AIHA®

Example Occupational Exposure Assessment and Management Program

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Introduction

Overview

*A written Occupational Exposure Assessment and Management Program defines the organization's process for assessing and managing exposures. The process must be tailored to the organization and will vary depending upon the size of the organization, access to resources, complexity and magnitude of exposures, and the level of program implementation. The example written program provided below and herein referred to as the Model Written Program (***MWP***), is intended to serve as a template that incorporates the provisions of the AIHA Exposure Assessment Principles of Good Practice for Occupational Exposure Assessment (PGP).*

Target Audience

The target audience for this MWP includes:

- *Organizations wishing to develop an Exposure Assessment process.*
- *Consultants engaged by their clients to manage an exposure assessment process.*
- *Organizations with an existing written Exposure Assessment and Management Program who wish to further align their practices with AIHA recommendations.*

Use / Application of the MWP

It is suggested that the MWP and PGP documents be reviewed and compared to any existing or planned organization programs to identify gaps and opportunities for improvement and:

- *Adopt the MWP provisions that can be readily achieved using same or similar language,*
- *Identify the MWP provisions that will require management support and / or time to implement and for those where support can be obtained, specify target implementation dates within your written program and,*
- *For any remaining gaps between the PGP and your organization's written program(s), continue to consider the PGP and language examples provided in the MWP during future periodic reviews of your management systems.*
- *Copy and paste the entire MWP (starting on page 5 below) or applicable provisions into the document format you intend to use. Note original formatting / color coding will not be retained when copying.*

Key considerations for development of organization specific written programs based on MWP.

The following should be addressed prior to establishing the program:

- *Determine the scope of the program: All chemical, physical and biological exposures for all workers across all workdays? Are specific agents managed separately such as heat stress or ergonomic risks? Should the organization's exposure assessment program cover contractors?* **See example language in Section 5B of the Model Program**
- *How is the IH function resourced and what are the required qualifications? On-site professional? Off-site professional? Consultant?* **See example language in Section 4B, 5A, Or combine all as illustrated in Appendix A of the Model Program**
- *How is the Occupational Medicine function resourced? On-site professional? Off-site professional? Consultant?* **See example language in Section 5E of the Model Program**
- *How are OELs selected? For example, the organization may choose to generally apply ACGIH TLVs, and where unavailable, Working OELs are determined using the NIOSH Exposure Banding process. What methodology is used to adjust OELs for non-traditional work schedules?* **See example language in Section 5D3 a & b of the Model Program**
- *Ensure management understands and supports the decision statistic applied to air contaminant and noise exposure assessments.*
    - **There are references to the decision statistic in Section 5B1 which also refers to Appendix A as a place to describe a more complete technical description of statistical methods.**
    - **Management support of this standard is acknowledged by authorized signature on the Program document.**
- *Address exposure assessment data management: Identify standard data elements for Similar Exposure Groups, Exposure Categories, Certainty Ratings, etc. Identify standard monitoring data. Address the utilization of a software database.* **See example language in Section 5B1 of Model Program**
- *Verify access to appropriate monitoring instrumentation and laboratory services.* **See example language in Section 5D2 1&2 of Model Program**
- *Verify or establish administrative procedures to ensure notification regarding newly planned changes in the workplace, workforce and environmental agents, thereby enabling the IH resource to complete prospective exposure assessments.* **See example language in Section 5B3 of the Model Program**

Additional Notes:

- *The MWP is intended to describe how the EA process is managed within an organization. Some important elements of the PGP, deemed too technical or detailed to include in the main body of the MWP, are described in Appendices A, B and C.*

- *Some elements of the EA PGP may already be addressed in other processes established by an organization. Examples of these include processes for*
    - *Management of Change / Chemical Approval*
    - *Injury / illness investigation*
    - *Non-recurring operations covered by work permit / pre-start up review.*
    - *Preventive maintenance procedures / schedules*
    - *PPE / Respiratory protection*
    - *Area / operation inspection programs*
    - *Noise Management*
    - *Ergonomic programs*
    - *Electromagnetic Fields / Radiation Management*
    - *Records Management policies*

If these types of written programs exist within your organization, please add as references in Section 10. Some examples references are already provided in this section of the MWP.

Text Font & Color

- *Language presented in blue italics is intended as instruction / explanation notes and must be removed from any adopted standard / provisions.*
- *Language presented as green italics represent provisions where more than one option for adoption exists or where organization / position titles will be modified. For these cases, select the language that best fits your current plans / any additional statement that can be adopted at some future time.*

Model Program

Occupational Exposure Assessment and Management

1. Scope & Objectives (intended to align with PGP Sections Scope and Objectives / Management Program)

This Program establishes the assessment strategy and monitoring requirements for evaluation of chronic health risks associated with potential personal exposure to toxic substances, harmful physical / biological agents, or repetitive forces in the workplace. The Program applies to all work activities managed by (organization name), personnel including reasonably foreseeable upset conditions. This Program also defines related record keeping and management / employee notification requirements.

The objectives of this Program are to:

- Promote continual improvement through the recognized hierarchy of control where elimination or substitution is followed by engineering controls, administrative controls, and finally personal protective equipment. OK to keep "work practice controls"
- Identify and evaluate potential chronic injury and health risks related to work performed.
- Establish methods for complying with governmental and (organization) exposure / illness control standards and requirements.
- Provide documentation of processes used for basic exposure characterization, exposure assessments and monitoring.
- Promote efficient and effective direction of the organization's resources including industrial hygiene, medical, engineering and maintenance services in support of the system verification and exposure control / reduction initiatives.

2. Applicability – *minimum suggested applicability includes organization employees (permanent and temporary) as well as contractors utilizing organization provided tools / equipment and materials.*

This Program applies to all facilities owned and operated by the name of organization. All employees and contractors, as appropriate, working at the organization's sites are required to comply with all applicable aspects of this program.

3. Definitions - see Appendix B

4. Responsibilities

Successful implementation and maintenance of this Program will require the cooperation of many groups within the organization. Identification of responsibilities is required by most if not all Management System standards. Organization of responsibilities may differ from organization to organization or site to site within an organization . ***Suggested responsibilities are as follows. Please reorganize responsibilities / change position names to best fit your organizational structure:***

A. Site Manager

1. Has ultimate responsibility for site compliance with all aspects of this program.

2. Ensure that the person administering the Industrial Hygiene (IH) program has the knowledge and training necessary to do so.

3. Ensure that adequate resources are allocated for this program.

B. Site Industrial Hygiene Contact (*replace with Job Title / Consulting Organization serving this role*). see responsibility details in Appendix A Section 2a

C. Qualified Industrial Hygienist *(replace with Job Title / Consulting Organization serving this role.)* see details in Appendix A Section 3a.

D. Department Managers & Supervisors

1. Inform the *Industrial Hygiene Contact* of changes in operations or changes in planned use of chemicals and physical agents or proposed new processes or chemicals that could result in changes to levels of current exposures.

2. Inform workers under their supervision of the need for exposure monitoring.

E. Maintenance Department

1. Verify, through appropriate preventive maintenance programs, that process equipment and exposure control systems are operating per installation standards.

F. Medical Contact *(replace with Job Title / Consulting Organization serving this role)*

1. Provide medical surveillance / testing for personnel exposed to chemicals / agents. (include any criteria established for defining exposure)

2. Include the *Industrial Hygiene Contact* in communications concerning the occurrence of potential occupational disease or employee health concerns while also maintaining appropriate confidentiality.

3. *Notify the site / corporate Industrial Hygiene Contact if there is an occurrence of occupational disease or illness.*

4. As appropriate, assist in biological monitoring activities.

G. MoC / Chemical Approval Administrator *(replace with Job Title / Consulting Organization serving this role)*

1. Include the Industrial Hygiene Contact in reviews of:
    - any new chemicals introduced to the site.
    - process or additions / changes that have the potential to impact employee exposures to chemicals or physical agents.
    - Workforce organization changes for the evaluation of impact to SEG's

H. Corporate Industrial Hygiene Group (***if applicable to multi-site organization, define corporate IH responsibilities***)

I. Site Contractor Liaison

1. In conjunction with the *Industrial Hygiene Contact*, determine the needs, if any, for exposure assessment and monitoring of contractor workers, and who will be responsible for doing it.

J. Human Resources

1. Ensure IH Contact designation is included in appropriate Job Description

K. Employees

1. Participate in Industrial Hygiene monitoring when deemed necessary by the site *Industrial Hygiene Contact*

5. Requirements

A. Exposure Controls

The hierarchy of control is elimination or substitution, followed by engineering controls proven to effectively control exposures to acceptable levels in an operation or category of operations, administrative controls, work practice controls, and finally personal protective equipment. The hierarchy is based on the reliability and effectiveness of the control strategies. Effective and reliable protection is often achieved through multiple layers of protection. While preferred, the superior mitigation strategies (elimination, substitution, engineering controls) may take time to plan, resource and implement.

Newly identified unacceptable SEGs are quickly controlled, often through administrative controls, work practice controls, and/or personal protective equipment. Then permanent controls are sought featuring one (or more) of the superior mitigation strategies.

B. Technical Qualifications of Personnel

- Industrial Hygiene Contact - see Appendix A section 2b

- Qualified Industrial Hygienist- see Appendix A section 3b

C. Basic Characterization / Exposure Assessment

The *Industrial Hygiene Contact* or a Qualified Industrial Hygienist will conduct initial and periodic evaluations of the workplace to establish exposure potential profiles for chemicals / agents, repetitive forces to which each Job Class / SEG may be exposed. Factors that will be considered in these assessments will include: *(list factors to be considered. See examples below)*

- *Degree of hazard of the substance / agent / force*
- *Quantity and dispersion potential of the substance / agent*
- *Frequency / duration of potential exposure*
- *Potential for dermal exposure to chemicals*
- *Effectiveness / reliability of control systems in place*
- *Other…*

1. Maintenance of Chemical / Agent Exposure Assessments

Exposure Assessments for each Job or SEG will be maintained *(describe organization specific method for maintenance of the Exposure Assessments)*

- *Standardized spreadsheet tool?*
- *Software database (provide name if applicable) (if capability exists to track worker SEG history – mention that here)*
- *Externally by IH support organization?*
- *Other?*

2. Other Material / Agent Condition Assessments *(if applicable describe any practices for periodic assessment of asbestos containing materials, management of lead / other hazardous coatings, lighting conditions, noise source evaluations, etc.*

3. Exposure / Risk Reassessment and Update

a. Reassessment based on Chemical Approval, MOC (including regulation / exposure limit revisions) or monitoring driven events.

i. Individual exposure assessments will be updated or added as soon as possible to reflect changes in the work environment or availability of new information such as:

- Introduction of new chemicals/agents or new use of existing chemicals/agents.
- Changes in process, equipment, or controls.
- Changes in work shifts, work practices or additional personnel exposed.
- When existing protective measures may be inadequate to meet a new (lower) OEL.
- Availability of new/updated health information such as medical or toxicity data.

Exposure assessments will also be updated as soon as possible when sampling results affect the prioritization calculations.

b. Exposure Limit Review

i. (describe organizations position regarding use of OEL's (authoritative, regulatory, if, when working OEL's such as NIOSH Exposure Banding)

ii. describe process for addressing new or updated exposure limits applicable to site operations including replacement of Working OEL's where applicable.

c. Complete Re-assessment

i. A complete re-evaluation of all exposure assessments will be performed every five years. Personnel associated with a process including supervision, operator and maintenance will be assigned to participate in this re-assessment.

D. Site IH Plans / Performance Improvement Measures

1. IH Plan The purpose of the IH plan document approved projects and monitoring activities related to an organization's continuous improvement efforts. The organizations effectiveness in completing the IH Plan may serve as its measure for monitoring performance improvement. Some organization may have this type of process named differently. If so, adopt the process name in use.Site IH plans shall be developed and executed on (*x frequency basis*) unless required more frequently by local regulation. Factors that should be considered in the development of the plan include:

a. Projects or activities that:

- Have the potential to reduce exposures, or dependance on PPE.
- Reduce the number of people exposed,
- Raise awareness of potential exposure situations,
- Improve the efficiency or effectiveness of the occupational health program.

b. Monitoring or other exposure verification to:

- Comply with regulatory requirements,
- Confirm ongoing work group status with respect to regulatory exposure classification,
- Remove uncertainty regarding exposure categorization of prior initial assessments by providing additional information for statistical analysis,
- Verify effectiveness of operating controls
- Address employee or community concerns.
- Support business initiatives.

2. IH Plan Content

The site IH plan shall include the following items:

a. Feasible exposure reduction and / or improved process efficiency opportunities from D 1 a., above. Each associated with a responsible person and a target completion date.

b. Monitoring requirements as identified in D1 b., above. Monitoring requirements will identify the work group to be monitored, the chemical or agent, the number of samples targeted to confirm statistical classification, the type of sample (biological, personal, area etc.) See additional details in Appendix C.2.

c. Comparison limit (TWA, Ceiling, STEL, Biological Exposure Indices); Some chemicals or agents may require data for comparison to multiple limit types.

3. IH Plans must be reviewed with plant management. (*If your organization has a performance measures / action tracking system include language like the following*). *After acceptance by plant management, the IH Plan shall be entered into the organization action tracking system as an IH Plan / Performance Improvement Plan. Each plan project and each set of quarterly sampling goals will be identified as a plan action with target completion date and person responsible.*

E. Monitoring and Analysis

1. Approved IH service organizations

a. All exposure monitoring will be conducted by or under the direction of a Qualified Industrial Hygienist, following procedures established by NIOSH, OSHA or identify other. When using direct reading instruments, follow manufacturer instructions.

2. Laboratory analysis

a. Following monitoring, samples requiring analysis will be submitted as soon as practical, to an

accredited AIHA or other accreditation laboratory with a chain of custody form. Most accredited laboratories will supply this form.

3. Evaluation of data

a. Comparison to appropriate limits: *Identify primary standards to be used for exposure evaluation and any possible exceptions for example:*

1) ACGIH TLV's / AIHA WEEL's will be used as the primary source of exposure guidelines except as follows:

a) In the absence of TLV or WEEL, other sources such as FRG MAK's, internally developed or Manufacturer recommended OEL's may be used.

b) In the absence of 1 or 1a above, NIOSH exposure banding e-Tool should be utilized, and

c) In any case, where the local regulatory OEL is the lowest value, it must be used as the comparison exposure standard.

b. For full shift exposures, compare results to time weighted average (TWA) OEL value.

1) For extended work shifts TWA adjustments per (name method e,g. Brief & Scala, IRSST...In some cases, regulation may specify) standards will be evaluated as required for certain categories of chemicals.

2) For short term or task specific exposures, compare results to Ceiling or STEL values.

3) Compare to OSHA Action Level for a specific regulated chemical/agent (ex: butadiene, Methylene chloride, noise).

4) The ACGIH TLV additive mixture formula is applied when workers are simultaneously exposed to two or more chemical agents with the same target effect.

F. Reporting

1. Monitoring Event Reports

Narrative reports summarizing the purpose of the monitoring performed, methods utilized, and conclusions derived are required for all monitoring events. Conclusions will be based on the decision statistic (*select either 70% or 95% confidence level*) and accompanied by a Certainty rating (as described in Definitions). In some cases, statistical analysis will include relevant results of monitoring performed previously.

All reports and sample worksheets developed by Organization personnel or Consultant, must be validated, and approved by a Qualified Industrial Hygienist as described Appendix A.

2. Management Reports and Notifications

The *IH Contact* will communicate results / progress of all IH Plan and additional other monitoring activities to site management.

a) Management update of IH Plan status will be accomplished through the organizations action tracking system / regularly scheduled action item status reviews.

b) Results of all exposure monitoring activities, per IH Plan or based on additional needs will be communicated to site management in report format.

c) Appropriate management personnel, including area supervisors will receive copies of any employee notifications. Any employee notifications involving improvement recommendations will be developed with management input.

3. Employee Notifications

a) *An annual review of exposure assessments and monitoring results with employees is recommended.*

b) Written notification to all applicable workers is required for results of all personal samples (this includes Biological Monitoring for comparison to BEIs or OSHA specific standards). Applicable workers are all workers in the same job category / SEG performing same or similar work whether or not they were individually sampled. The notification must include an identification of follow up or corrective actions being taken if any results / statistical analysis indicate exposures at or above the OEL.

4. Format of Employee Notification (describe method(s) of employee notification to be used)

The following notification formats or combination of formats can be used for employee notification of monitoring results. For traceability purposes, any communication format used must include identification numbers of the results being discussed and identification of who was informed.

a) Individual letters

b) Group / Posted notification: They will be displayed for at least one full cycle of work groups to allow all applicable shift workers to see the notification. Do not use names, use jobs titles and / or task identifiers.

c) Meeting notification: Examples: during a training session, health and safety committee meeting, etc. Meeting minutes or training agenda must describe the notification made and the roster of attendees.

5. Timing of Notification

All notifications will be made within thirty (30) days of the receipt of monitoring results unless earlier

reporting is required under a specific regulation. (e.g. a 15 day limit is specified for laboratories in 1910.1450 or chemical specific standards 1910.1001 – 1910.1052).

6. Records

Define record types, duration of retention and record location. All record types listed below will be maintained per time frame specified by law or longer if defined by Organization Procedure (show procedure name e.g. "Access to Medical and Industrial Hygiene Records" procedure.) The following are record types applicable to this Program. Edit list below as needed and to identify record physical or system location.

a. Access to Records

Employee access to exposure monitoring records shall be provided in accordance with Organization "Access to Medical and Industrial Hygiene Records

7. **Auditing** – *add organization specific language related to:*

a. Any Management System requirements – internal and third- party audits.

b. Regulatory compliance audits performed.

8. Implementation Schedule – if there are provisions to this program that will require time to fully integrate, list those below along with required implementation date(s)

a. New provision 1 / date

Record Type	Storage Location or System
Results of Exposure evaluations – including consultant reports, reports / communications to management or employees see Appendix C for additional details of record content.	
Documentation regarding Basic Characterization and rational for SEG development / organization	
SEG records and their updates	
Industrial Hygiene Monitoring Forms / field documentation - see Appendix C for additional details of record content.	
Lab reports (air, surface, biological..)	
Calibration records	
Employee Notifications of Monitoring Results.	
SDS's	

b. New provision 2 / date ...

9. Appendices (Complete / Attach Appendices as necessary)

a. Qualifications of personnel overseeing Site Industrial Hygiene program and performing Exposure Assessments / Evaluations – *see example Appendix A below*

b. Definitions – *see example Appendix B below*

c. Organization Exposure Assessment Instructions - *see example Appendix C below*

d. Example Ergonomic Survey – appendix content not currently included

e. Notification Letter - appendix content not currently included

f. Example IH Plan Format - appendix content not currently included

g. IH Monitoring Report Content – appendix content not currently included

h. Approved IH Consulting / Lab Service organizations - appendix content not currently included.

10. References (Modify type and title of References as necessary)

A. Regulatory standards applicable to the site / organization.

B. A Strategy for Assessing and Managing Occupational Exposures, AIHA. (latest edition)

C. AIHA Exposure Assessment Principles of Good Practice (latest version)

D. AIHA 2022 Competency Framework *Understanding and Applying ARECC to Occupational and Environmental Health and Safety*

E. NIOSH Manual of Analytical Methods, Latest Edition.

F. The NIOSH Occupational Exposure Banding Process for Chemical Risk Management. NIOSH 2019-132.

G. *Organization "Access to Medical and Industrial Hygiene Records" procedure.*

H. *Organization Incident Reporting, Investigation and Documentation Procedure.*

I. *Organization Chemical Approval / Management of Change Program*

J. *Organization Internally established OEL's*

K. *Organization adopted method for Adjustment of TWA Results* (select option below used by your organization uses)

a. *IRSST Institute de Recherche en Sante et en Secutite du Travail*

b. *Brief & Scala*

c. *AIHA pharmacokinetic adjustment tool*

L. Applicable Management Systems (*select option(s) below used by your organization*)

a. *ISO 45001 Hazard Identification (6.1.2.1), a defined methodology for risk assessment (6.1.2.2) and, opportunities to improve performance and reduce /eliminate risk (6.1.2.3)*

b. *ANSI Z10.0 - 2019 Occupational Health and Safety Management Systems.*

c. *International Safety Rating System*

d. *ACC Responsible Care 14001*

e. *Other*

M. *Organization Safe Work Permit System*

N. *Organization Medical Surveillance Program*

Appendix A

Qualifications of personnel overseeing Site Industrial Hygiene program and performing Exposure Assessments / Evaluations

1. Purpose

This Appendix is intended to provide an overview of experience, responsibilities and technical qualifications expected of personnel:

- Overseeing the (organization/ site) IH / EA program
- Personnel (internal or external) performing exposure assessments and evaluations.

2. Internal Personnel Overseeing site Industrial Hygiene Program

a) Responsibilities

- Ensure that systematic initial and periodic site evaluations, including applicable regulatory review, walk-through surveys, and employee interviews, are conducted to review exposures to potentially hazardous materials / agents / repetitive forces and to establish, maintain, and update exposure assessments for each Similar Exposure Group (SEG).
- Establish site specific IH Plans that identify feasible exposure reduction or control projects and that include monitoring activities necessary to comply with governmental or internal organizational standards and / or to verify adequacy of control systems in place.
- Perform exposure monitoring or direct the activities of third-party Qualified Industrial Hygiene monitoring organizations as defined in the IH Plan or as otherwise become necessary.
- Inform site management of all monitoring activities including results, identified trends in exposure levels, action items, and exception conditions.
- Provide affected workers with specific results of personal exposure monitoring and the results of representative monitoring for their work group.
- Provide site management with reports identifying current status of exposure assessments, results of IH monitoring and any opportunities for reduction of employee exposures.
- Coordinate resources to ensure controls are effectively implemented and verify their effectiveness following implementation;
- Ensure that follow-up is performed as necessary to determine effectiveness of control measures / acceptability of exposure levels / risk assessments upon completion of corrective actions.

- Coordinate with the *site medical contact* to ensure that all medical testing / evaluation required by chemical or agent exposure regulations or by Exposure Group (EC) category (Minimum EC 3 and 4) is provided to the appropriate work groups or individuals.
- Provide support to the *Contractor Liaison* in determining the need for exposure assessment and monitoring of contractor activities.
- Perform self-audits of this program to ensure compliance with all aspects and to recommend updates as necessary to insure it achieves its intended purpose.
- Maintain all exposure records.

b) Training (to be completed within *3 months* of assignment). Training / experience must include:

- Formal training or pre-existing experience on all site processes
- Formal training on organization exposure assessment protocol
- Basic understanding of exposure monitoring methods applicable to site operations
- Knowledge of applicable chemical / physical agent exposure standards and regulations
- Knowledge of organization related standards such as: This Program, HazCom, MoC / Chemical Approval, PPE, Respiratory Protection, Noise Management
- If the Industrial Hygiene Contact will be performing any basic IH sampling, including noise dosimetry, the Contact shall attend recognized training prior to completion of a sampling event.
- Personnel with technician level certifications or diplomas and no formal coursework, but a few years of experience, may perform some tasks, such as air sampling, but are required to contract the exposure judgement work to a firm with a Qualified Industrial Hygienist.

3. Qualified Industrial Hygienist - Personnel performing / overseeing exposure assessments and evaluations (Internal Resource or Third Party)

a) Associated Responsibilities.

- Perform exposure assessments, including the development and validation of similar exposure groups.
- Understand effects of those exposures (using toxicological and epidemiological principles, published exposure standards, and manufacturer's safety data sheets, as well as other credible resources) to anticipate and recognize potential hazards;
- Recommend appropriate engineering, administrative, and personal protective equipment options using recognized standards, guidelines, and practices based on the principles of

hierarchy of control to eliminate the hazard or reduce exposure to acceptable limits;

- Develop conclusions and recommended exposure mitigation actions;
- Recommend further investigation as needed to assess risks to worker health and clearly report/communicate findings.

b) Professional Certifications Requirements

- Personnel holding a professional certification (i.e., Certified Industrial Hygienist [CIH], Registered Occupational Hygienist [ROH], Diploma of Professional Competence in Occupational Hygiene [DipOH], etc.) preferably also holding designation as AIHA Registered Specialist Exposure Decision Analysis.
- Countries with professional certification schemes can be found on the International Occupational Hygiene Association's (IOHA's) website under this link: https://www.ioha.net/blog/national-accreditation-recognition-nar/
    - Some countries have a national certification scheme but are not a member of IOHA, so check within the country, or contact Corporate EHS for support if not present on the list.
    - Many countries have a competency framework available from a professional association, the local government, or a National Competency Scheme that can help direct the site to acceptable external providers.
- Personnel with technician level certifications or diplomas and no formal coursework, but a few years of experience, may perform some tasks, under the direction of the Qualified Industrial Hygienist.

Appendix B Definitions

Basic Characterization – Critical information is gathered on the workplace (e.g., operations, processes, equipment, controls, etc.), work force (jobs, division of labor, tasks, etc.), and environmental agents (materials, agents, quantities, chemical and physical properties, potential health effects and OELs, etc.). See also Chapter 3: Basic Characterization and Information Gathering. A Strategy for Assessing and Managing Occupational Exposures. 4th Edition. AIHA 2015.

Certainty Ratings – see SEG Certainty Ratings below

Exposure Categories AIHA exposure categories:

- Category 0: 95th percentile < 1% OEL;
- Category 1: 95th percentile 1-10% OEL;
- Category 2: 95th percentile 10-50% OEL;
- Category 3: 95th percentile 50-100% OEL;
- Category 4: 95th percentile > 100% OEL.

OEL's

- Authoritative or internal OELs are used as criteria for exposure judgments to differentiate acceptable from unacceptable exposures. Authoritative and internal OELs are based on robust toxicologic and or epidemiologic studies and integrate appropriate safety factors. Regulatory OELs are used if lower than authoritative or internal OELs.
- Internal OELs for specific environmental agents may be established and documented by an organization when 1) authoritative OELs are unavailable, or 2) newly developed and robust health effects studies support internal OELs set at levels above or below authoritative OELs.
- Working OELs are utilized where authoritative or internal OELs are unavailable. Working OELs can be determined using an exposure banding system (e.g. NIOSH OEB) where working OELs are expressed as a range of exposure levels (i.e., OEL bands). Working OELs can also be based on REACH DNELs (Derived No Effect Levels) or DMELs (Derived Minimal Effect Levels); or based on analogy with another environmental agent for which there is an authoritative, internal or regulatory OEL.

Qualified Industrial Hygienist -

Occupational exposure assessments are performed by or under the supervision of a qualified and experienced industrial hygienist who has been trained and has demonstrated competence in exposure assessment methodology (e.g., AIHA's comprehensive exposure assessment strategy). The training

includes decision statistics; exposure categories; formation of SEGs; selection and use of OELs; exposure assessment techniques and tools; selection, use and limitations of exposure models; sampling strategies; the application of traditional and Bayesian statistics; measures of certainty; dermal assessments; prioritization schemes; and control strategies.

Persons holding professional certification such as Certified Industrial Hygienist [CIH], Registered Occupational Hygienist [ROH], Diploma of Professional Competence in Occupational Hygiene [DipOH], Certified Occupational Hygienist / equivalent or who maintain AIHA Exposure Decision Analysis Registration are considered Qualified Industrial Hygienists.

SEG – The workforce is stratified into similar exposure groups. This stratification covers all operations and tasks including those performed infrequently. SEGs can be defined by processes, jobs, tasks, or other logical groupings. Individual workers may be assigned to more than one SEG. Each SEG is linked to one or more environmental agents, and SEGs may be further subdivided according to OEL integration period (e.g., 8 hr. TWA, 15-minute STEL) and route of exposure (e.g., airborne, dermal).

SEG Certainty Rating Criteria

For Qualitative Assessment Evaluation:

- High: The environmental agent's exposure profile is well understood. The IH has high confidence in the acceptability judgment.
- Medium: There is enough information to make a judgment, but further information gathering is warranted to verify the exposure assessment.
- Low: The acceptability judgment was made in the absence of significant information on the exposure profile.

For Quantitative – Using Traditional Statistics:

- High: The 95th percentile and the upper tolerance limit (UTL) are in the same exposure category.
- Medium: The 95th percentile is one category below the UTL
- Low: The 95th percentile is two categories below the UTL

For Quantitative – Using Bayesian Statistics (BDA Charts)

- High: The likelihood that the selected exposure category is correct is >75%
- Medium: The likelihood that the selected exposure category is correct is 50% - 75%
- Low: The likelihood that the selected exposure category is correct is <50%

Working OEL's

Working OELs can be determined using an exposure banding system (e.g. NIOSH OEB) where working OELs are expressed as a range of exposure levels (i.e., OEL bands). Working OELs can also be based on REACH DNELs (Derived No Effect Levels) or DMELs (Derived Minimal Effect Levels); or based on analogy with another environmental agent for which there is an authoritative, internal or regulatory OEL. Note: Working OELs are based on limited health effects information, and generally feature more uncertainty than internal OELs. The need for a more robust OEL increases as exposure levels approach a working OEL.

Appendix C

Organization Exposure Assessment Instructions

It is suggested (recommended) that specific organization practices regarding the following PGP elements be addressed here as a technical Appendix of the Exposure Assessment and Management written Program.

1. Initial Assessment Considerations

Describe here:

- Approached used to establish SEG's
- Approach used for initial categorization of exposures including factors considered and any details on scoring / ranking approach.
- Include in description above excerpts from the following paragraph as applicable "Initial exposure assessments compare an estimate of the SEG exposure profile 95th percentile to the OEL. Initial exposure assessments utilize observation of the SEG activities, and all available data collected during the basic characterization. Judgments are based upon past or surrogate monitoring data, mathematical models, and other tools (e.g., algorithms, checklists based on material chemical and physical properties and workplace conditions such as Structured Deterministic Model 2.0). The rationale for each exposure assessment is documented."

2. Monitoring Considerations

Describe here:

- Any standard form(s) used in association with IH sample collection and explanation of form data entry fields as necessary.
- Factors that are considered in determining the type, number and distribution of samples collected when developing the IH Plan. (see examples listed below as extracted from AIHA OEA PGP)
- Three or more baseline personal samples are collected for each SEG that was initially rated exposure category 2 or 3. The monitoring results are analyzed using traditional and/or Bayesian statistics and are used to update the SEG exposure category and the associated certainty rating. Three or more additional samples are then collected for each SEG rated exposure category 2 or 3 with low or medium certainty. No additional baseline samples are needed if a SEG's certainty is rated high based on the statistical analysis. Reclassifying to category 4 (and implementing controls) is an alternative to collecting additional samples.
- Six to ten baseline personal samples are collected for each SEG that was initially rated exposure

category 2 or 3. The data are analyzed using traditional and/or Bayesian statistics and are used to update the SEG exposure category and the associated certainty rating.

- Exposure judgments performed following the statistical analysis of monitoring data are compared to prior judgements as a feedback tool for strengthening the accuracy of professional judgment. If large geometric standard deviations (e.g., > 3) are noted, conclusions / recommendations regarding the accuracy of exposure characterization are required to reduce the likelihood of worker misclassification.
- Personal monitoring data are collected for SEGs rated unacceptable (category 4) when: a) the additional data may support reducing the assessment to category 3 or below, b) the data are needed to support the selection of controls, including PPE in view of respirator protection factors or noise reduction ratings, or c) the data are needed to establish a baseline for assessing the effectiveness of newly planned engineering or work practice controls.
- A small percentage of exposure category 0 and 1 SEGs are periodically monitored to validate initial exposure assessments.
- When characterizing a SEG exposure profile, samples are collected in a manner that is unbiased, representative of the entire SEG population of exposures, and as close to random as is practical.
- Air samples are collected in accordance with standard methods, good quality assurance / quality control processes, and analyzed by an AIHA-accredited laboratory.
- Where practical, all periods of exposure during the workday are monitored in order to accurately determine the time-weighted average. Measured exposure values are averaged over the integration period of the OEL. However, the airborne concentration during the unsampled time period is only counted as zero if it is known that exposures were not present during the time period.
- Biological monitoring and surface sampling are considered where skin absorption or inadvertent ingestion are significant routes of exposure.
- Biological monitoring is considered as a supplement to air monitoring where a) validated protocols and Biological Exposure Indices (BEIs) have been established, and b) the assessment findings may provide additional insight into worker exposures and associated health risks.
- Quantitative dermal assessments (modeling, skin pads, etc.) are performed where an improved characterization of exposure (beyond a qualitative assessment) is needed to more accurately quantify the health risk or support the selection of control strategies.
- Real-time monitors with alarms are used to provide an early warning of exposure levels trending toward exceedance of an OEL (Ceiling Limit, Short-Term Exposure Limit, Time-Weighted Average).
- Personal data logging instrumentation is used to illustrate how sources and tasks contribute to eight-hour average, Short-Term Exposure Limit (STEL) or Ceiling Limit-based exposure assessments.