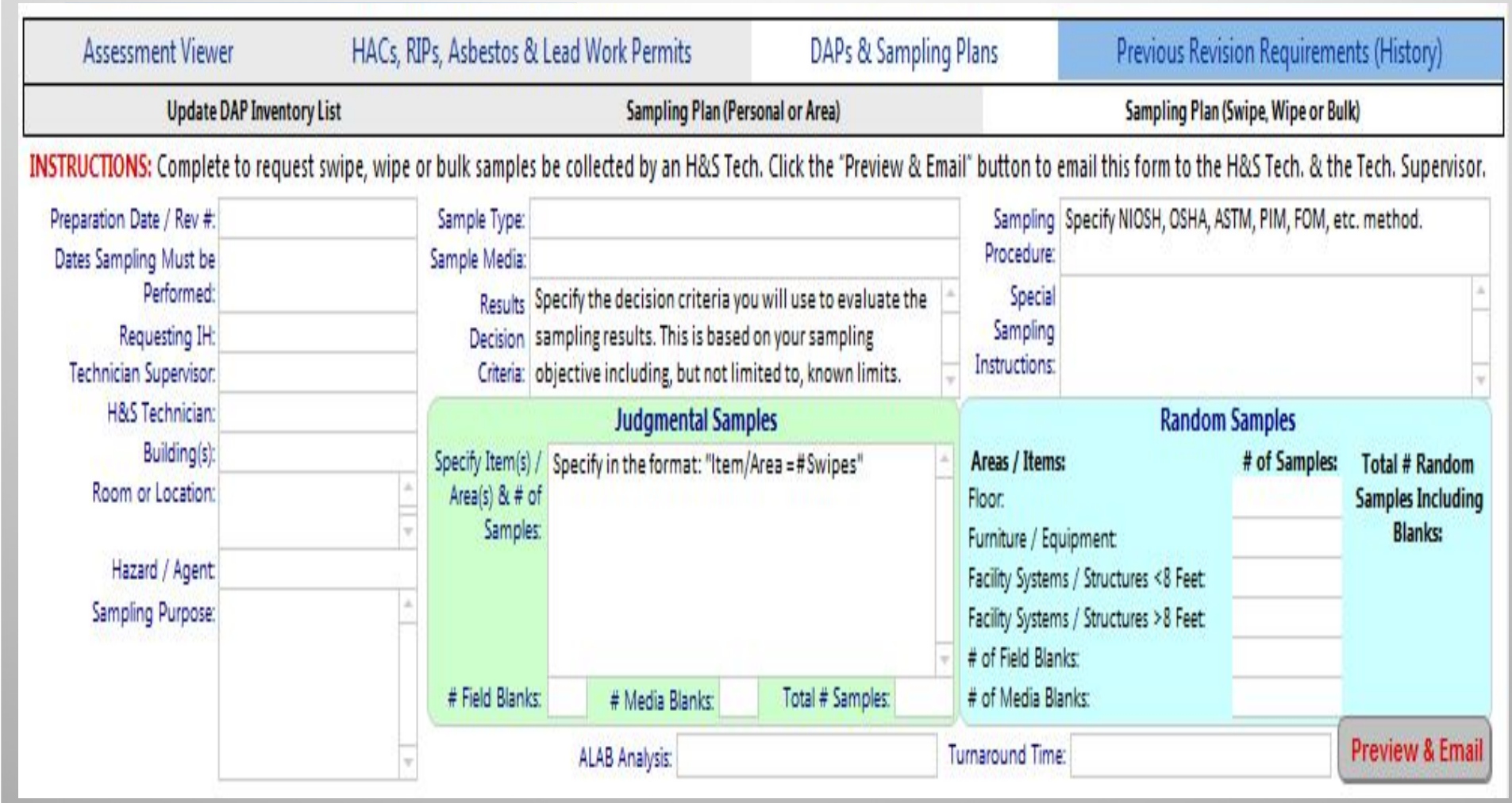
Scope of Work / Work Plan:

1. Will the work scope be limited to a single room? ○ Yes ○ No
2. Will the work scope involve less effort than about two employees for a full work shift? ○ Yes ○ No
3. Will any part of the work scope be performed in a location that is in need of an OSHA defined alternate design? ○ Yes ○ No

Follow Up Requirements – Sampling Plan for Air (Personal or Area)



Follow Up Requirements – Sampling Plan for Surface (Swipe, Wipe, Bulk)



Assessment Viewer | HACs, RIPs, Asbestos & Lead Work Permits | DAPs & Sampling Plans | Previous Revision Requirements (History)

Update DAP Inventory List | Sampling Plan (Personal or Area) | Sampling Plan (Swipe, Wipe or Bulk)

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.

Sampling Procedure: Specify NIOSH, OSHA, ASTM, PIM, FOM, etc. method.
Special Sampling Instructions:

Judgmental Samples

Specify Item(s) / Area(s) & # of Samples: Specify in the format: "Item/Area = # Swipes"

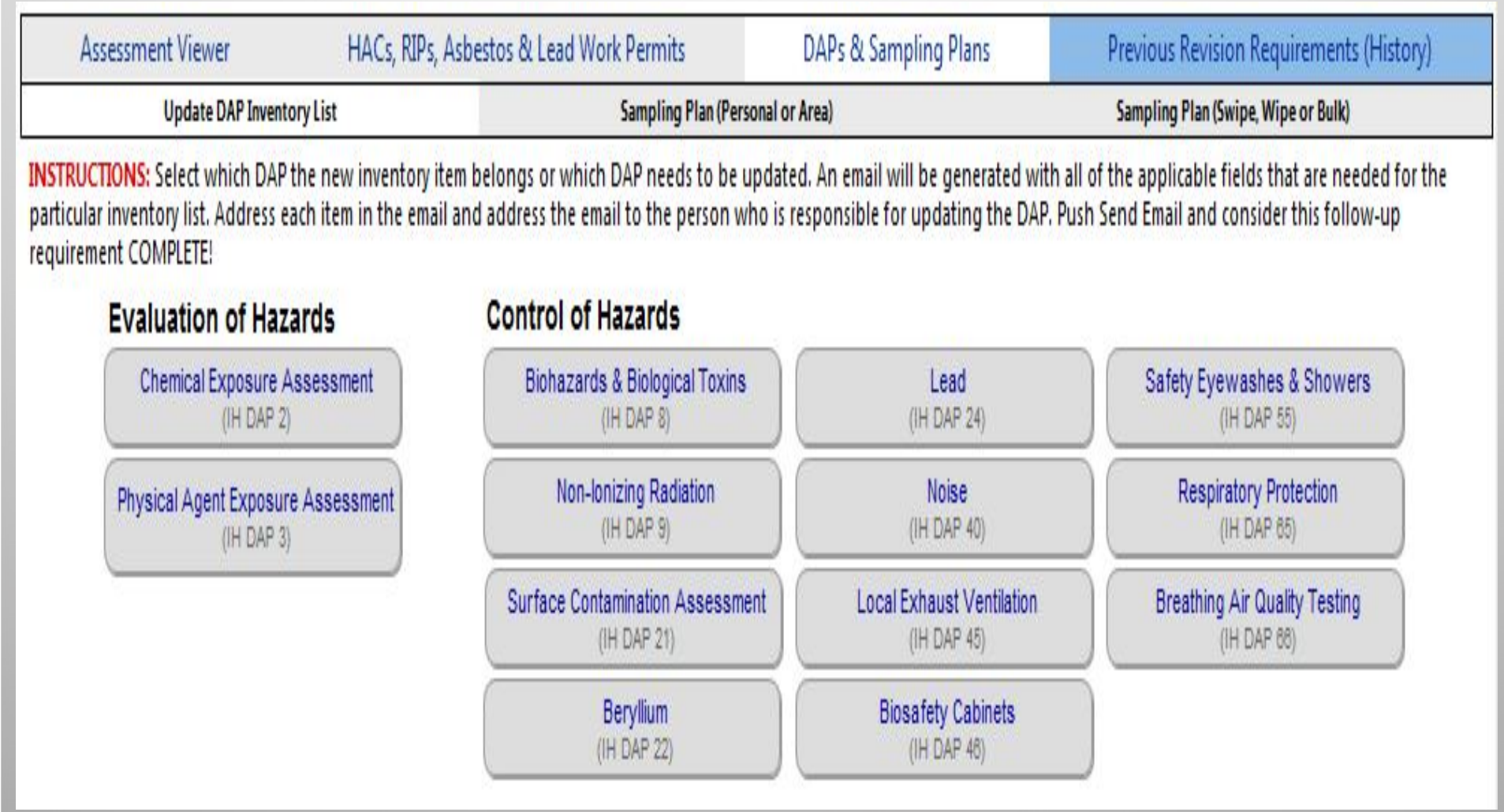
Field Blanks: | # Media Blanks: | Total # Samples:

Random Samples

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

ALAB Analysis:
Turnaround Time:
Preview & Email

Follow Up Requirements – IH Discipline Action Plan (DAP)



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

Industrial Hygiene Section

ALAB "RUSH" SAMPLE ANALYSIS REQUEST FORM

Batch #:	20153016	**Type of Samples:**	Swipes
Date Submitted:	5/16/2013	**# of Samples:**	13
Responsible IH:		**Sample Analysis:**	Beryllium

Describe Special Circumstances: DAP routine showed detectable beryllium. This is to ascertain if this is a larger issue.

Check One:

○ **EMERGENCY** — Personal exposure or spill occurred (NOT potential)
Date of Occurrence:
Time of Occurrence:
Analysis will be done ASAP

○ **URGENT** — Personal monitoring samples where potential exposure is greater than Action level (w/o respect to respiratory protection)
Analysis will be done in two (2) business days

● **WORK AUTHORIZATION SAMPLES**
(Programmatic Requests)

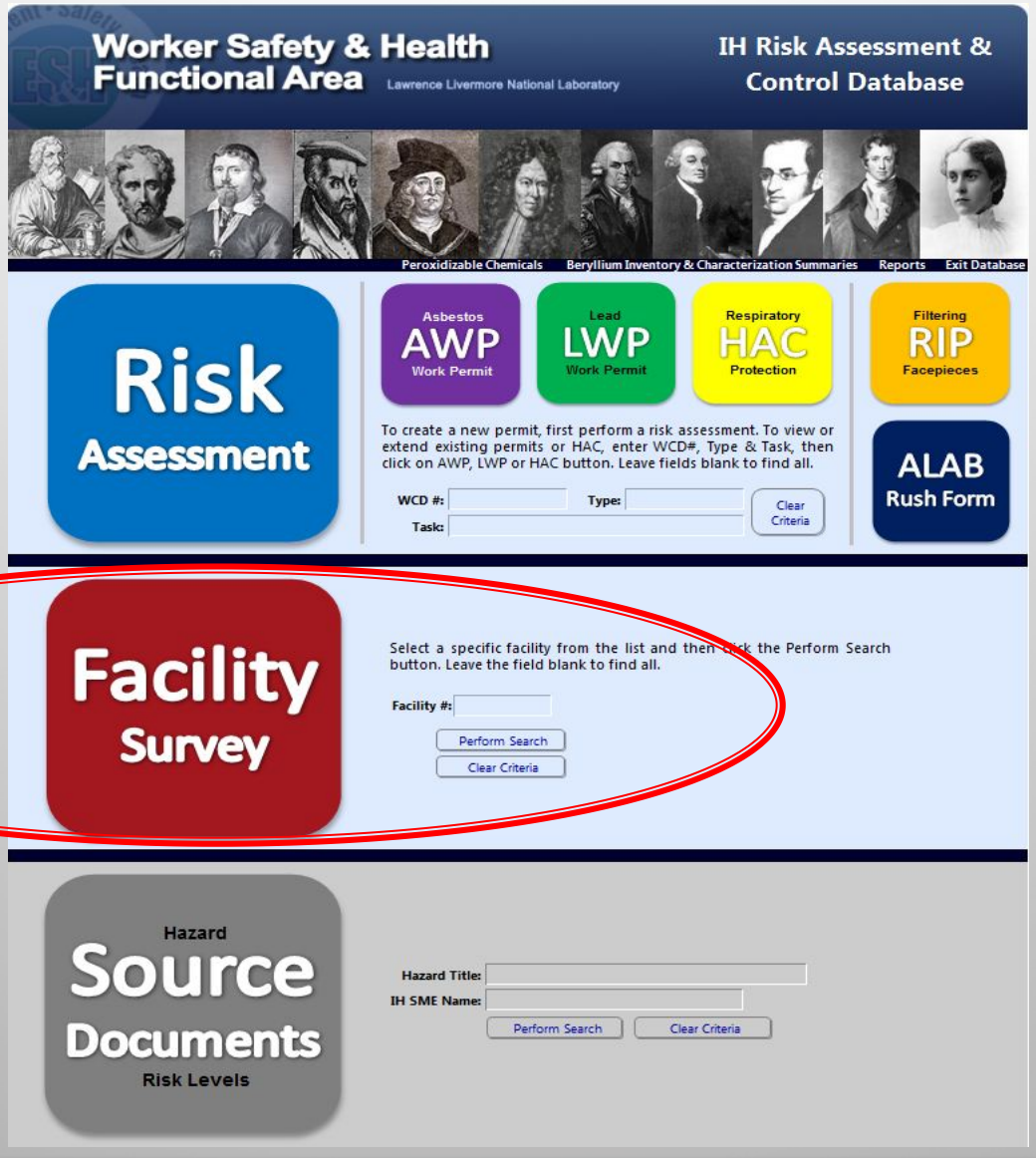
≤ ten (10) samples (Approval by ALAB supervisor)
Approved by: Date:

> ten (10) samples for Beryllium (Approval by Be SME)
Approved by: Date:

> ten (10) samples (other than Be) (Approval by IHS Leader)
Approved by: 5/13/2013 Date:

AGREED UPON TURNAROUND TIME:
5/13/2013

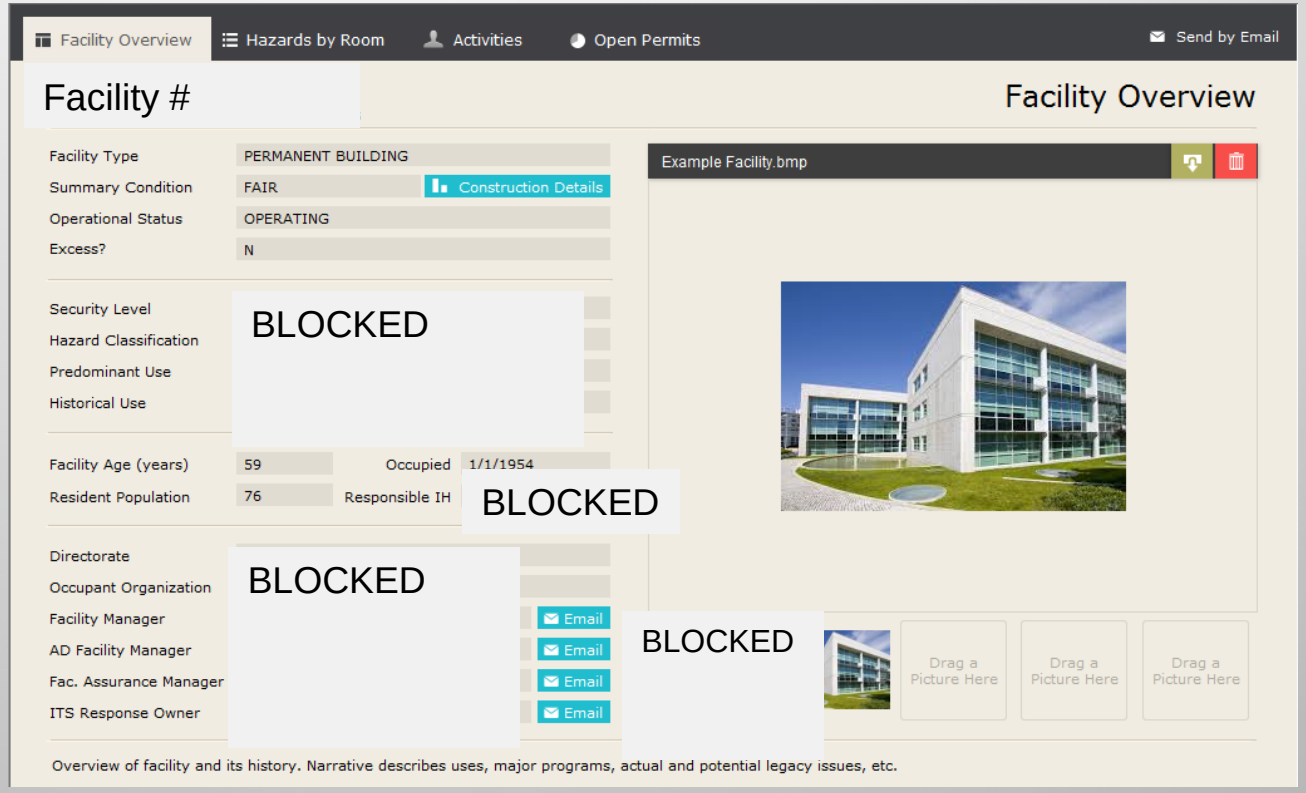
Facility Survey Through the RAC Database



Facility Information

Facility Overview

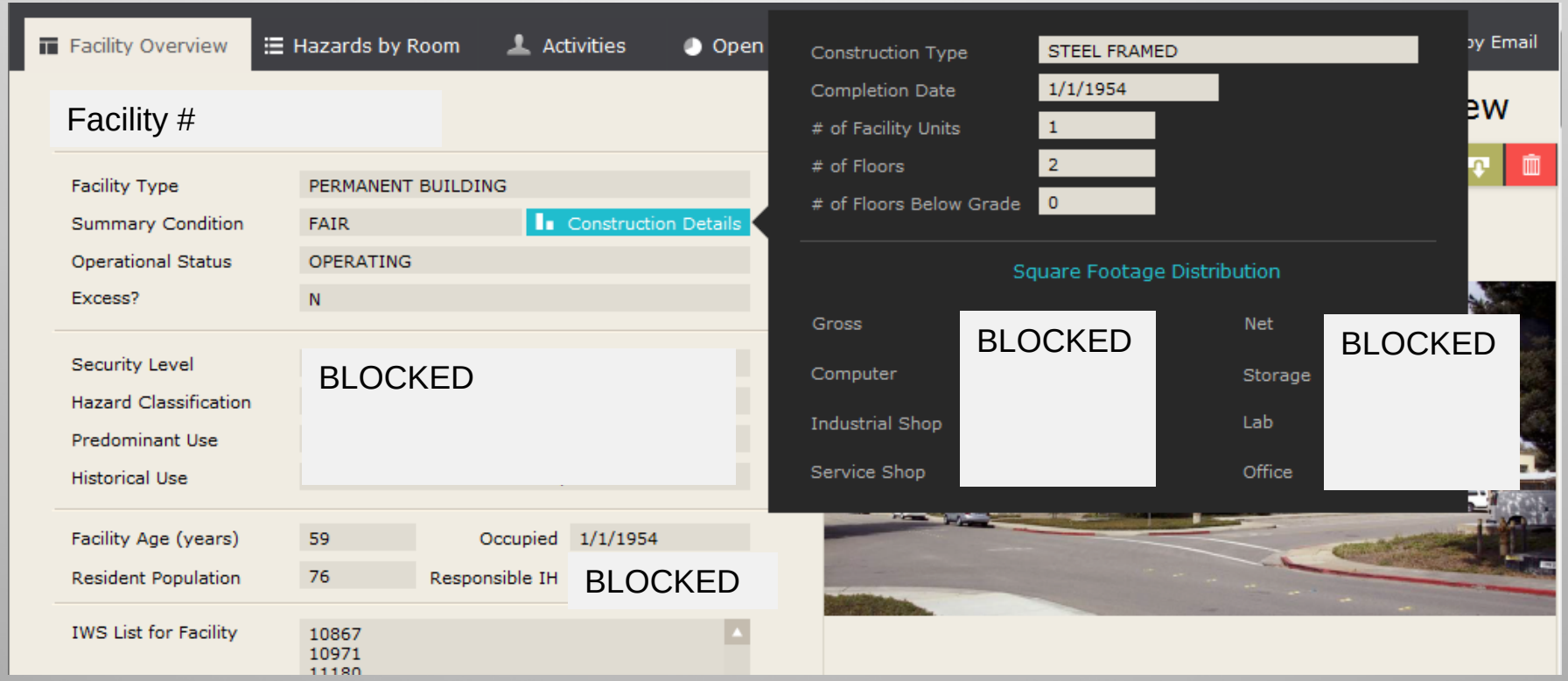
- Condition
- Operational Status
- Security Level
- Hazard Classification
- Predominant Use
- Age
- Resident population
- Historical Summary



Facility Information

Facility Overview

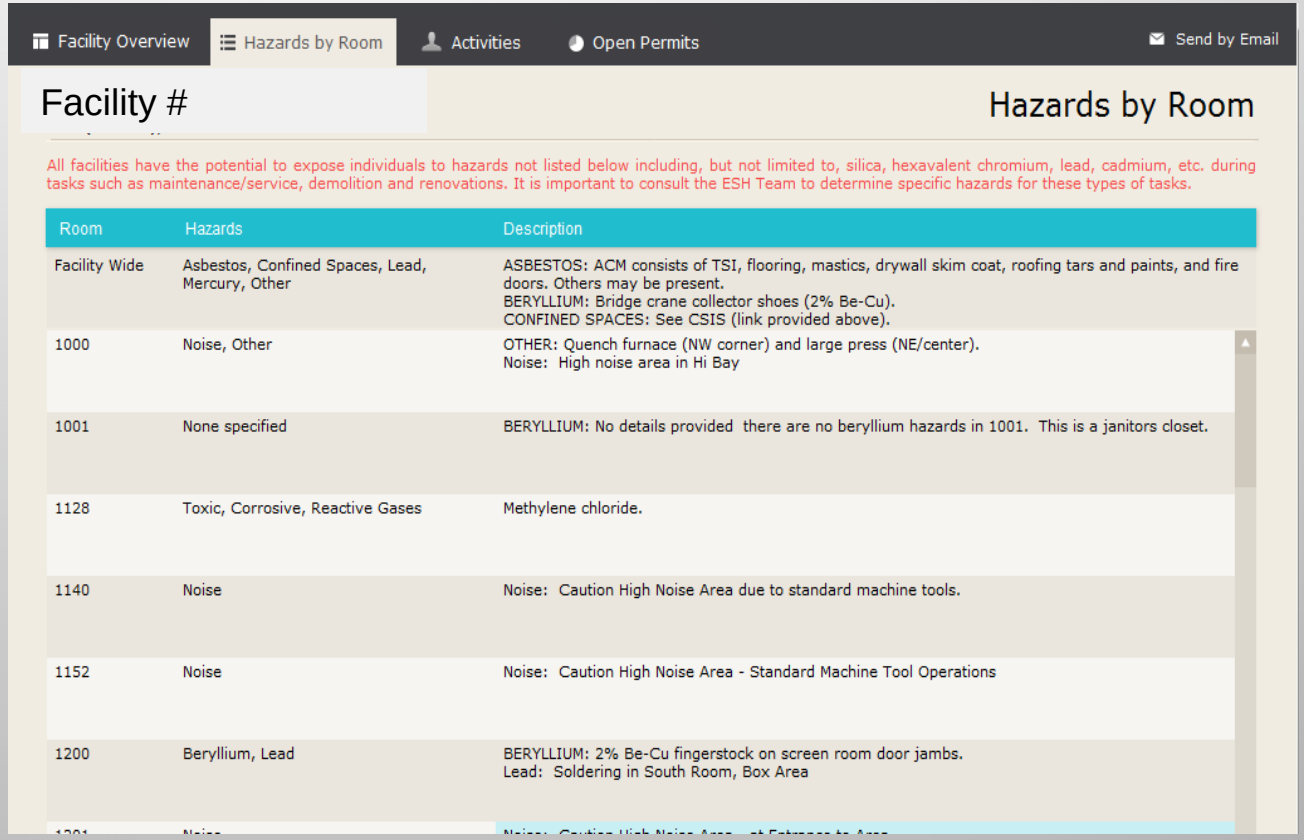
- Construction Type & # of units
- Square footage distribution



Facility Information

Hazards by Room

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

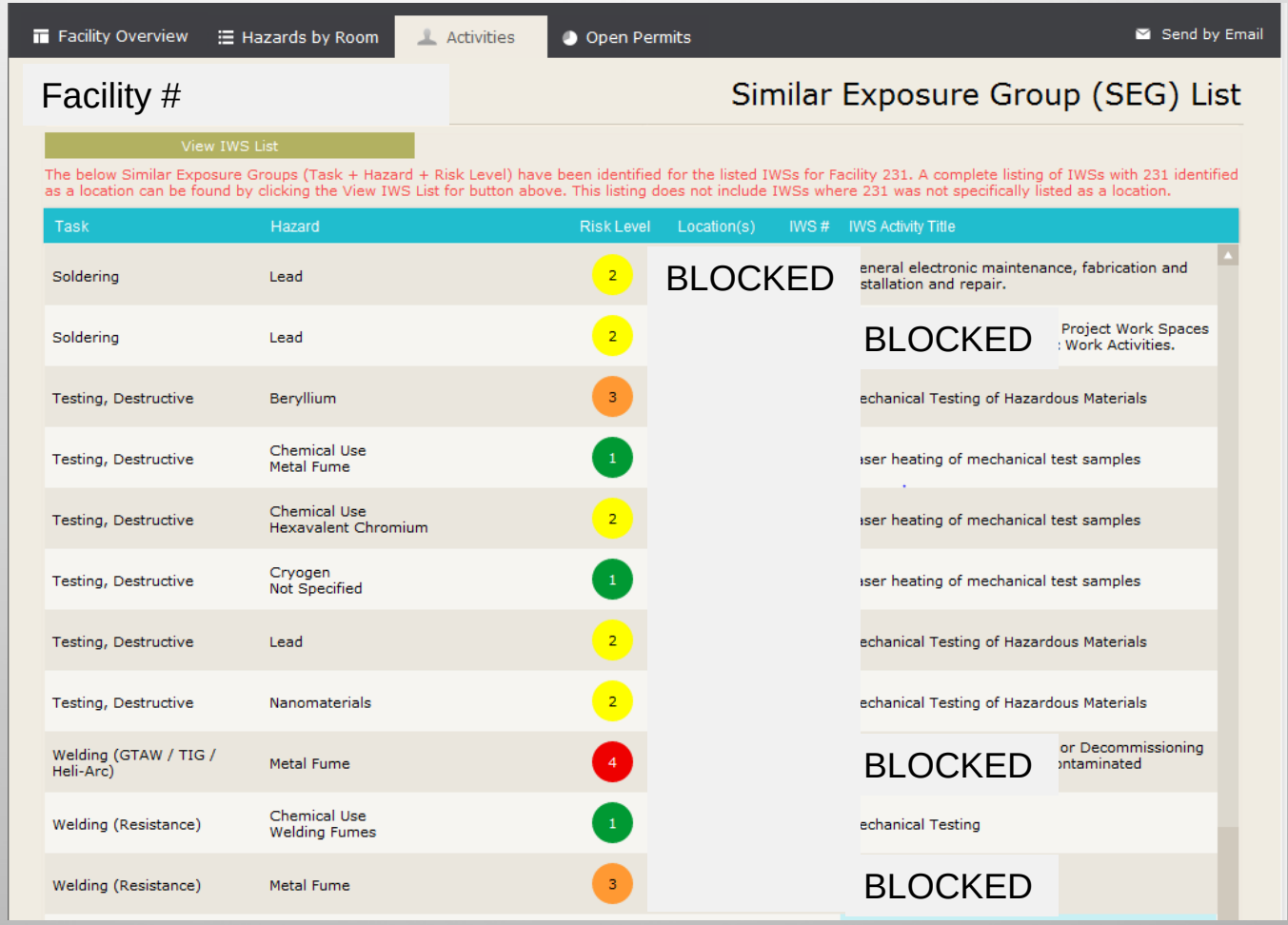


Room	Hazards	Description
Facility Wide	Asbestos, Confined Spaces, Lead, Mercury, Other	ASBESTOS: ACM consists of TSI, flooring, mastics, drywall skim coat, roofing tars and paints, and fire doors. Others may be present. BERYLLIUM: Bridge crane collector shoes (2% Be-Cu). CONFINED SPACES: See CSIS (link provided above).
1000	Noise, Other	OTHER: Quench furnace (NW corner) and large press (NE/center). Noise: High noise area in Hi Bay
1001	None specified	BERYLLIUM: No details provided there are no beryllium hazards in 1001. This is a janitors closet.
1128	Toxic, Corrosive, Reactive Gases	Methylene chloride.
1140	Noise	Noise: Caution High Noise Area due to standard machine tools.
1152	Noise	Noise: Caution High Noise Area - Standard Machine Tool Operations
1200	Beryllium, Lead	BERYLLIUM: 2% Be-Cu fingerstock on screen room door jambs. Lead: Soldering in South Room, Box Area

Facility Information

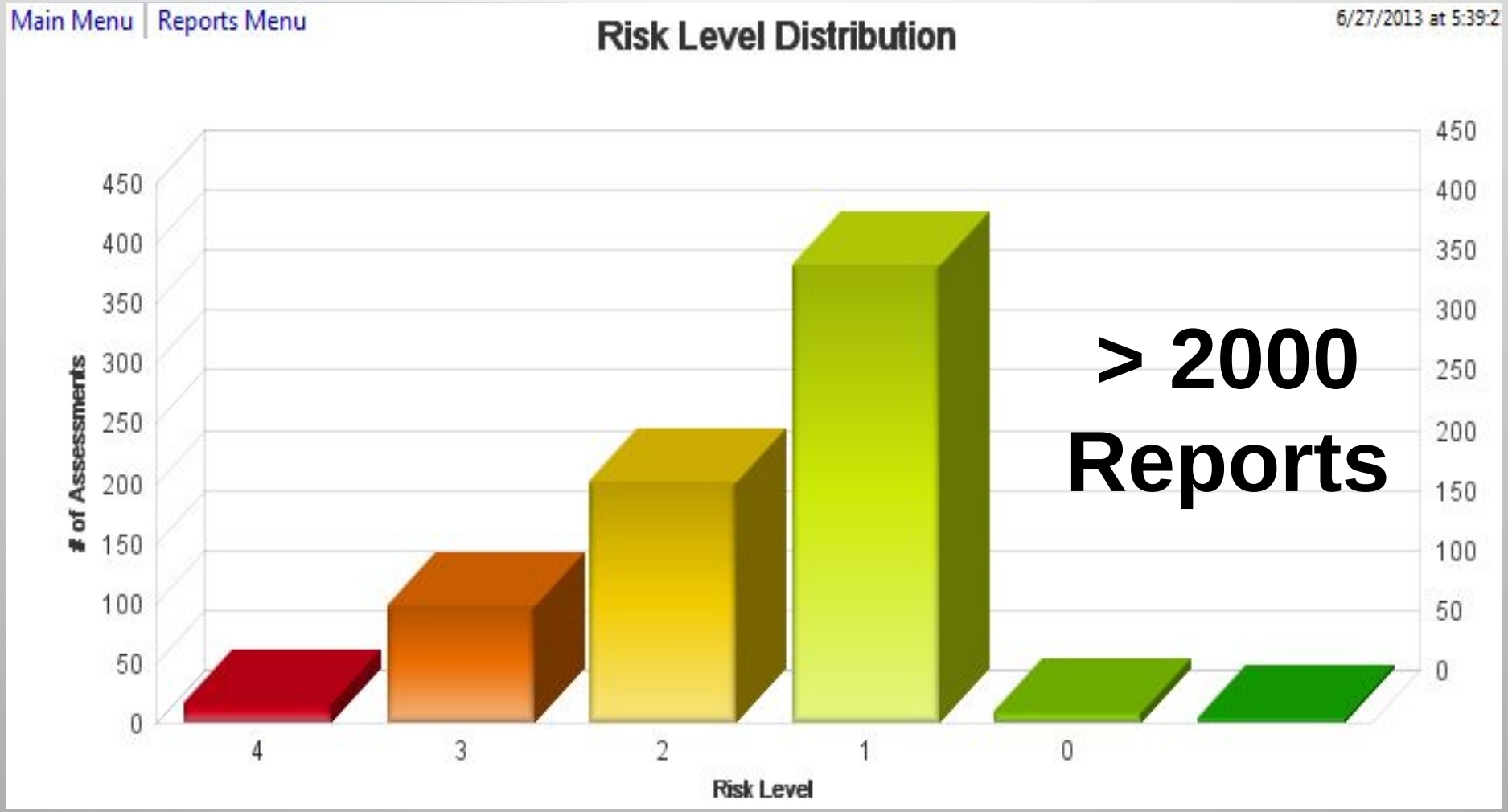
Similar Exposure Groups

- Lists SEGs in facility
  - Task +
  - Hazard +
  - Risk Level
- Lists Activity Title for each SEG

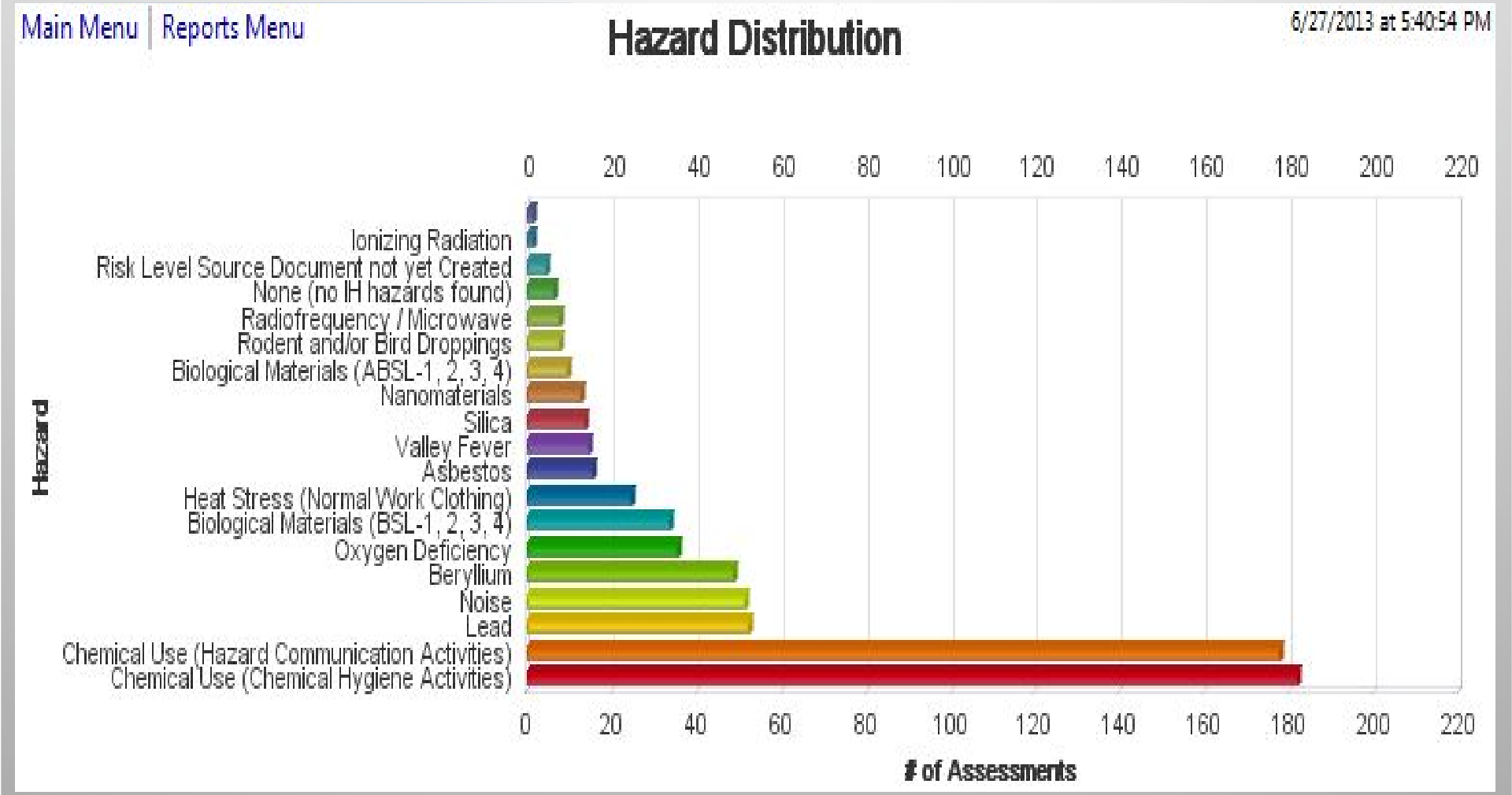


RAC Database Reports – Main Menu

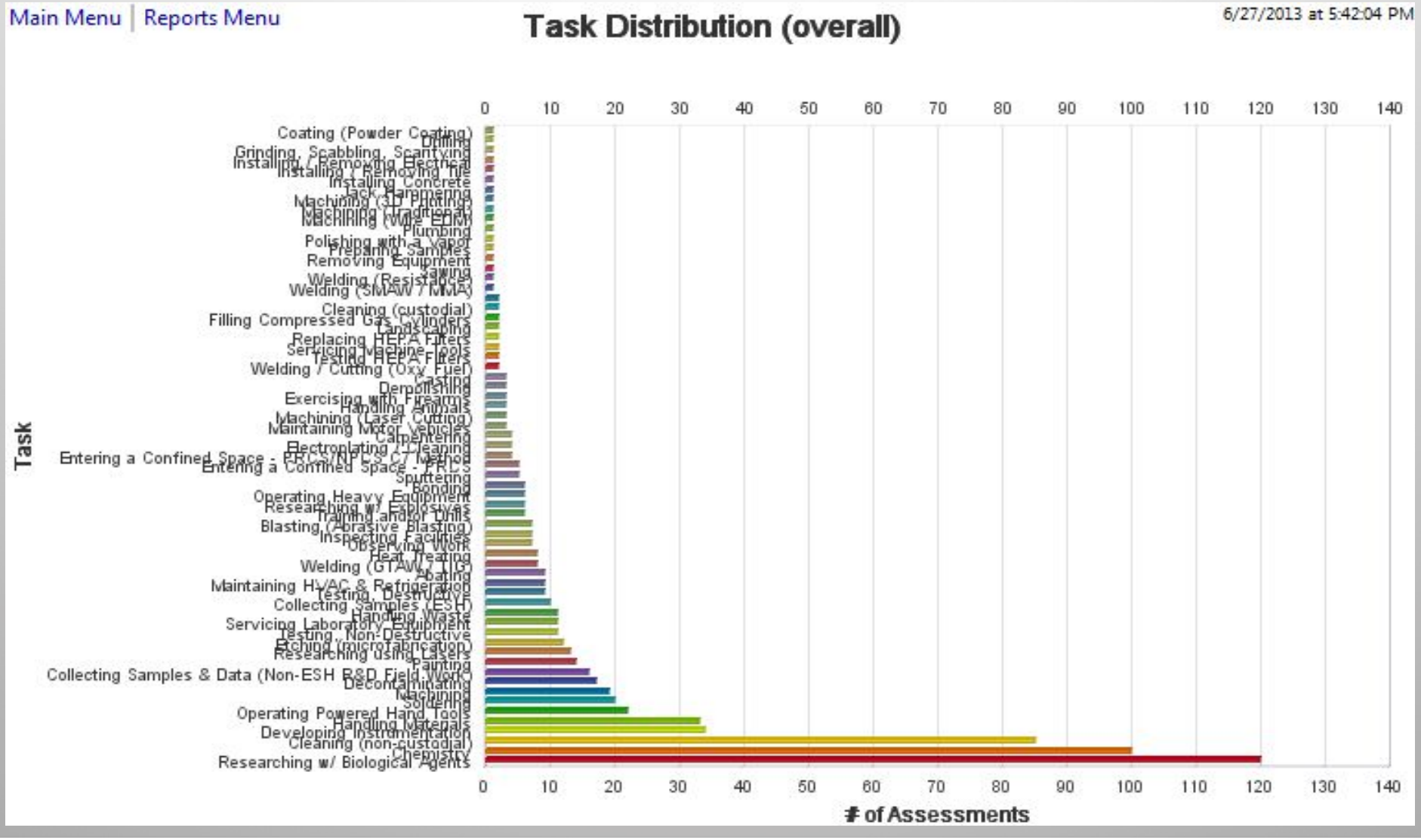
RAC Database Reports – RL Distribution



RAC Database Reports – Hazard Distribution



RAC Database Reports – Task Distribution



RAC Database Reports – Similar Exposure Group (SEG) Summary

SEGs:

- Defined by TASK – HAZARD – RISK LEVEL

Inspecting Facilities	Risk Level	# at Risk Level
Chemical Use (Hazard Communication Activities)	1	4
Heat Stress (Normal Work Clothing)	2	1
Rodent and/or Bird Droppings	1	1
Valley Fever	1	1
Installing / Removing Electrical	**Risk Level**	**# at Risk Level**
Risk Level Source Document not yet Created	2	1
Installing / Removing Tile	**Risk Level**	**# at Risk Level**
Asbestos	2	1
Installing Concrete	**Risk Level**	**# at Risk Level**
Silica	1	1
Jack Hammering	**Risk Level**	**# at Risk Level**
Silica	3	1
Landscaping	**Risk Level**	**# at Risk Level**
Heat Stress (Normal Work Clothing)	3	1
Noise	3	1
Machining	**Risk Level**	**# at Risk Level**
Beryllium	3	1
Chemical Use (Chemical Hygiene Activities)	1	3
Chemical Use (Hazard Communication Activities)	1	5
Lead	3	1
Noise	2	8
Silica	2	1
Machining (3D Printing)	**Risk Level**	**# at Risk Level**
Chemical Use (Hazard Communication Activities)	1	1
Machining (Laser Cutting)	**Risk Level**	**# at Risk Level**
Chemical Use (Hazard Communication Activities)	1	1
Nanomaterials	2	1
Noise	3	1
Machining (Traditional)	**Risk Level**	**# at Risk Level**
Noise	2	1

Lessons Learned – Time to Expand RLBMS

Combining Facility Baselines and RLBMS

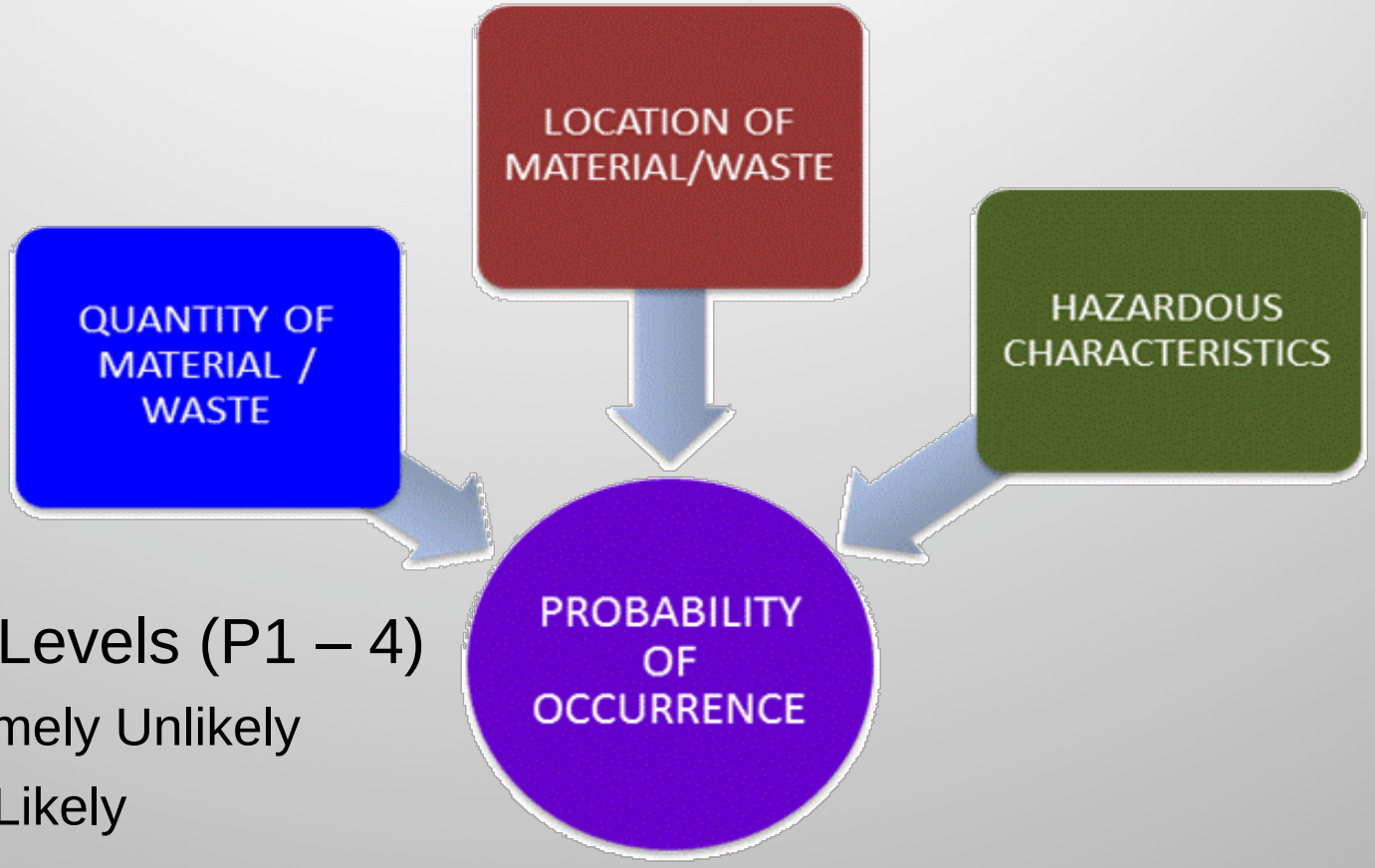
A Basis For E&ORM Expansion

- 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

Probability Level	Quantity		Location		Hazardous Characteristics		
	<RQ	≥RQ	Controlled	Inadequate & Uncontrolled	Regulated Material/ Waste	Environ. Permit	EMP Goal
P1	✓		✓				✓
P1	✓			✓			✓
P2	✓		✓		✓		
P2	✓		✓			✓	
P2		✓	✓				✓
P2		✓		✓			✓
P3		✓	✓		✓		
P3	✓			✓	✓		
P3		✓	✓			✓	
P3	✓			✓		✓	
P4		✓		✓	✓		
P4		✓		✓		✓	

Severity Component

Long-Term Effect
-Reportable

Short-Term Effect
-Reportable

Short-Term Effect
-Non-reportable

Minimal Effect

RLBMS – Environmental Risk Matrix

SEVERITY (CONSEQUENCE TO THE ENVIRONMENT)	PROBABILITY			
	Extremely Unlikely (P1)	Less Likely (P2)	Likely (P3)	Extremely Likely (P4)
Long-term damage (reportable)	**RL3**	**RL3**	**RL4**	**RL4**
Short-term damage (reportable)	**RL2**	**RL2**	**RL3**	**RL4**
Short-term damage (non-reportable)	**RL1**	**RL1**	**RL2**	**RL3**
Minimal damage / Nuisance/ Not immediately reportable event	**RL1**	**RL1**	**RL1**	**RL2**

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

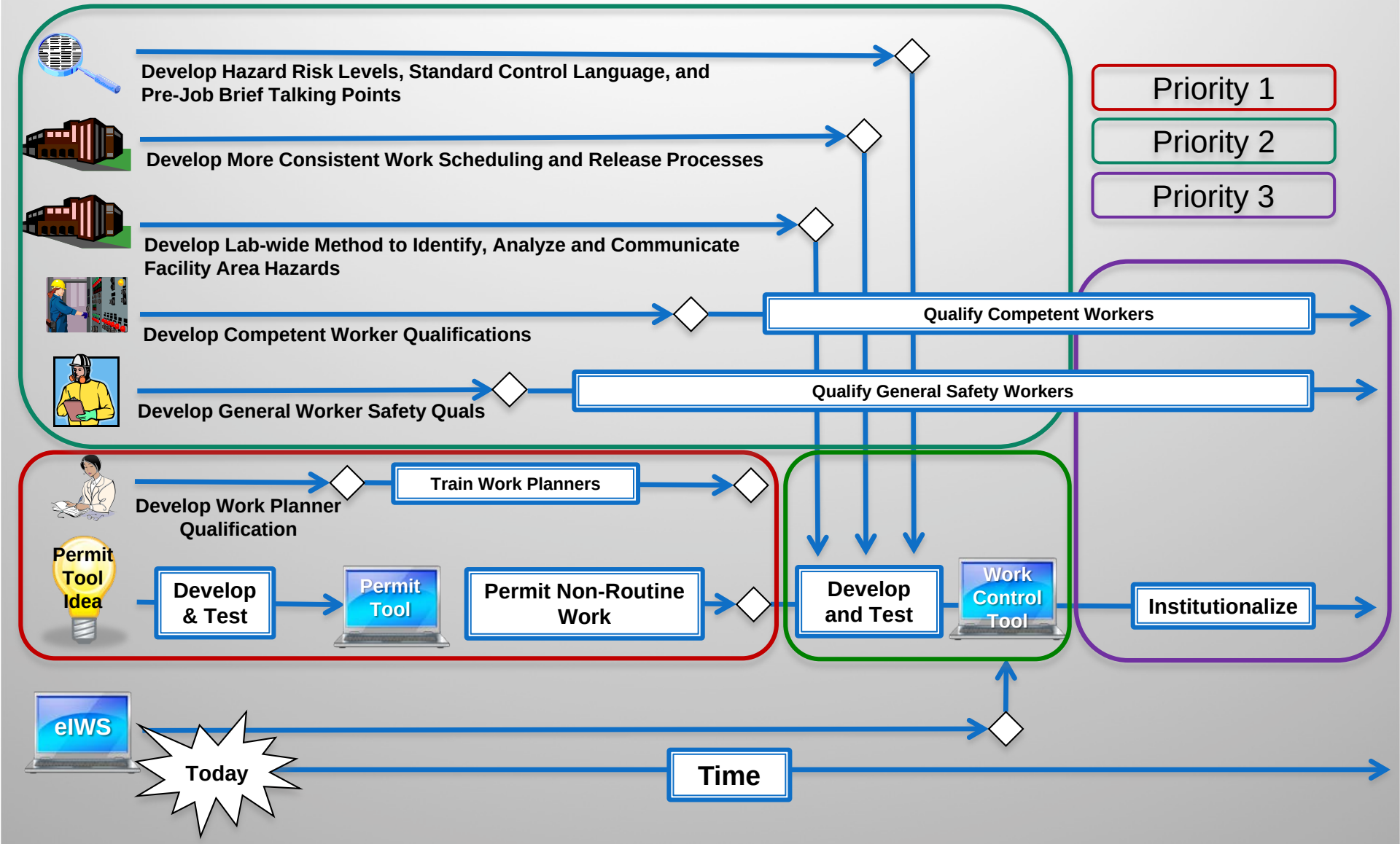
Once EHS Risk Levels are known the worker knows:

- 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

Implementation Priority and Timeline



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

Future Vision for RLBMS & E&ORM

Q: Why do you spend your free time on this?

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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.

IOHA 2016-20 Strategy Document; Fulfill IOHA's Mission

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**
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Environment	**RL2**
Fire Protection	**RL1**
Project	**RL3**

Future Vision for RLBMS & E&ORM

RL3

RL2

RL3

RL2

RL1

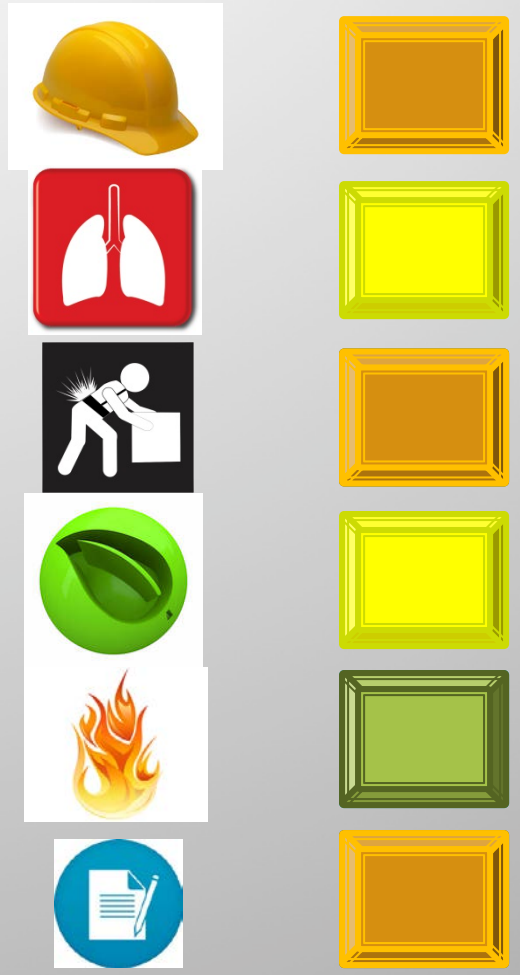
RL3

What's in my toolbox today?

What's in my toolbox today?


HEARING PROTECTION MUST BE WORN IN THIS AREA
SAFETY HELMET MUST BE WORN IN THIS AREA
EYE PROTECTION MUST BE WORN IN THIS AREA
SAFETY VESTS MUST BE WORN
SAFETY FOOTWEAR MUST BE WORN IN THIS AREA
RESPIRATOR MUST BE WORN IN THIS AREA
HAIR PROTECTION MUST BE WORN IN THIS AREA
GLOVES MUST BE WORN IN THIS AREA
PROTECTIVE CLOTHING MUST BE WORN
HEARING AND EYE PROTECTION MUST BE WORN IN THIS AREA
THIS PROTECTIVE EQUIPMENT
MUST BE WORN ON THIS SITE
LG

Future Vision for RLBMS & E&ORM



E&ORM – The Banding of EHS

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E&ORM – The Banding of EHS

Questions?

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