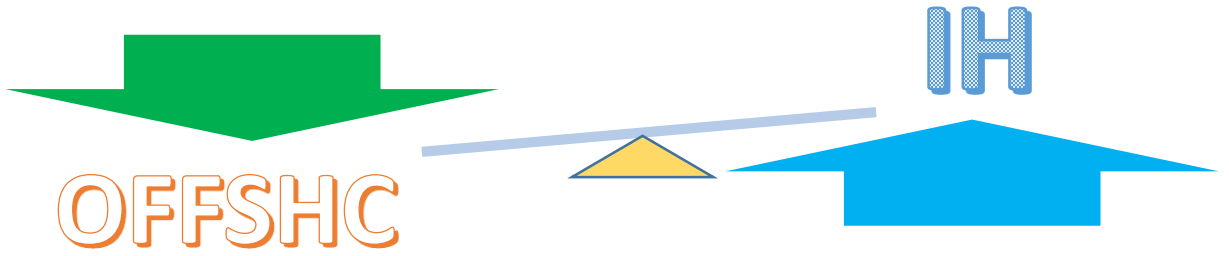
Update Your EH&S Program

– Current Topics Impacting Industrial Hygiene

Oklahoma Field Federal Safety & Health Council

November 12, 2015

Mike Monroney Aeronautical Center's
Conference Center
6500 South MacArthur Blvd
Oklahoma City, OK 73169



OFFSHC Meeting, Thursday November 12, 2015

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Oklahoma Field Federal Safety and Health Council

12 November, 2015 from 10:30AM-12:00PM
FAA MMAC
6500 S. MacArthur
OKC

- The Oklahoma Chapter Field Federal Safety and Health Council (OFFSHC) facilitates the exchange of ideas and information to assist Oklahoma Federal agencies in reducing the incidence, severity, and cost of occupational accidents, injuries, and illnesses.

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Topics for Presentation

- Part I Review of IH Principles - Modernization I.H.
  - Challenges, Rigger/Legal Requirements, Future AIHA Strategic Portfolio – what the future may hold for Industrial Hygiene.

- **Part II – Documentation Based Industrial Hygiene**
  - Changes in the Administration of Worker Compensation Programs – A Call for Defensive Industrial Hygiene Programs.(Discussed in Cases Reviewed in Part IV)

- **Part III – Safety Management Systems**
  - Role of Industrial Hygienists in Voluntary Initiatives and Safety Management Systems – ANSI/AIHA® Occupational Health and Safety Management Systems.

- **Part IV – Practical Aspects of I.H. Work**
  - Review of Recent changes and/or proposed changes in TLVs – Case studies that challenge application of OEL's

FUNDAMENTALS OF INDUSTRIAL HYGIENE

NSC 1st Edition© (1971)

- "Industrial Hygiene is recognized as that science (or art) devoted to the recognition, evaluation and control of those environmental factors or stressors – chemical, physical, biological, and ergonomic – that may cause sickness, impaired health, or significant discomfort to employees or residents of the community."

2015 AIHA® website I.H. defined as-

- "Industrial Hygiene is a science and art devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well being, or significant discomfort among workers or among citizens of the community."

Modernizing the Definition of Industrial Hygiene

- **Goals**
  - **We Anticipate, not just Recognize,** Industrial Hygiene Hazards and Stressors

- **Objectives**
  - The Industrial Hygienist is still seen as a specialized EH&S Professional tasked to **Evaluate** factors and stresses effecting people (we must know how to characterize hazards through sampling, analysis and data interpretation).

- **Outcomes**
  - Modern rubrics for risk management have move Prevention up in the Hierarchy of strategies ahead of **Control** for Industrial Hygiene Hazards.
  - We must maintain **Metrics** to support our **Outcomes**.
  - Data, testing, calibration records, chain of custody and training.

Challenges to Practicing IH Consultants

Traditional IH- OSHA Related Demand

- Updating of HAZCOM – **Low**
- Testing for PELs – **High**
  - Subpart Z Standards Only
- SMS & Heath and Safety Plans Work
  - Non-HAZWOPER Related - **Medium**
- Respirator Selection - **High**
  - Written Program, Fit Testing, Training
- Indoor Air Quality – **Very High**
  - Mold, HVAC Related, Remediation Protocols
- State Program Related – **High**
  - Asbestos
- Legal/WC/Tort Claims- **High**
  - Expert Witness, *Daubert* Standard Testimony

Consulting Service Requests: ***Low*** *= semi annual* ***Medium*** *= at least quarterly* ***High*** *= at least monthly*

Non-Traditional EPA/OCC/DOT Related

- Air Quality Permitting – **Medium**
  - Title V, HAPS,
- Hazardous Waste – **High**
  - Characterization/Sampling
- Vapor Intrusion - **High**
- Phase I and Phase II Work - **Medium**
  - Brownsfields, VCP, QAP's
- Highway Infrastructure - **Medium**
  - Silica, LBP, Noise
- State/City Programs – **High**

  LBP, Community Noise
- Legal - **Low**
  - Consent Orders, ALJ Hearings

Rigger of Industrial Hygiene Work

Daubert

- In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, (1993) the U.S. Supreme Court changed the standard for admissibility of expert testimony.
- Evidence must meet Federal Rule of Evidence 702

Federal Rules of Evidence 702

1. The testimony is based upon sufficient facts or data.
2. The testimony is the product of reliable principles and methods.
3. The witness has applied the principles and methods reliably to the facts of the case.

Ask yourself the question: Does your I.H. documentation include recordkeeping that will hold up when put under the scrutiny of legal challenges?

Preventing "*Junk*" Science Testimony

- Four Considerations:

- *Daubert* Challenge or Test:
  1. Testing
  2. Peer Review
  3. Error Rates
  4. Acceptability in the Relevant Scientific Community.

Ways Industrial Hygiene Can Be Helpful

- A. Perform Initial Surveys
  - Three Types:
    1. Area Survey (maps noise on floor plans)
    2. Personal 8-Hour TWA (Action Level for HCP*)
    3. Dosimetry of Different Periods of Noise Exposure
- B. Identify High Noise Areas > 90-dBA
  - Post required warnings & train all personnel
- C. Institute Controls
  - 1. Isolate, Enclose or Dampen Sound Pressure
  - 2. Administrative – Limit Time & Rotate Tasks
  - 3. Verify Adequacy of Hearing Protection Device

*HPD = OSHA Hearing Conservation Program ≥ 85-dBA

Valued Expert Witnesses

(Objective, Ethical and Impartial)

- Industrial Hygienist work to assist Attorneys is all types of Torts:
  - Personal Injury Alleged by Employer Negligence
  - Product Liability Resulting in Health Effects
  - Pollution Cases with Alleged Health Effects
    - Associated Property Damages and Trespass
  - Citizen Community Complaints (Noise Ordinance)
  - Wrongful Termination, Whistle Blower
  - Equal Pay Act Claims
  - Workers Compensation (Respondent and Claimant)
  - Administrative Defense, OSHA & EPA Citations

Ask the Question:
Is There Room for Improvement?

Future Perspectives on the Direction of AIHA®

- 2015 Strategy Report
- Six (6) Initiatives were recommended for the AIHA to Pursue

Future AIHA® Initiatives

Recommendations to the AIHA® Board of Directors for Initiatives Ranked high to low[1]

1. Hazard Banding / OEL Process
2. Sensor Technologies
3. Emerging Markets /Global EHS Standard of Care
4. IH Value Strategy/Business Case Development
5. Changing Workforce Demographics / Environment
6. Big Data, Data Management and Interpretation

Abandoning OEL'S

Will U.S. Regulatory OELs Become a Thing of the Past?

- Most OEL's are Outdated and not synchronized with modern approaches to risk management.
- OEL's represent limits for few global chemicals (<1% of globally used chemicals).
- In the absence of sufficient OEL's why not emphasize Hazard Banding.
- AIHA needs to be a leader/advocate for alternative approaches to risk management that rely less on OELs.
- De-emphasize OEL's as the method for hazard control.
- Implications – Will the future move us away for additional OSHA Subpart Z Performance Standards to a singular Hazard Banding Guideline.
- Enforcement – Will the continued lack of OEL's be enforces solely by the General Duty Clause.
- Standards – Development of a ANSI/AIHA for Global Hazard Banding Standard (Guidelines have begun at various levels, ILO).

1. Hazard Banding vs. OEL Driven I.H. Programs

Banding Advantages

- ✓Start with a Risk Based Process
- ✓Hazards are Anticipated
- ✓Controls are scrutinized early
- ✓"May" not need to be a Regulatory Driven Process
- ✓Sported by Recognized Industry Standard Organizations (ANSI/AIHA Z10 Standard©)
- ✓Content for Banding Grouping Process Exists

OEL Disadvantages

- OSHA PEL Setting Process is Broken
- 1971 – 1978 lead to 6 new PELs
- Only 7 new PELs in last 20 years
- 1989 Vacated PELs
- OSHA Left with General Duty Clause Sec. 5(a) to enforce relevant changes by ACGIH®
- Noise – 5-dB vs. 3-dB Exchange Rate and difference in OSHA vs NIOSH approach to rating HPD NRRs

1. Hazard Banding vs. OEL Driven I.H. Programs

Banding Disadvantages

- ✓While content may exist, most I.H. Professionals are not “schooled” in how to implement Hazard Banding
- ✓Establishment of some materials into a particular OEL Bands could represent problems for companies.
- ✓Banding is not a traditional IH Rubric. Qualifying professionals to implement it presents new training and certification issues.

OEL Advantages

- Modernized PELs require less change in processes used to cite violations and fit the current enforcement and abatement processes.
- OELs fit within current toxicology models and are supported by epidemiology and decades of science (e.g. ACGIH documentation for TLVs).
- We seem to like numbers that signal safe exposure levels.

Fixing the Initiatives
60/40 Content vs. Research

- Reflected in the content of AIHA® PDC's at AIHCE

- Areas requiring more RESEACH
- Sensor Technologies – "I.H. in a Box" – Handheld Technologies are booming, more "ubiquitous" and connected.
- Real time, Bluetooth with streaming of live video or at least photo and camera capability.
- Imagine if we not just insisted on "Bump Testing" before use but video, live streaming and storage or event monitoring was a SOP?

2. Sensor Technologies

- Heavy weighted towards the need for Research.
- Senor Technologies is Booming in the EH&S Filed.
- Perhaps faster than the corresponding research on reliability.
- Many validity studies are not third party but vendor driven.
- Can Senor Technology Data be as reliable as Personal Monitoring?
- **Uncertainties:** Can objective partnerships address QA/QC issues and -
  - **Will I.H. professional embrace sensor technology as a major component of Hazard Evaluation Phase IH work?**
  - **Will Agencies (OSHA) accept senor technology data for compliance and enforcement.**
  - **Some already are: Dept. of Agriculture for Fumigant (Restricted Entry Intervals)**

3. Emerging Markets and the Global EHS Standard of Care

- Recognize the Growth of I.H. on a International Scale.
- No longer perceived as a US dominated field.
- Embrace Canada and Great Brittan Occupational Health Professionals.
- Global Harmonizing extends beyond GHS to Supply Chain and Economic Interests.
- Begs the question? “Can we have a Universal Standard of Care”
- Partnerships, Alliances
- Aviation Example: ICAO SMS now FAA SMS mandates
- AIHA looking at having and International Affairs Committee, AIHA Ambassadors and a Stewardship and Sustainability Committee, allied with trade associations and foreign governments.

4. Keeping IH a Valued Added Business Strategy

- Foster Use of IH Talent at the Onset of Projects
- Integrate IH into Business Functions, Growth & Transition

- IH having role in Train the Trainer
- IH sign off on workplace protocols

- Stronger identification of IH within academia
- More IH in e-tools, and how to use IH in small businesses

5. Changing Workforce Demographics and the Changing Workplace Environment

- Age–Loss of Talent Pool & Perspectives of the “Baby Boomer” Generation.
- Millennials-Capture and hold the attention span of the Millennial Generation.
- Losses due to aging members in Regulatory Agencies, NIOSH /7 Academia.

- Resulting changes in perspectives of Next-Gen IH’s
  - Will AIHA survive the challenges from niche professional groups (e.g. IAQA)
  - Will ABIH be relevant if CIH pool shrinks and exam serves as barrier to certification.
- College accreditation programs like ABET and AABI increase academic rigger and as a result enrollment drops or shifts to a different type of graduate.
- Without recognition within EPA, DEQ’s related environmental agencies, IH influence may falter and potentially be diminished (subject matter experts)

6. Big Data, Data Management & Interpretation

- Analysis of Large Sets of Data
- Overwhelming size of databases
- Multiple Databases creating different risk management outcomes:
  - NIOSH Criteria Documents
  - ASTDR – Toxicology Profiles
  - ACGIH® – Documentation for TLVs, Chemical, Physical Agents and BEIs
  - ECHA - European Chemical Agency Database
- Environmental Databases
  - EPA
  - Dept. of Agriculture
  - FDA

AIHA® Emphasis on Registry's

- Talent must come from training
- Trained I.H. Professionals should engage in continuing education.

AIHA® Registry Participation

These initiatives are reflected in AIHA® Content Strategy

Type of Registry	# of Registrants	# in Oklahoma	Valid for	Body of Knowledge
Registered Asbestos Analyst	652	0	3- quarters	Asbestos Analyst Registry
Registered Asbestos Organizations	128	0	3-quarters	Asbestos Analyst Registry
SDS & Labeling Authority	95	0	5 years	SDS & Labeling Authority Registry
4-Gas/PID	16	0	2 years	4-Gas Meter and PID Registry
Exposure Decision: Information	80	0	N/A – Pass 2-part MC exam and Essay	Exposure Decision: Information

Compared to AIHA® Initiatives

Does your Industrial Hygiene Program need to change?

Are you sufficiently Risk Management Dirven.

When is the last time your IH program had a check up?

GAP Analysis ….. Anyone???

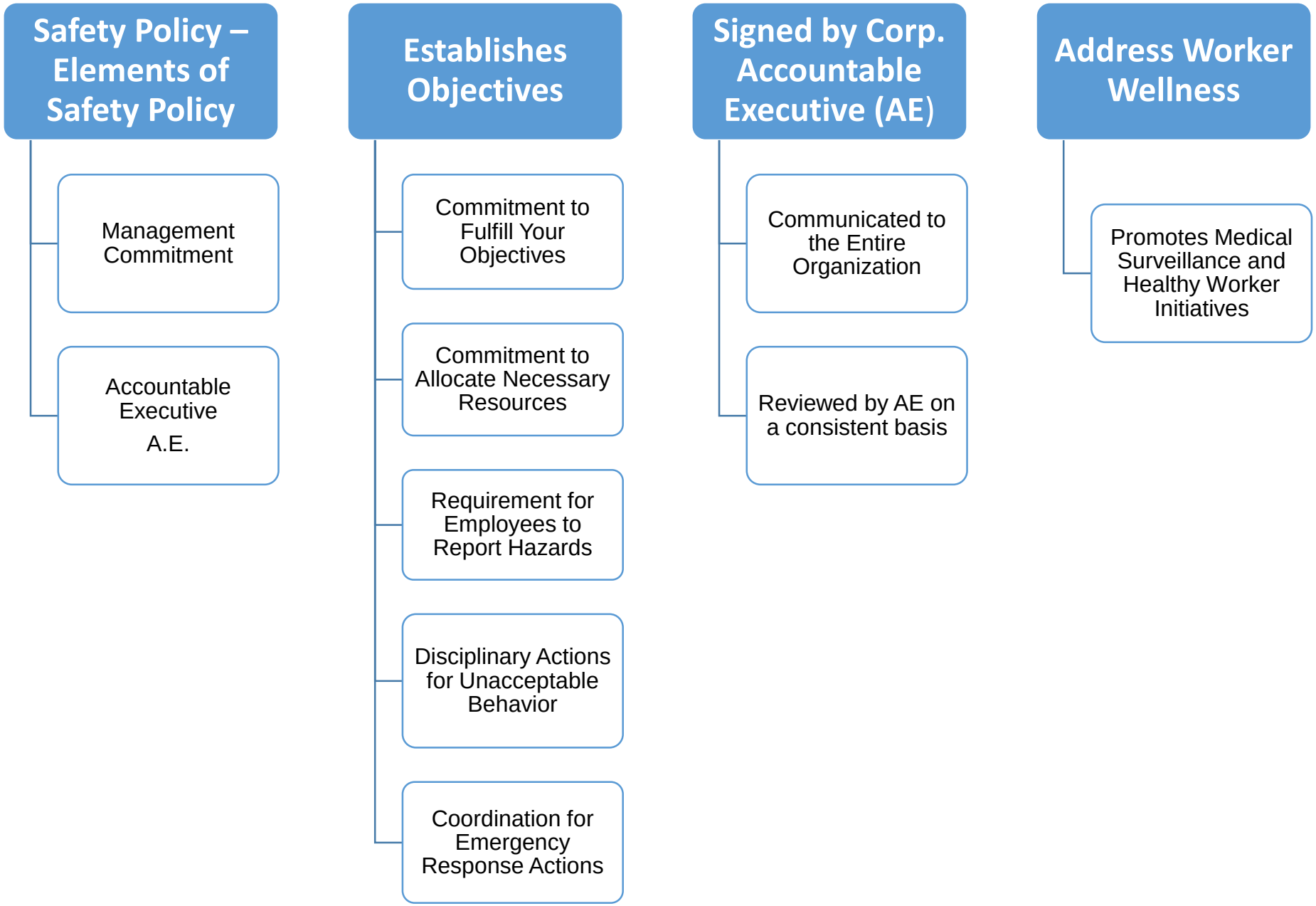
Getting Started – GAP Analysis

- Not really a GAP or a lack of IH Programs
- More of a process of extracting the IH you already have and need from existing work practices, programs, and safety management processes and
- Putting all the IH into an implementable and organized plan with the required commitments (goals, objectives and outcomes)
- Example: Baseline Noise Evaluations not assumptions
  - Initial and subsequent monitoring is a metric use to document outcomes

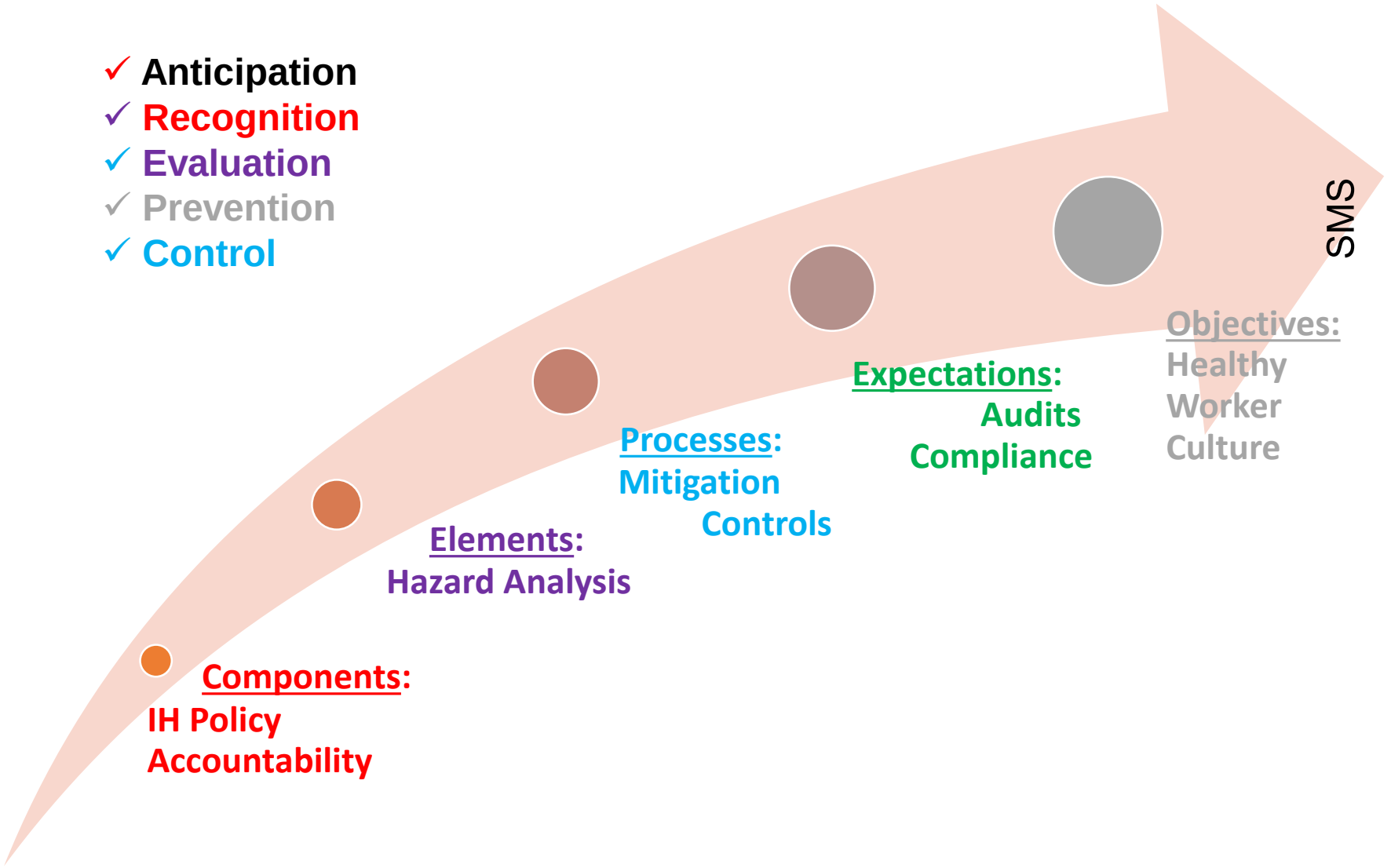
Traditional GAP Analysis

- Identifies how well you organization does or does not meet the needs of a System
- Such as with various voluntary initiative
  - ISO 9000 QM™
  - ISO 14001
  - ICAO SMS
  - VPP program requirements
- Ultimately finding out what IH requirements are missing from your organization’s Safety Management Programs

GAP Analysis Policy Objectives



GAP Analysis is a Progression Towards Objectives



Value of A Voluntary Initiative: It Generates Defensive I.H. Documentation/Metrics

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Preparing For The "New Oklahoma Commission"

- Need to do two things better now than before.
  - 1. Document Workplace Relatedness (29 CFR 1905)
  - 2. Keep Defensive Industrial Hygiene Documentation
- Hearing before an ALJ will be more likely to be challenged for creditability of medical evidence on causation.
- Hence IH documentation should have greater use.

Modern Challenges of Worker Comp

Stressors

- Hearing Loss
- Muscular Skeletal Trauma
- Lung Hazards as Cumulative Trauma
- Mold, Allergies, Asthma
- Multiple Chemical Sensitivity

Defenses

- Record Keeping
- Photos
- Peer Testimony
- Monitoring Data
- Defensive I.H. Programs
  - SMS
- Third Party Audits, Sampling

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'Background' on SMS

The History and Development of Safety Management Systems (SMS)

Early Initiatives

1. OSHA VPP
2. ISO 9000
3. ISO 14001
4. ANSI-AIHA Z10 2012 ASTM Standard

Regulatory Origins

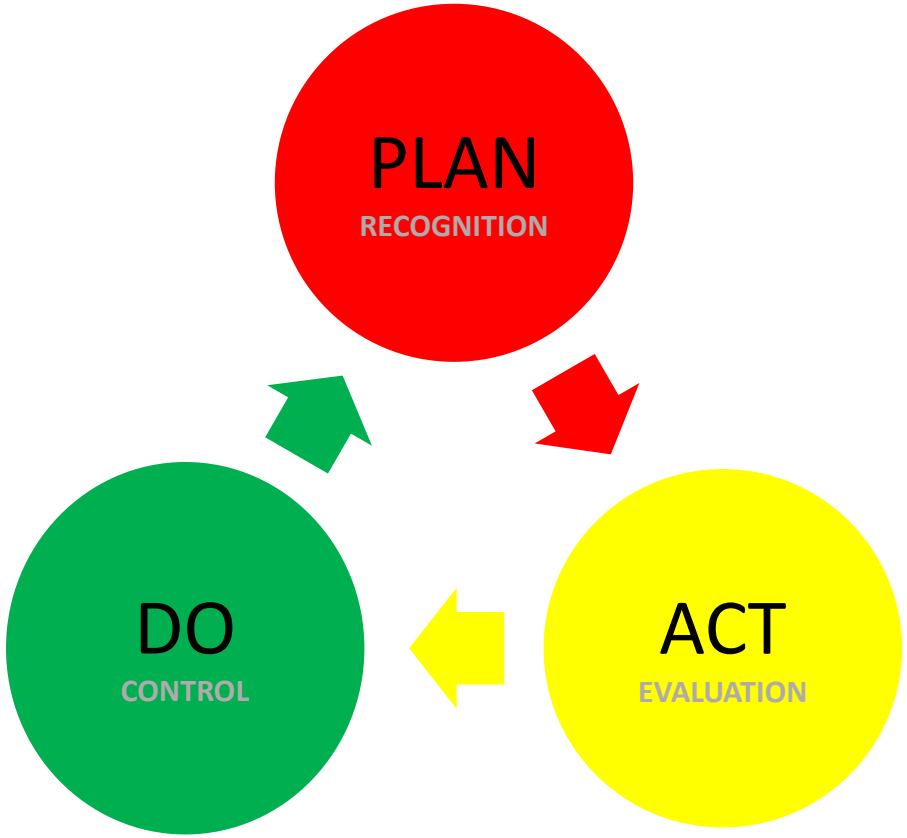
- OSHA – Process Safety Management Standard, 29 CFR 1910.119 – Extremely Hazardous Chemicals (EHS-List)
- EPA 40 CFR 68 Risk Management Program RMP Rule
- ICAO 9859 Safety Management Manual
  - (2006 and 2009)
- FAA Advisory AC 120-92 2006
- FAA – Major Airports, Part121 Certificate Holders -per 14 CFR part 5, § 5.1(b) and (c)

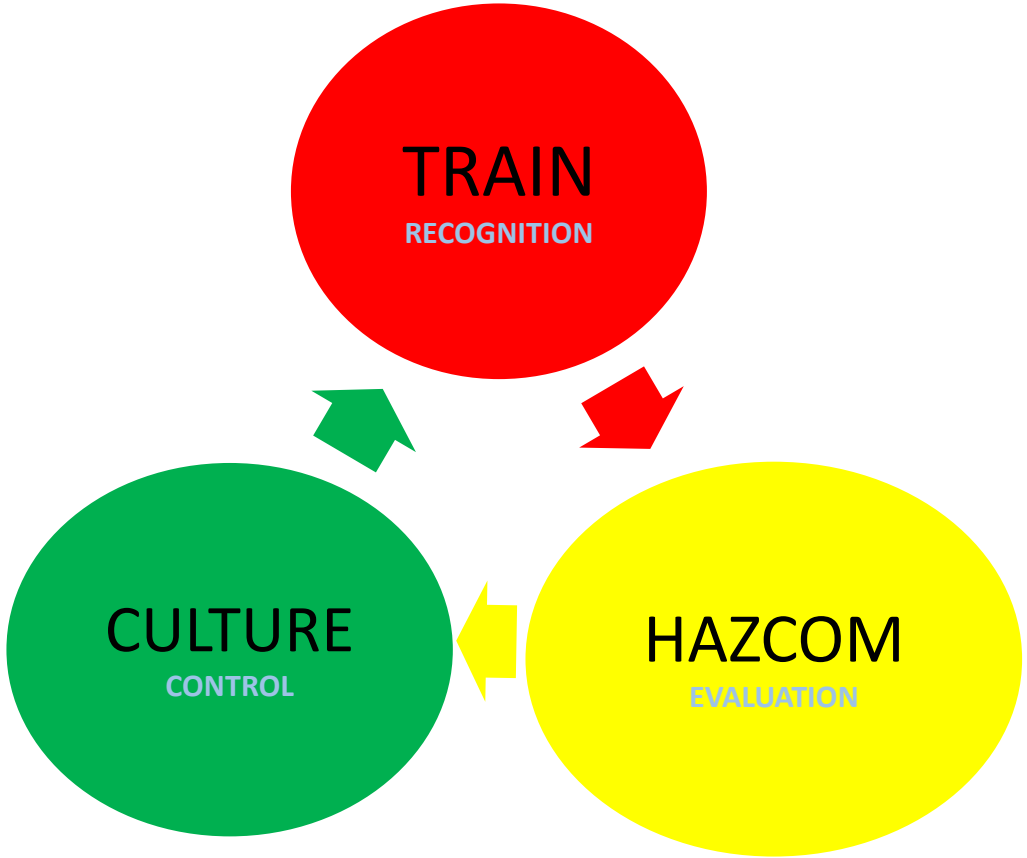
Voluntary Initiatives History

- VPP Cal-OSHA, 1979
- VPP Federal OSHA 1982
- ISO 9000, 1987
- ISO 14001, EMS, 1987
- BSI 18001, 1996
- RSMS, American Chemical Society, 2004
- ICAO/EASA – SMS, 2006
- API's Model OHS Management Indicatives, 2010
- ISO 45001, OH&S Management System, 2013
- ANSI/AIHA-Z10 Standard, 2012
- FAA SMS, 2015

SMS is a requirement that has grown out from Risk Management & Assessment Programs that began as voluntary initiative (ISO 14001 and ACS Responsible Care®) and are becoming regulatory mandates.

Promotion of Industrial Hygiene in the Safety Management System





ANSI/AIHA-Z10 STANDARD©

VOLUNTARY INITIATIVES

Introduction to IH & Safety

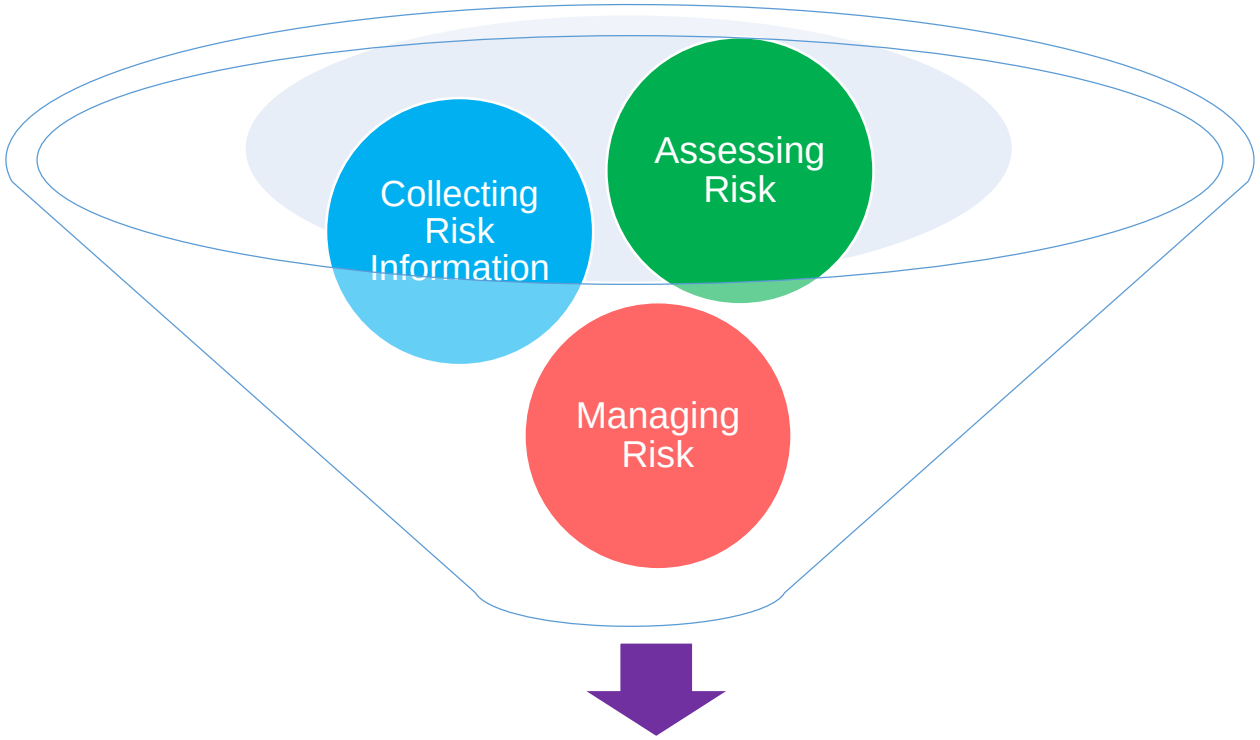
- ***Safety*** is recognizing, evaluating and controlling hazards and managing the associated information and programs in order to prevent harm to people, property and the environment.

BSCP

- ***Industrial Hygiene*** is the *science of protecting and enhancing health* and safety of people at work and in their communities.

ABIH

Professional Safety Practice



BCSP: Domains of Safety Knowledge

Funnel Into Your Safety Practice

Industrial Hygiene Practice

- Air Sampling and Instrumentation
- Analytical Chemistry
- Basic Science
- Biohazards
- Biostatistics & Epidemiology
- Community Exposure
- Engineering Controls/Ventilation
- Ergonomics
- Health Risk Analysis and Hazard Communication
- IH Program Management
- Noise
- Non-Engineering Controls
- Radiation/Ionizing
- Radiation/Nonionizing
- Thermal Stressors
- Toxicology
- Work Environments and Industrial Processes

ABIH Modern Rubrics (17)

- Calibration & Sampling for Chemicals & Dusts
- Lab Analysis, Chemistry & Microbiology
- Basic Science Concepts, Temp. & Pressure
- Bloodborne Pathogens, MRSA, Mold
- Occupational Epidemiology, Statistics
- Air Pollution and Community Health
- Ventilation, Isolation, Process Controls
- Prevention of MSDs, Human Factors
- OELs (PEL & TLV), HAZCOM (GHS)
- SMS, ANSI/AIHA Z-10 OH&S Management
- Hearing Conservation, Noise Pollution
- Person Protective Equipment (PPE)
- Measurement-Controlling Radiation Exposure
- Electromagnetic Radiation, UV/ IR Assessment
- Heat/Thermal Stress, Work Rest Regimen
- Understanding Effects of Chemical Exposures
- Assessing Work Environments, Confined Space

Examples of IH Tasks

General Duty Clause

Section 5. Duties.

(a) Each employer –

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

- Indoor Air Quality
  - Exposure to Mold, Mildew, Bacteria, Vermin, etc.
- Heat Stress
  - ACGIH TLV
  - Work Rest Regimen
- Enforcement of Outdated PELs'
  - Silica
- Hypersensitivity
  - Allergies, Asthma

General Duty Clause

Impact on Industrial Hygiene and Uses for OSHA Citations

High Hazard Industries

OSHA Top 10 Standards

Fall Protection

Hazard Communication

Scaffolding

Respiratory Protection

Powered Industrial Trucks

Lockout/Tagout *

Ladders

Electrical, Wiring Methods

Machine Guarding

Electrical General Requirements

Targeted Enforcement & OSHA Initiatives**

- Chemical Facilities
- Combustible Dust
- Federal Agency Targeting
- Hazardous Machinery
- Hexavalent Chromium
- Isocyanates (e.g. spray foams)
- Lead
- Nursing/Residential Care Facilities
- Primary Metal Industry
- PSM Standard
- Shipbreaking (demolition)
- Silica
- Trenching & Excavation

***Remember**: Who/When was Oklahoma's last "Top 10" in penalties issued?

** **RED** Indicates Significant Industrial Hygiene Requirements

Required Written Program Summary

- Subpart E – EAP 1910.39
- Subpart E – Fire Prevention Plan 1910.39
  - Include 1910.157 Fire Extinguisher Plan
- Subpart H – 1910.119 PSM
  - Written Emergency Plan & Procedures
- Subpart L – 1910.156 Fire Brigades
  - Equipment Maintenance Plan

Subpart N – 1910.179 Overhead Cranes

Written Maintenance Plan

Subpart Q - 1910.252 Welding Cutting & Brazing, Hot Work Permit

- Subpart R – Special Industries
  - Example: Power Generation, T&D., 1910.269
- Subpart S – 1910.333 Electrical, LOTO Procedures
- Includes 1904 Recordkeeping Responsibilities and 300 Log Reporting

Written Safety Plans

- Subpart G - 1910.95 Noise, Hearing Conservation Program
- Subpart H – 1910.120(q) HAZWOPER, Emergency Response Plan
  - if exempt must still address it in EA1910.38 (e.g. evaluate only, no in-house cleanup/response).
- Subpart I – 1910.132 Written Hazard Assessment and PPE Certification
  - 1910.134 Written Respirator Program
- Subpart Z Toxic & Hazardous Substances
  - Initial Exposure Assessment and Follow-up Exposure Control Plans
- Subpart Z – 1910.1020 Bloodborne Pathogens, Exposure Control Plan
- Subpart Z – 1200 Hazard Communication, Written HAZCOM Program
- Subpart Z – OSHA Lab Standard, Written Chemical Hygiene Plan

Written Industrial Hygiene Plans

PEL Lists, HAZCOM, Bloodborne Pathogens, Carcinogens

Subpart Z – Toxic/Hazardous Substances
1910.1000 – 1450
1910.1000
List of PELs
Air Contaminants
Table Z-1, Table Z-2 and Z-3

1910 1002 & 1003 OSHA 13 Carcinogens

1910.1020 - Access To Employee Exposure and Medical Records

1910.1030 - Bloodborne Pathogens

1910.1200 - Hazard Communication
- With the New GHS

1910.1201 - Retention of DOT markings, placards and labels

1910 – 1450 Occupational Exposure to Hazardous Chemicals in Laboratories

1910.1001 or 1926.1101 Asbestos
1910.1002 & 1003 OSHA 13 Carcinogens
1910.1017 - Vinyl Chloride

1910.1018 - Inorganic Arsenic

1910.1025 - Lead (not Tetra-Ethyl Lead)

1910.1026 - Hexavalent Chromium

1910.1027 – Cadmium

1910.1028 – Benzene

1910.1029 - Coke Oven Emissions

1910.1043 - Cotton Dust

1910.1044 - 1,2-dibromo-3-chloropropane

1910.1045 – Acrylonitrile

1910.1047 - Ethylene Oxide

1910.1048 – Formaldehyde

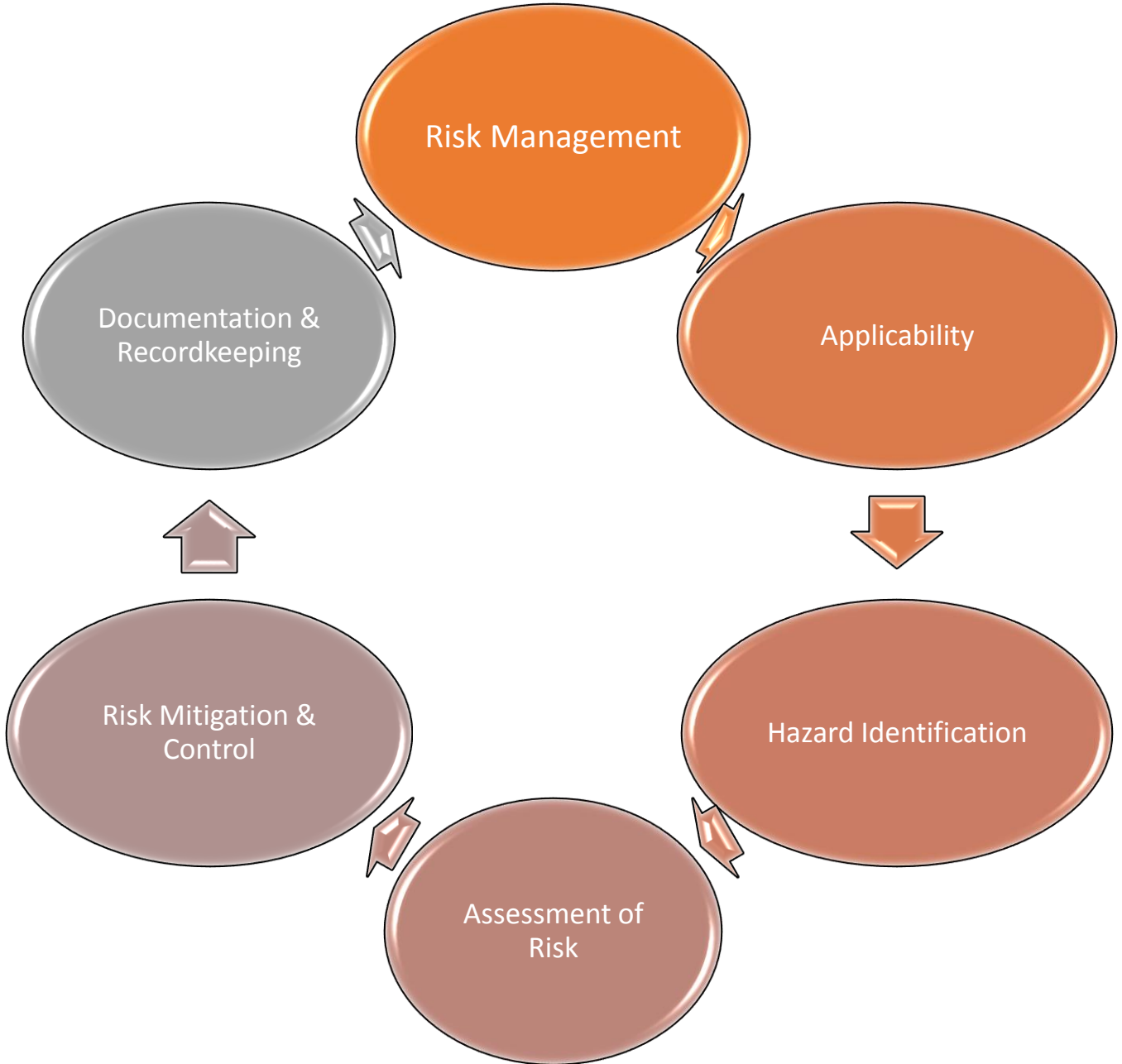
1910.1050 – Methylenedianiline

1910.1051 - 1,3-Butadiene

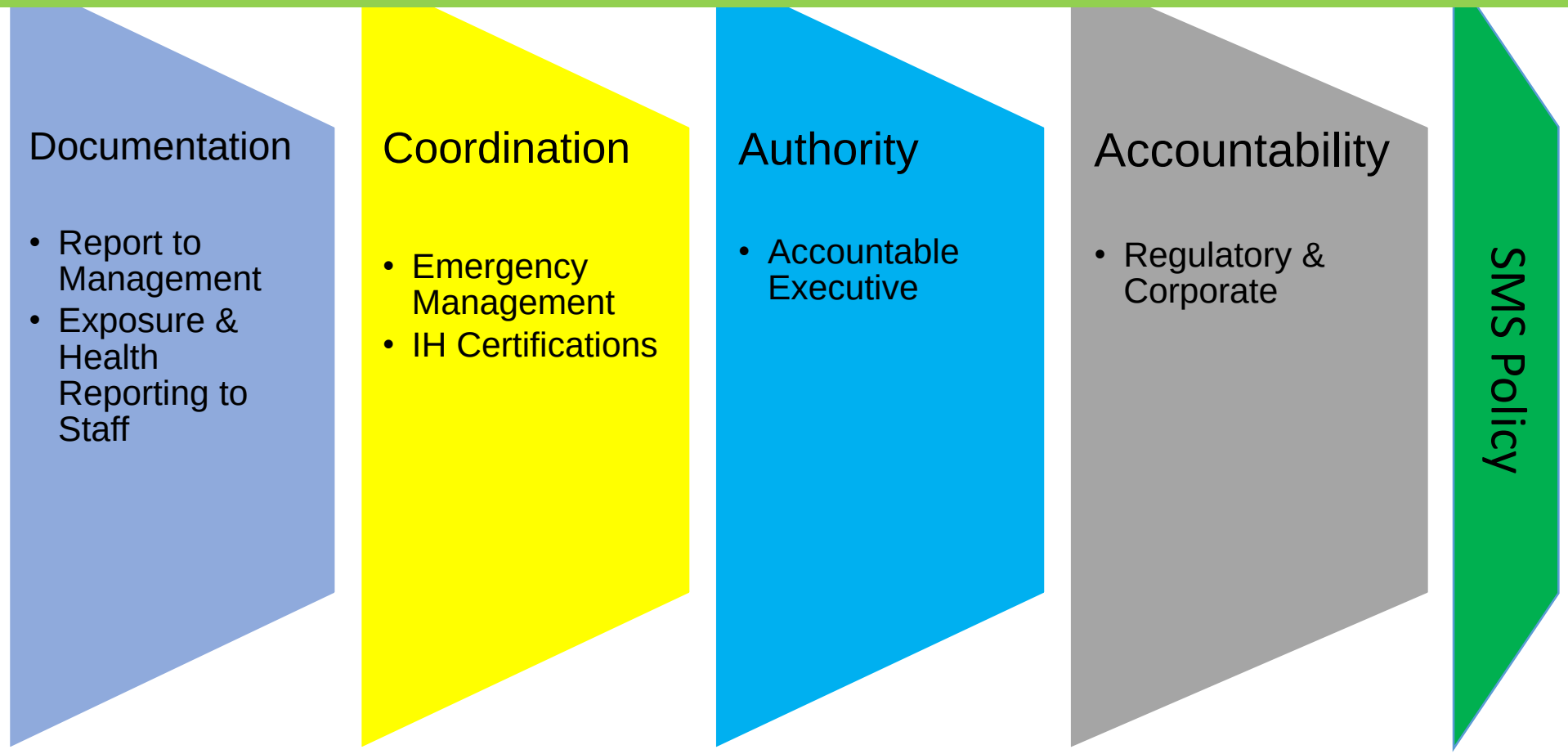
1910.1052 - Methylene Chloride

1910.1096 - Ionizing Radiation

Risk Management Elements

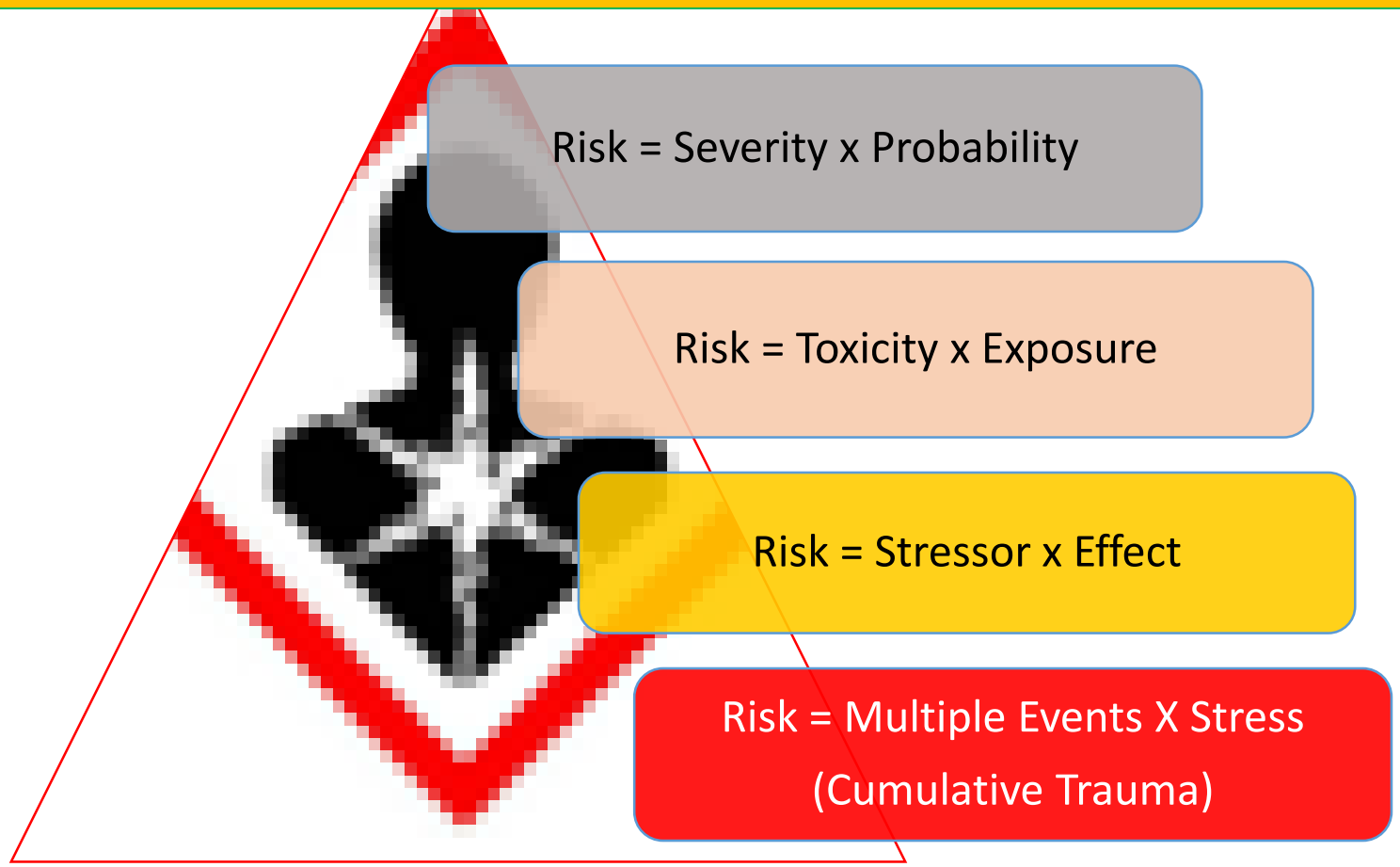


Recognition Phase – Policy Statement Components



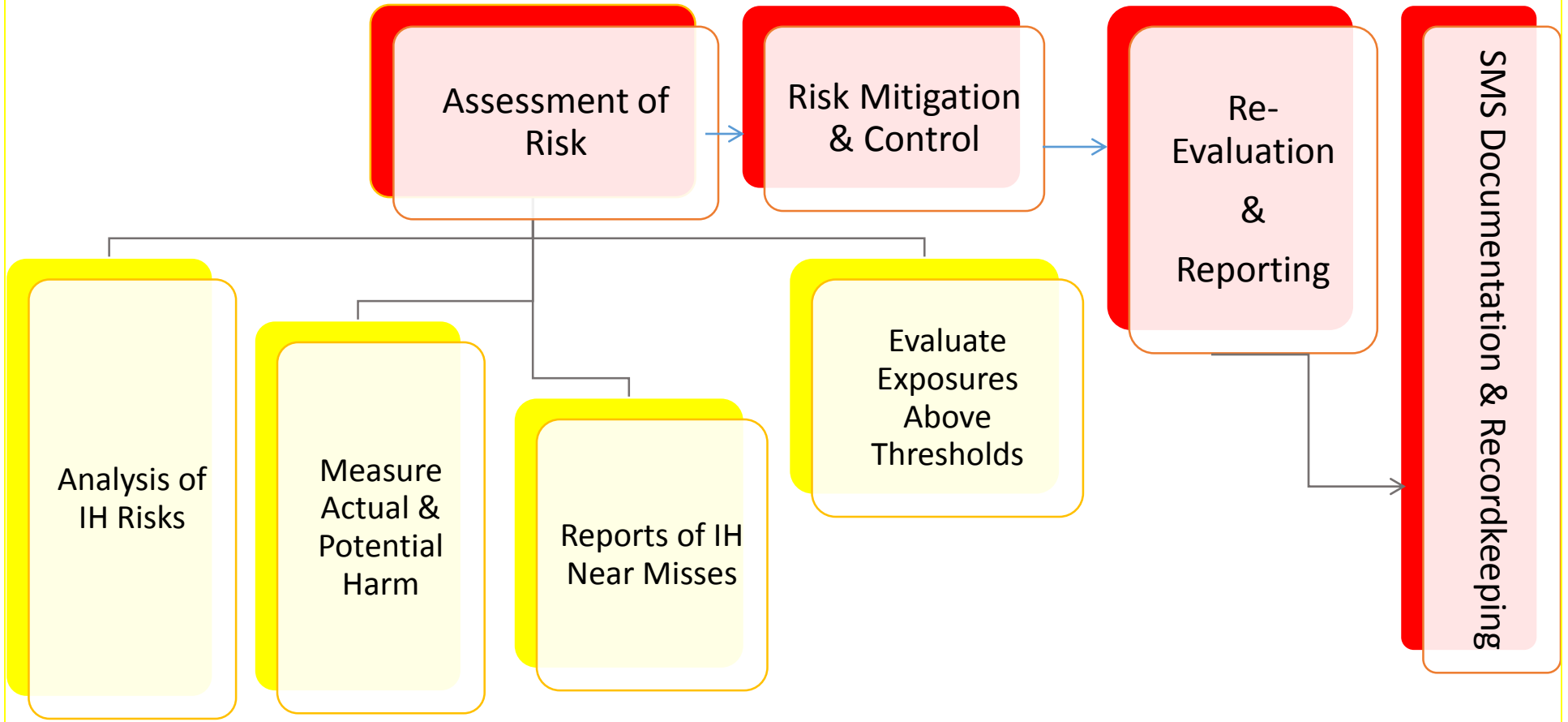
Observing, SDS Review, Hazard Identification

Evaluation Phase - Elements of Hazard Identification & Analysis

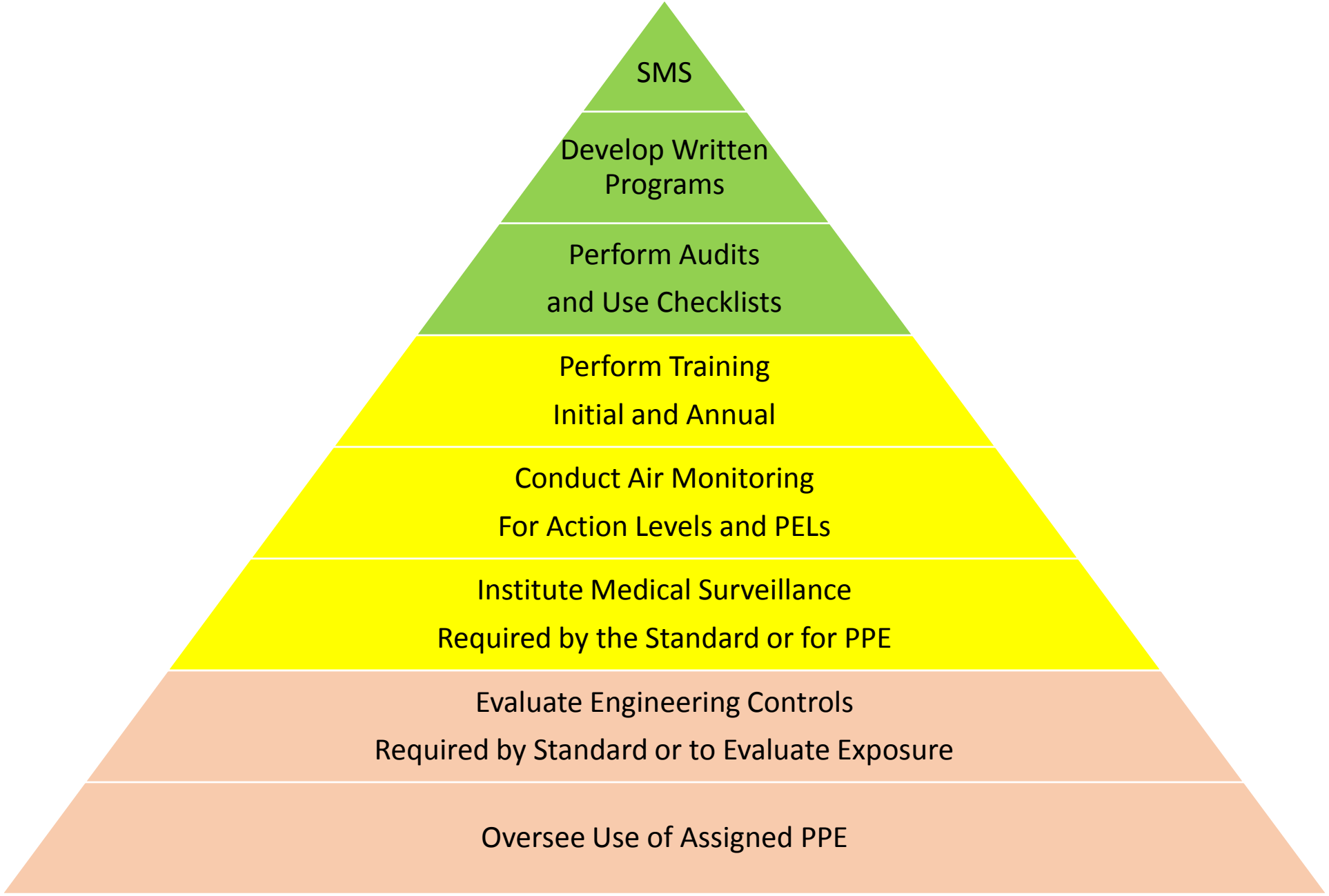


Monitoring, Measuring & Analyzing Exposures

Control Phase – Risk Mitigation and Documentation



Verification of Controls, Engr. /Administrative & PPE

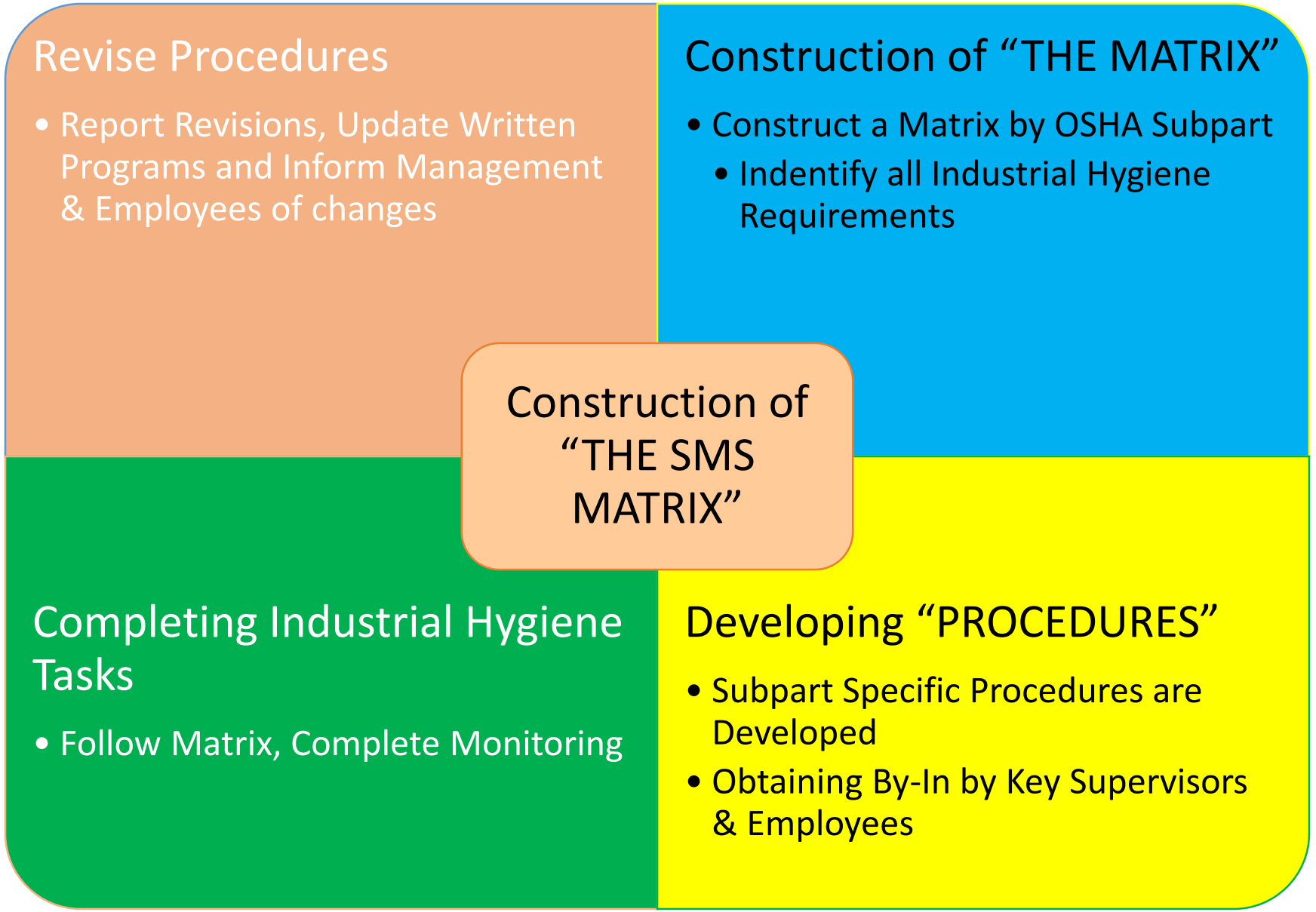


SMS IH Performance Pyramid

Work Elements for the Industrial Hygienist

Anticipation -Management	• Identify Applicable OSHA Standards
Recognition Phase - Awareness	• Draft Written Programs • Conduct Audits
Evaluation Phase -Documentation	• Performs Personal & Area Monitoring • Hazard Assessment
Control Phase -Mitigation	• Engineering • Administrative • PPE

SMS - Gaining Structure

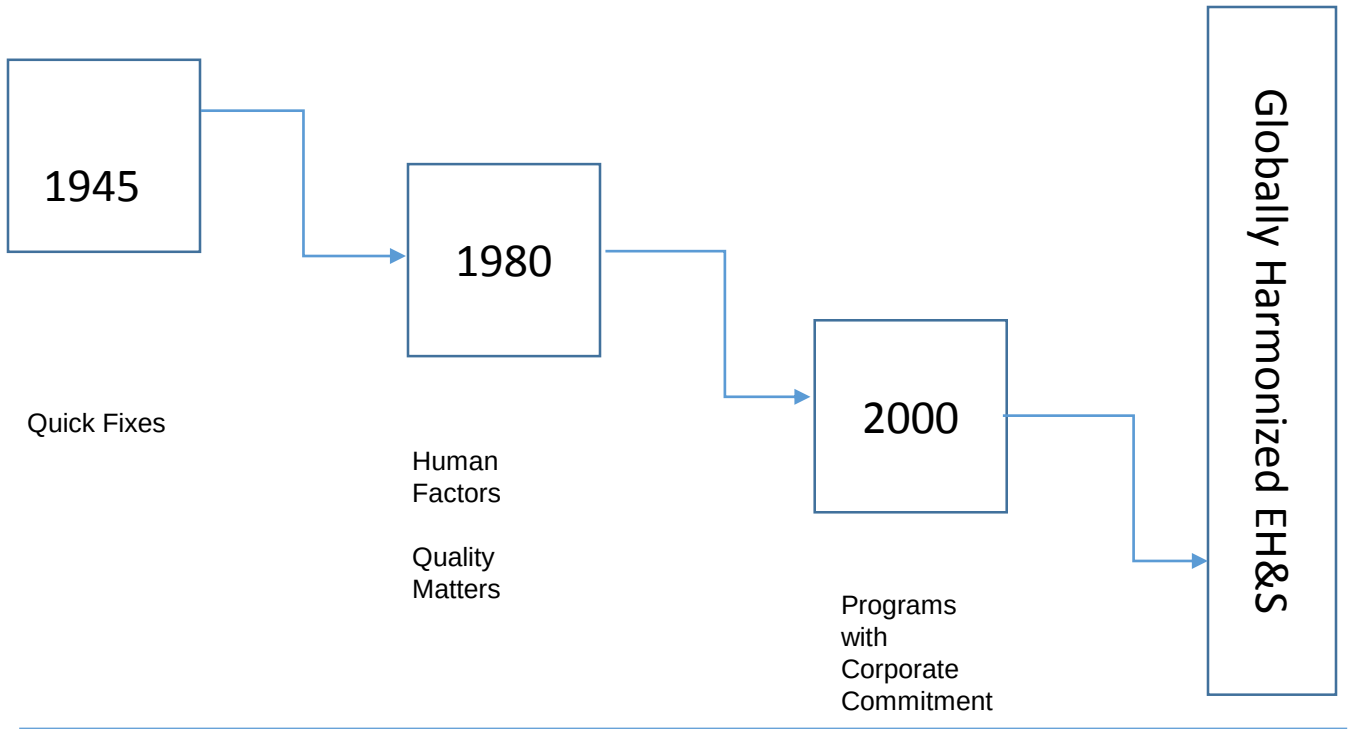


Part IV

Notice of Intent for Change
The NOI in TLVs'

How do they shape Industrial Hygiene Practice?

Movements to a Global Perspective!



Topics for Presentation

- **Part I Review of IH Principles - Modernization I.H.**
- **Part II – Documentation Based Industrial Hygiene**
- **Part III – Safety Management Systems**
- **Part IV – Practical Aspects of I.H. Work**
  - Review of Recent changes and/or proposed changes in TLVs
  - Case studies that challenge application of OEL's

ACGIH® Policy on Notice of Intended Changes

"These substances, with their corresponding values and notations, comprise those for which (1) a limit is proposed for the first time, (2) a change in the Adopted value is proposed, (3) retention as an NIC is proposed, or (4) withdrawal of the *Documentation* and adopted TLV® is proposed. In each case, the proposals should be considered trial values during the period they are on the NIC. These proposals were ratified by the ACGIH® Board of Directors and will remain on the NIC for approximately one year following this ratification. If the Committee neither finds nor receives any substantive data that change its scientific opinion regarding an NIC TLV®, the Committee may then approve its recommendation to the ACGIH® Board of Directors for adoption. If the Committee finds or receives sub-stantive data that change its scientific opinion regarding an NIC TLV®, the Committee may change its recommendation to the ACGIH® Board of Directors for the matter to be either retained on or withdrawn from the NIC."

2015 List of Notice of Intended Changes

- **Introduction to the Chemical Substances**
  – *Peak Exposures*

Boron tribromide
Boron trichloride
Boron trifluoride
n-Butyl acetate (withdraw adopted TLV® and *Documentation*; refer to Butyl acetates, all isomers)
sec-Butyl acetate (withdraw adopted TLV® and *Documentation*; refer to Butyl acetates, all isomers)
tert-Butyl acetate (withdraw adopted TLV® and *Documentation*; refer to Butyl acetates, all isomers)
Butyl acetates, all isomers
Calcium silicate, naturally occurring as Wollastonite
Calcium silicate, synthetic nonfibrous (withdraw adopted TLV® and *Documentation*; refer to Appendix B: Particles (insoluble or poorly soluble) Not Otherwise Specified (PNOS))
Cyanogen
Ethylene glycol
Hard metals containing Cobalt and Tungsten carbide, as Co
Isobutyl acetate (withdraw adopted TLV® and *Documentation*; refer to Butyl acetates, all isomers)
Methyl 2-cyanoacrylate
Phosphine (withdraw from Notice of Intended Changes)
Propoxur
Simazine
Toluene-2,4- or 2,6-diisocyanate (or as a mixture)
Trimetacresyl phosphate
Triorthocresyl phosphate
Triparacresyl phosphate
Warfarin

- **PHYSICAL AGENTS TLVs®**
  2015 NOTICE OF INTENDED CHANGES (NIC)
  Electromagnetic Fields 0–300 GHz
- Radiofrequency/microwave radiation
- Ergonomics
- Upper limb localized fatigue
- Whole-body vibration

- **BIOLOGICAL EXPOSURE INDICES (BEIs®)**
  2015 NOTICE OF INTENDED CHANGES (NIC)
  Toluene diisocyanate-2,4- or 2,6- or as a mixture of isomers

Source: www.acgih.org

Change in Manganese TLV

2012 NIC

- Mn was 0.2 mg/m^3 sampled as a total dust.
- Changed from 0.2 mg/m^3 to 0.02 mg/m^3 for Respirable Mass
- Change to 0.1 mg/m^3 as an Inhalable Mass

Current 2015 TLV

Effect of a lower 8-Hour TLV for Mn:

Now Mn is sampled as -

a. Respirable and/or

b. Inhalable Mass

Issues:

1. Current Records, are they comparable with previous baseline sampling?
2. New Technology with different types of sampling cassettes, calibration methods, different flow rates and leak detection for use of numerous new cyclones.

- Changes in Sampling for Dust

Particle Size Selective Sampling

Respirable Particulate Mass per ACGIH

- Respirable Thoracic Particulate Matter TLVs® (RPM-TLVs) for those materials that are hazardous when deposited in the gas-exchange region of the lung.

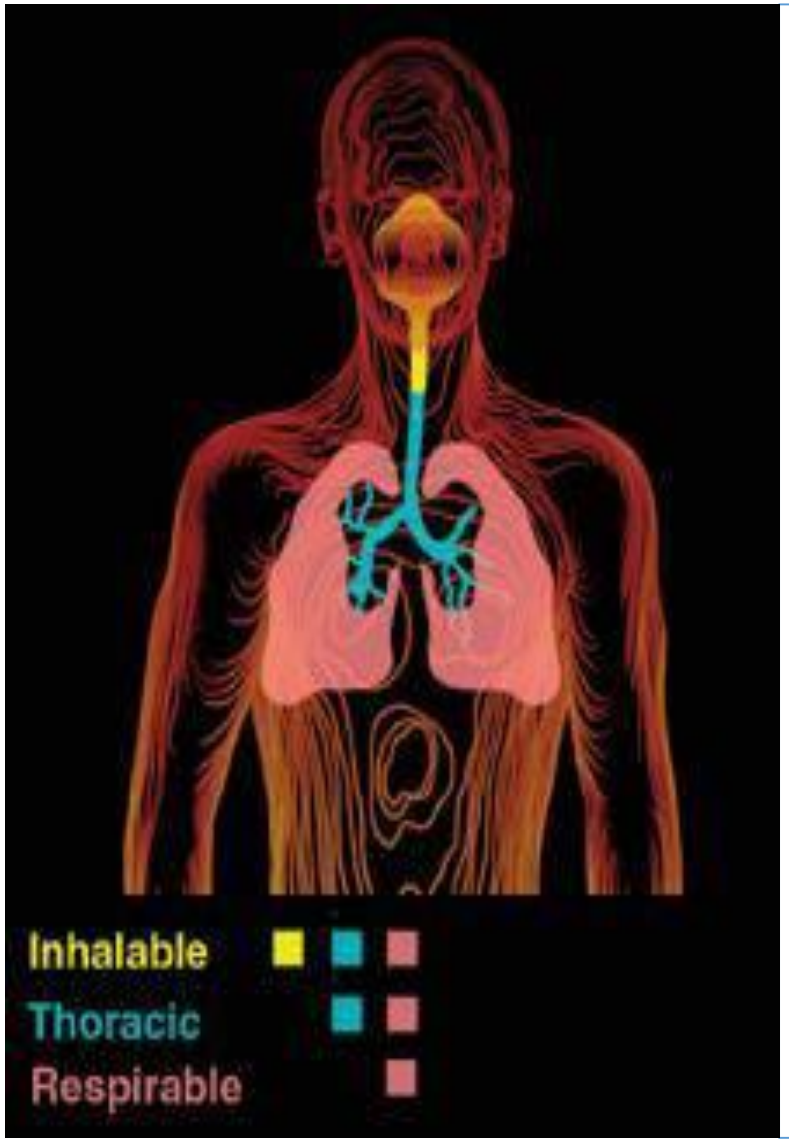
- Dust particles having a 50% cut-point of 4 µm. These dust particles are hazardous when deposited anywhere in the gas-exchange regions.

Inhalable Particulate Mass per ACGIH

- Inhalable Particulate Matter TLVs® (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract.

- Dust particles having a 50% cut-point of 100 µm. These dust particles are hazardous when deposited anywhere in the respiratory tract.

ACGIH Selective Particle Size Sampling



- *Inhalable Particulate Mass*
  - ➢ a 50% cut-point of 100 µm.
  - ➢ hazardous when deposited anywhere in the respiratory tract.
- Thoracic Particulate Mass
  - ➢ a 50% cut-point of 10 µm.
  - ➢ hazardous when deposited anywhere in the lung airways and gas-exchange regions.
- Respirable Mass
  - ➢ a 50% cut-point of 4 µm
  - ➢ hazardous when deposited anywhere in the gas-exchange regions.

Source: SKC INC. Product Catalog

Traditional Sampling

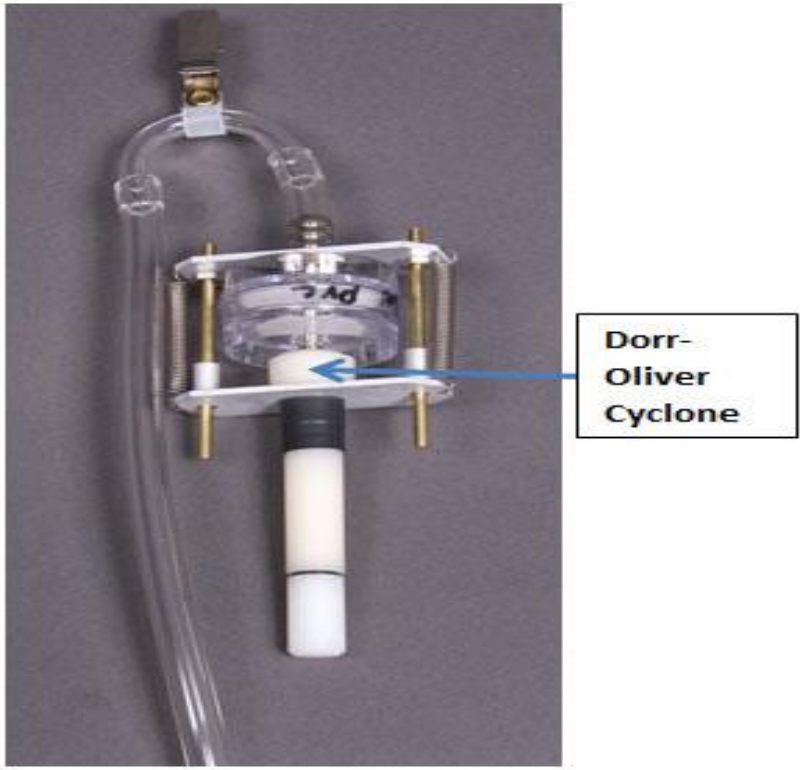
Traditional Closed Face Cassettes

37 mm 0.8 µ MCE or 5 µ PVC Cassettes

Example SKC Inc. IOM* Sampler

Traditional Respirable Mass Sampler

Collect respirable dust samples using a clean 10 mm nylon Dorr-Oliver® cyclone and a pre-weighed PVC filter at a flow rate of 1.7 L/min for a maximum sampling time of 480 minute.



Source: OSHA Technical Manual, Section II: Chapter 1
Note: Requires a Leak Test Procedure Leak Test Procedure

Respirable Particulate Mass Cyclone are designed to meet the ACGIH/ISO/CEN respirable convention with a 50% cut-point of 4.0 µm at 2.0 L/min.

GS-1 Cyclone is a 10-mm Dorr-Oliver equivalent design but comprised of conductive material to eliminate the electrostatic effects associated with the nylon Dorr-Oliver.

GS-3 Silica Dust Cyclone has a 50% cut-point of 4 µm (bias within ISO/OSHA/NIOSH requirements) at 2.75 L/min

Source: SKC Inc. : Particle Selective Size Samplers

Example of NIC - Toluene Di-Isocyanate or TDI

ACGIH TLV
– Includes both 2,6 and 2,4 Isomers

- ACGIH, since 1992
- TLV-TWA = 0.005 ppm
- TLV-STEL = 0.02 ppm

- NOI (not yet implemented)
- TLV-TWA = 0.001 ppm (IFV)
- TLV-STEL = 0.003 ppm (IFV)
- **Basis for TLV would change from Sensitization* IFV means IH should also consider both particle and vapor stage to assess exposure son to Asthma!**

.

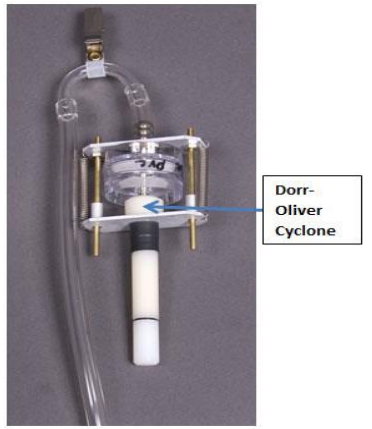
OSHA PEL
– Only applies to 2,4 Isomer

- OSHA, since 1971
- PEL-TWA Ceiling = 0.02 ppm

- Vacated PEL's
- PEL-TWA = 0.005 ppm
- SEL- STEL = 0.02 ppm

- Impact of Respirator Maximus Use Concentration
- Lead Exposure to Cutting Fumes and Grinding Dusts

Examples for Respiratory Protection



IH Performs Fit Testing, Training and Air Monitoring For Respirator Program Management.

3M 8293 P100

Industrial Hygiene Interventions

Respirator Selection
Fit Testing, Training
Air Monitoring
Written Program Upgrades

Noise Surveys, Dosimetry
TWA Monitoring
HPD and NRR Evaluations
Written Program Upgrades

Respiratory Protection

Noise Evaluation & Control

nd Dust

I.H. Involvement in Respirator Program

Types of Respirators 3M™ 6000 Series	OSHA Assigned Protection Factor (APF)	Anticipated Air Contaminants Maximum Use Concentration (MUC) PEL x APF			
		Lead		Total Particulates (See Note #2)	
		PEL	MUC	PEL	MUC
Half-Facepiece APR	10	0.05 mg/m^3	≤ 0.50 mg/m^3	15.0 mg/m^3	See Note #2
Full-Facepiece APR	50	0.05 mg/m^3	≤ 5.00 mg/m^3	15.0 mg/m^3	See Note #2
3M™ Adflo Flow PAPR System	1000	0.05 mg/m^3	≤ 50.0 mg/m^3	15.0 mg/m^3	See Note #2
NIOSH IDLH Levels			100 mg/m^3		Not Established

Summary of Work Tasks Requiring Respirators

Description of Work Processes (See Written Respirator Program for Additional Information)		
Work Tasks	**Type of Respirator**	**Potential Air Contaminants**
Welding and/or Torch Cutting Use 3M™ Adflo PAPR System with TR 300 Series HEPA Filter Pack and Speed Glass	 with Speed Glass eye protection 	Welding can generate metal fumes and particulates, such as lead fume from lead in paint and/o r primer on steel components of the bridge Welding can generate metal fumes and particulates, such as lead fume from lead in paint and/or primer on steel components of the bridge. Torch Cutting can generate metal fumes and particulates, such as lead fume from lead in paint and/o r primer on steel components of the bridge. Welding can generate metal fumes and particulates, such as lead fume from lead in paint and/o r primer on steel components of the bridge.
3M™ 6000 Series Full Face APR used for Unbolting Steel Component and De-riveting		Mechanical action of tools and manual hand work will dislodge or disturb substrates and can generate particulate matter (dust) and lead in dust requiring use of the specified APR.
3M™ 6000 Series Full Face APR Collecting or Cleaning Lead Debris/Dusts and/or Assisting with Personal or Equipment Decontamination		Manual hand work, cleaning or sweeping will dislodge or disturb settled debris or paint from substrates. This work can generate particulate matter (dust) and lead in dust requiring use of the specified APR.

- Hexavalent Chromium Example

Strontium Chromate – Cr VI

- Strontium Chromate contains Hexavalent Chromium
- Coating residues (solid primer) can be up to 60% Strontium Chromate.
- Aluminum alloys used in the construction of modern aircraft are subject to corrosion and are painted with Cr VI containing primers.
- $SrCrO_4$ is also used in some types of topcoats.

OEL's for Cr VI as Cr

OSHA PELs

- Action Level
  = 0.0025 µg/m^3
- PEL-TWA
  = 0.005 µg/m^3
- Large Aircraft Painting
- PEL – TWA
  = 0.250 µg/m^3

ACGIH TLVs

- $SrCrO_4$ as Cr
  TLV-TWA = 0.0005 µg/m^3

- Chromium TLVs as Cr

Metal and Cr III compounds	0.5 mg/m^3
Water-soluble Cr VI	0.05 mg/m^3
Insoluble Cr VI	0.01 mg/m^3

Surface Contamination? µg/ft^2 = none

Analysis OSHA 103

The chromium (VI) is extracted from the filter using a carbonate/bicarbonate buffer solution and then analyzed by differential pulse polarography

Lab Analysis:
The chromium (VI) is extracted from the filter using a carbonate/bicarbonate buffer solution and then analyzed by differential pulse polarography.

Sampling Train:
Filter holder consisting of a two- or three-piece cassette, 37-mm diameter.
Backup pad, 37-mm, cellulose.
Membrane filter, PVC, 37-mm, 5-µm pore size

Potential Analytical Issues

1. Sample should be onto a PVC Filter (MCE or PTFE is ok if analyzed promptly).
2. Reduction of Cr(VI) to Cr(III) during sampling/extraction:
   a. Acid mist & iron in aerosol problematic (can introduce bias (+/-)
   b. Deliver Promptly to lab
   c. Use of PVC filter (rather than MCE) helps this
   d. Lab does a base treatment of filter to stabilize Cr(VI)
3. Oxidation of Cr(III) to Cr(VI) during extraction:
   a. Minimize by using slightly basic buffer during extraction
4. Cr(III)/Cr(VI) redox equilibrium during extraction:
   a. Ammonium sulfate buffer prevents Cr(III)💻Cr(VI)
5. Tell lab if Cr Vi is from Paint Overspray, Dust or Solids vs Cr VI in Welding which is CrO^3
6. Possible interferences are iron, copper, nickel, and vanadium.

Source: https://www.aiha.org/aihce00/handouts/RT244ashley/RT244ashley.PPT

- Occupational Noise Example
- Doing More Than Base Line Dosimeter Testing

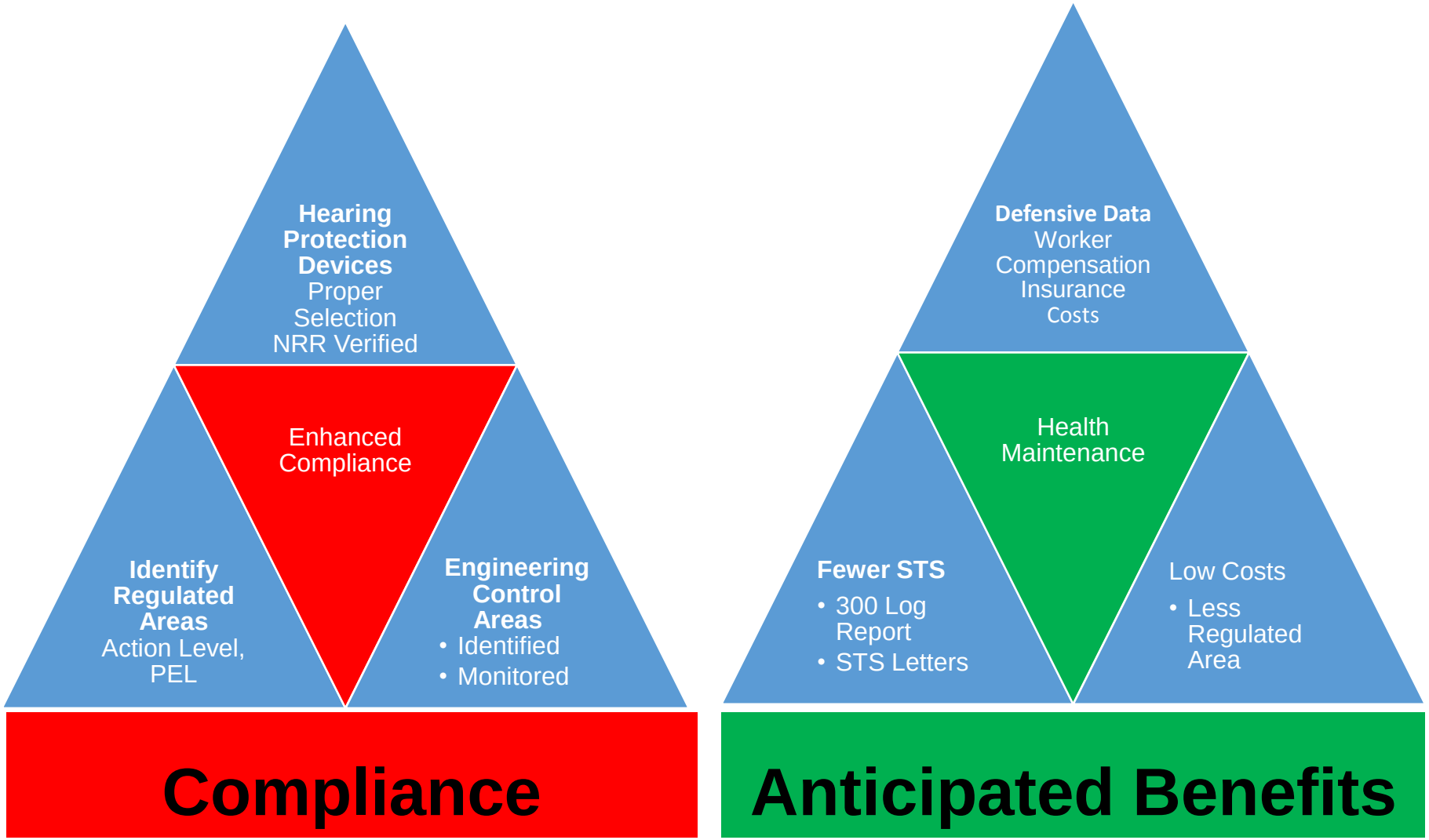
Noise
(Physical Stressors)

- **1910.95 Occupational Noise**

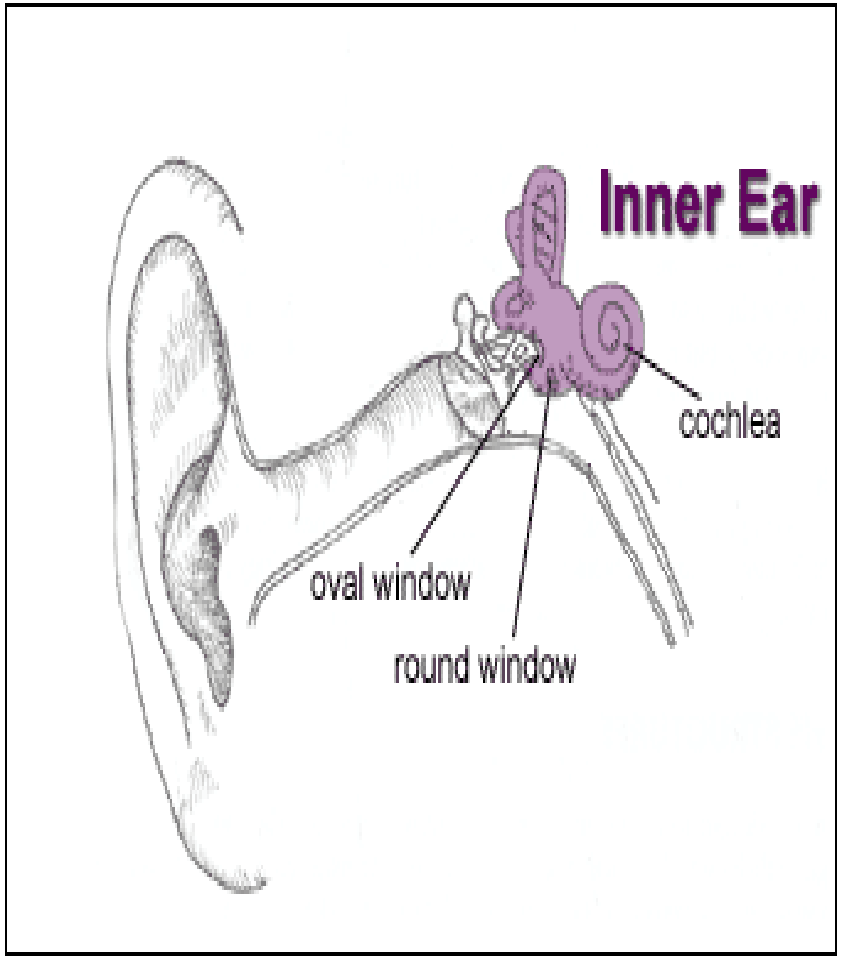
- **Among the #1 Worker Compensation Awards***
  - An Exit Retirement Bonus
  - Can Be A Real Cumulative Trauma
  - Happens in Small (<200) and Large Businesses (>200)

*OSHA's 300 Log is Based on 100 employee 200,000 man-hour year

IH Benefits for Noise Exposure



Preventing Sensorineural Hearing Loss (occurs in the inner ear)



Hair Cells and Cilia

The hair cells at the base of the cochlea respond to high-frequency sounds, while those at the apex respond to low-frequency sounds

Activity in the Cochlea

The bending of the hair cells activates the neural endings so that sound is transformed into an electrochemical response that goes to the brain.

HPDs are designed to reduce sensorineural hearing loss

Common Noise Controls, PPE - HPDs

E.A.R. Foam Inserts

Taper Fit 2

NRR = 32

Classic

NRR = 29

Peltor H10B Muff

NRR = 29

Implement Defensive IH To Prevent Hearing Loss

- Validation of TWA exposure
- Scenario – HPD's are not suited for High Noise Exposure
- Job requires use of dual HPD's
- and Employee Rotation
- Must document daily exposure with PPE reduce noise to below 100% for OEL

- **Quagmire**: OSHA 5 dB vs. ACGIH 3dB Exchange Rate
  - OSHA Action Level vs ACGIH 8hr TLV

Allowable Duration of Exposure (without HPD)

OSHA PEL and Dose	
85 dBA	16 hrs
90 dBA	**8 hrs** =100%
95 dBA	4 hrs
100 dBA	2 hrs
105 dBA	1 hr.
110 dBA	½ hr.
115 dBA	¼ hr.

ACGIH TLV* and Dose	
82 dBA	16 hrs
85 dBA	**8 hrs = 100%**
88 dBA	4 hrs
91 dBA	2 hrs
94 dBA	1 hr.
97 dBA	½ hr.
100 dBA	¼ hr.

*Note: TLV is equivalent to the NIOSH Recommended Exposure Limit (REL)

OSHA vs NIOSH Attenuation

NRR = Noise Reduction Rating for A Scale Noise

OSHA NRR Calculation :

29 CFR 1910.95 – Appendix B

Not Required to "Derate" the HPD NRR

(OSHA recommends a Safety Factor)

For HPD with **NRR = 29**

at **Exposure at 100 -dBA**

100 - (29-7)= 78 –dBA (foam Insert Only)

OSHA 50% Safety Factor Recommendation

100 – [(29-7) x 50%] = 89 –dBA

Adding Duel Protection adds +5 dB

100 – [(29-7) x 50% +5] = 84 –dBA

NIOSH NRR Calculation:

NIOSH Recommends NRR be De-rated by:

Ear Muffs use 25% of the NRR

Foam Inserts use 50% of the NRR

Molded (flanged) plugs 70% of the NRR

and **Exposure at 100-dBA**

Using a Ear Muff (NRR = 29)

De-rating allows use of 75% of Ear Muff's NRR

Regarding NIOSH De-rating methods:

For A Scale, 7-dB is subtracted from the NRR prior to the derating.*

Est. Exposure Level =

[100 – Using 75% of (29-7)] = 83.5-dBA

* Source: AIHA The Noise Manual. 5th Ed. 2003. Chapter 10 page 434.

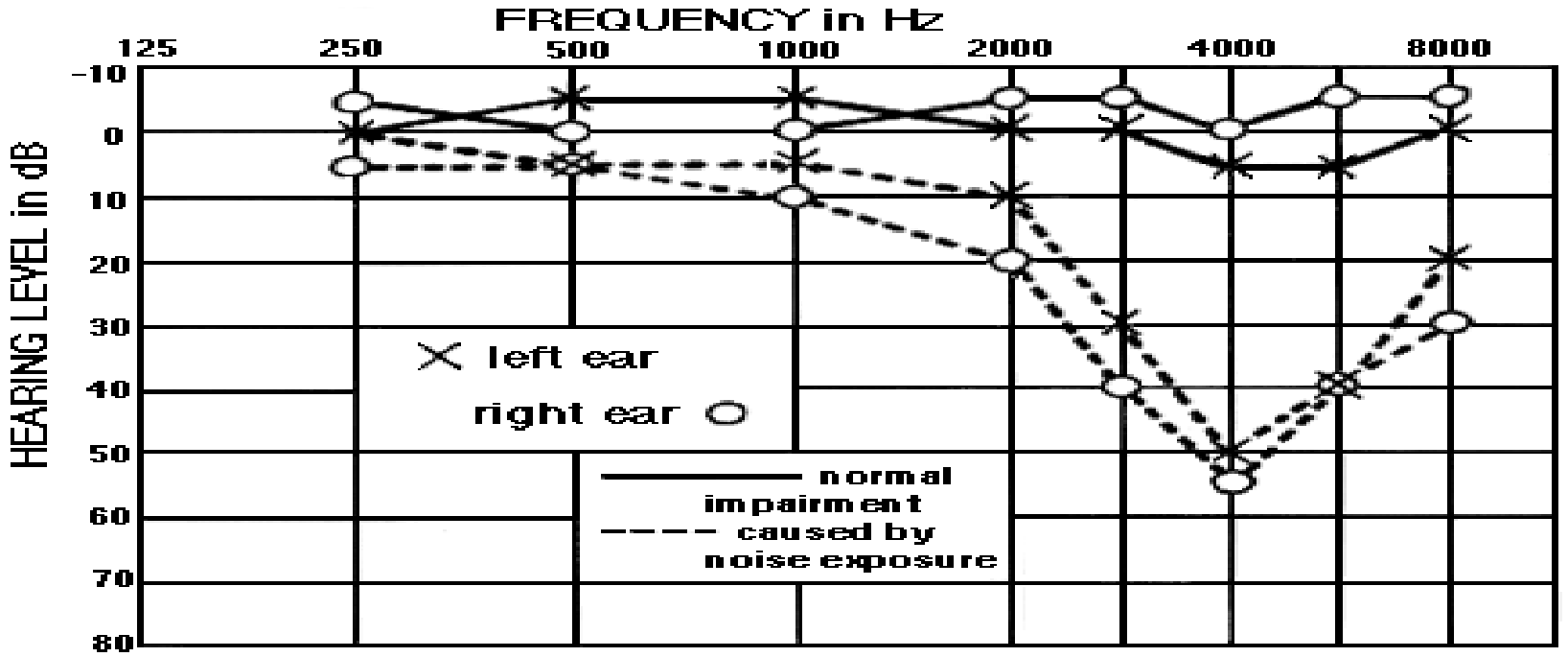
Use of the NIOSH Attenuation Estimate is not applicable to OSHA's Hearing Conservation Compliance Amendments, use 29 CFR 1910.95 Appendix B for that.

I.H. Can Use Octave Band Analyzer To Estimate NRR*

		Estimated Noise Reduction Rating for HPD								
Type of HPD	Location	LCeq	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	HPDs' SPL
C – Weighted Noise	Boiler and Chiller Room - South Side	89.0	63.1	61.3	55.7	63.8	63.8	63.7	62.6	
Peltor Tri-Flange	A-Weighted Corrections		-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1	
	A-Weighted SPL		47.0	52.7	52.5	64	65.0	64.7	61.5	70.1
	Pre-molded Ear Plug Attenuation		32.2	33.2	34.1	36.0	36.4	40.3	43.7	
	Standard Deviation x 2		10.2	8.6	9.8	9.2	6.8	9.4	8.7	
	Estimated A-Weighted SPL Protection		25.0	28.1	28.2	37.0	35.4	33.9	26.6	41.1
	Projected Noise Reduction By HPD									**29.0**

*NRR = Noise Reduction Rating

We Must Check each Audiogram "V-Notch"



STS = Standard Threshold Shift

≥ 10-dBA Loss in Hearing Acuity for either ear in the 2000, 3000, 4000 Hz frequencies

And* the loss averages a 25 dB above Audiometric Zero

Sensorineural Hearing Loss

- Permanent
- Documented by Standard Threshold Shift

- STS
- ≥ 10-dBA Loss in Hearing Acuity for either ear in the 2000, 3000, 4000 Hz frequencies
- **And*** the loss averages a 25 dB above Audiometric Zero

- Sounds Complex – yes, even for he IH

***Per 29 CFR 1904.10, effective 1/1/2003 and explained in 29 CFR 1910.95(g)(10)(i)

		Frequencies for STS					
Straight STS Calculation	Age	2000	3000	4000	Total	Ave	STS
Baseline	25	10	15	15			
Annual	35	25	30	30			
Average		15	15	15	45	15	Yes
		Frequencies for STS					
STS –Age Adj. for a male	Age	2000	3000	4000	Total	Ave	STS
	35	5	8	11			
	25	3	5	7			
Age Adjusted STS Calc.	Differences	2	3	4	9	12.0	Yes
		Frequencies for STS					
Exceeding Normal Hearing	Age	2000	3000	4000	Total	Ave	Criteria
Audiometric Zero	N/A	0	0	0			≥ 25-dB
	25	10	15	15			
	35	25	30	30			
Exceeds "Normal Hearing"	Differences	25	30	30	85	28.3	Yes

This Example Exceeds The Criteria For An OSHA Recordable Case

In Summary!

- **Part I Review of IH Principles - Modernization I.H.**
  - Challenges, Rigger/Legal Requirements, Future AIHA Strategic Portfolio
  – what the future may hold for Industrial Hygiene.

- **Part II – Documentation Based Industrial Hygiene**
  - Changes in the Administration of Worker Compensation Programs
  – A Call for Defensive Industrial Hygiene Programs.

- **Part III – Safety Management Systems**
  - Role of Industrial Hygienists in Voluntary Initiatives and Safety Management Systems
  – ANSI/AIHA® Occupational Health and Safety Management Systems.

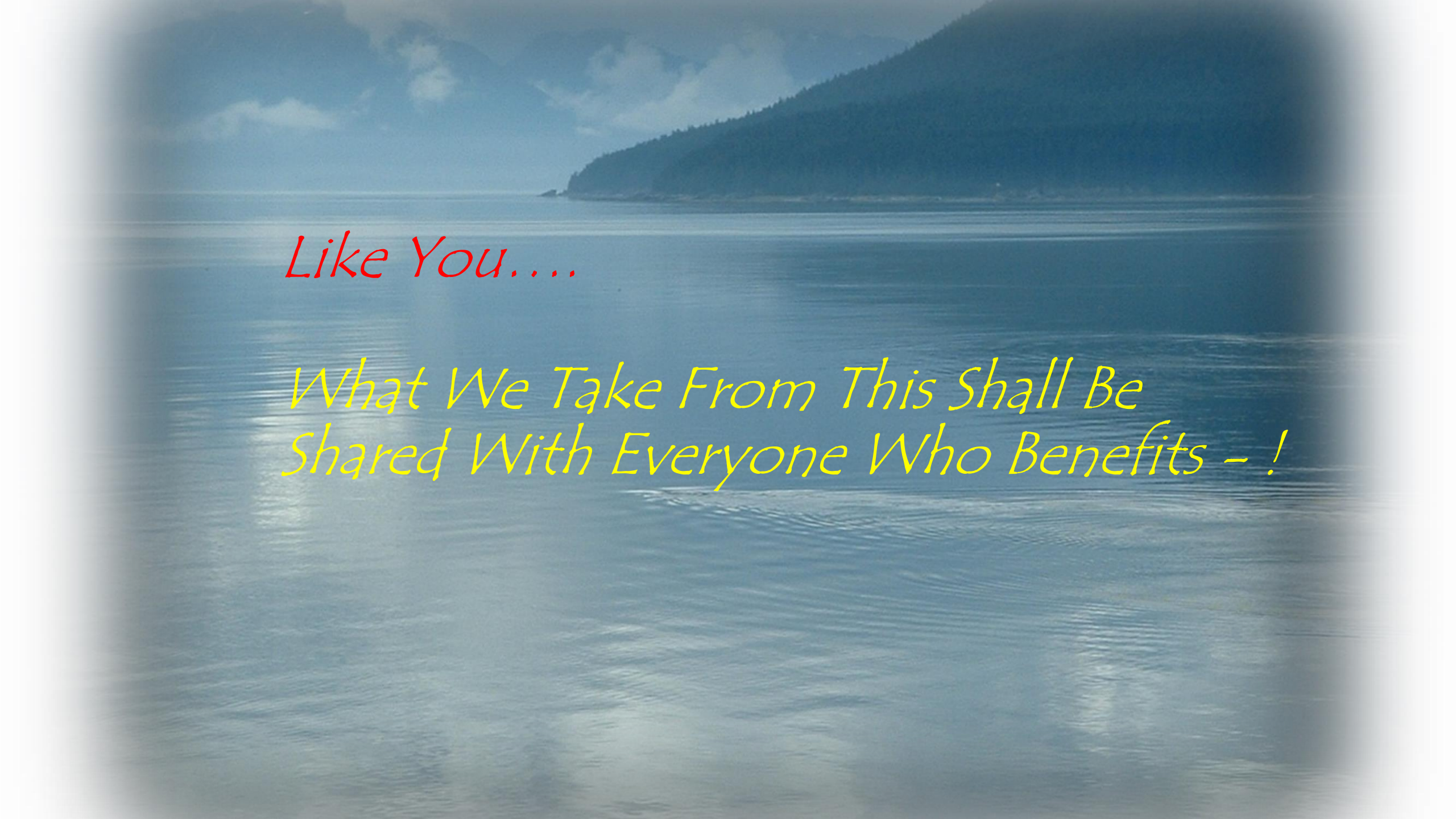
- **Part IV – Practical Aspects of I.H. Work**
  - Review of Recent changes and/or proposed changes in TLVs
  – Case studies that challenge application of OEL's

Questions-?

- What can't be answered now ….
  - Contact me at drmarshall@swbell.net

Dr. Marshall's Like a Paul Simon – "Still Teaching after all these years"

Thank Your for Letting Me Share My Thoughts and Experience!


Like You….
What We Take From This Shall Be
Shared With Everyone Who Benefits – !

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- Additional References shown on individual Slides