

Administrative Procedure

CPCC-PRO-SH-17916

PRC-PRO-SH-17916

Industrial Hygiene Exposure Assessments

Revision 1, Change 0

Published: 10/31/2022

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Program: Occupational Safety and Industrial Hygiene

Topic: Occupational Safety and Industrial Health

Technical Authority: Nelson, Zayne J

Functional Manager: Foster, Andrew L

Use Type: Administrative



USQ Facility	USQ Review	Screeners
Solid Waste Operations Complex	(Screening/Determination Performed (no issues)) <i>SWOC-22-062</i>	Jacobs, Orvil
Canister Storage Building/Interim Storage Area	(Screening/Determination Performed (no issues)) <i>CSB-22-053</i>	Garrett, Robert
Central Plateau Surveillance and Maintenance	GCX-8 (Not in Safety Basis Compliance Matrices)	Griebel, Scott
Waste Encapsulation Storage Facility	(Screening/Determination Performed (no issues)) <i>WESF-22-096</i>	Garrett, Robert
Plutonium Finishing Plant	GCX-8 (Not in Safety Basis Compliance Matrices)	Griebel, Scott
Transportation	Exclusion Reason: <i>N/A per Section 1.3</i>	
Capsule Storage Area	Exclusion Reason: <i>NA per App B (new safety basis being developed per DOE-STD-1189)</i>	
105 KW Facility	(Screening/Determination Performed (no issues)) <i>0142-2022</i>	Oberg, Brian
324 Building	(Screening/Determination Performed (no issues)) <i>324-22-119</i>	Garrett, Robert

JHA: Administrative

Periodic Review Due Date:10/31/2027

Rev. 1, Chg. 0

Change Summary

Description of Change

Updated the forms needed to support the current IHEA process. Updated the procedure verbiage and moved much of the body of the procedure into form instructions. Clarified the process of identifying and documenting hazards and controls to adequately protect workers. Removed portions of the procedure that are addressed in other documents. Updated PPS template.

Industrial Hygiene Exposure Assessments**Published Date: 10/31/22****PRC-PRO-SH-17916****Effective Date: 10/31/22****1.0 INTRODUCTION****1.1 Purpose**

This procedure provides a process for conducting and documenting Industrial Hygiene Exposure Assessments (IHEA) to support Central Plateau Cleanup Company (CPCCo)-directed work activities. This procedure also provides guidance for the processes of hazard evaluation and identification of controls. The IHEA may be used for a single work scope, a facility or the project as whole. The extent of coverage of the IHEA is up to the discretion of the project Industrial Hygienist.

The exposure assessment process includes (1) the identification of hazardous agents, (2) an evaluation of the relative risk associated with each agent, (3) determination of required sampling/monitoring, and (4) the determination of necessary controls. Ultimately, this information is used to ensure that workers are adequately protected when performing work activities.

In other words, the IHEA documents the following:

- The process—what work is going to be performed
- The chemicals used in the work evolution
- Other hazards (physical, biological, ergonomic)
- Personal protective equipment (PPE)
- A review of applicable/similar sampling and monitoring data
- Sample plan—what samples are expected to be collected and why
- Controls to eliminate or reduce exposure to occupational health hazards

- Statistical analysis of exposure data, when enough data are available.

1.2 Scope

The IHEA process identifies and evaluates anticipated biological, chemical, ergonomic, and physical agent hazards potentially present in products, materials, equipment and legacy wastes associated with CPCCo-directed work activities. IHEA is the process used to develop and assess control measures, and to maintain occupational exposures as low as practicable.

The following hazards are outside the scope of this procedure:

- Radiological hazards covered under 10 CFR 830, *Nuclear Safety Management*
- Bloodborne pathogens covered under 29 CFR 1910.1030, *Bloodborne Pathogens*
- Facility/process exposure hazards and controls addressed through design engineering
- Beryllium hazards covered under DOE-0342-001, *Hanford Site Beryllium Work Permit and Hazard Assessment*
- Confined spaces as managed under DOE-0360, *Hanford Site Confined Space Procedure (HSCSP)*
- Office ergonomics per CPCC-PRO-SH-40463, *Ergonomics*

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1.3 Applicability

This procedure is applicable when conducting and documenting IHEAs to support CPCCo work activities.

1.4 Implementation

This procedure is effective on the date published. Existing IHEAs and their supported documents (including previous form versions) in the process of being revised may continue the revision up to 30 days after publication. Existing IHEAs and their supported documents not in revision process, must be revised to meet the requirements of this procedure during their next scheduled review.

2.0 RESPONSIBILITIES

The industrial hygienist (IH) is responsible for performing the steps in this procedure.

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3.0 PROCESS

IHEA is a process for documenting the identification and evaluation of potential exposure hazards from biological, chemical, field ergonomics and physical agents for a defined scope of work. The IHEA process also defines controls for the identified hazards. Under the IHEA process, a negative exposure determination is as important to discuss and document as exposure to hazards of occupational significance.

When a work scope change introduces new hazards, or previously unidentified hazards are discovered during work performance, the IHEA is revised. The IHEA is also revised when a hazard is removed from the scope or found not to exist.

The IH may document the IHEA using a combination of the following forms:

- *Industrial Hygiene Hazard Screening Form* (Site Form A-6007-295) - Section 3.1
- *Industrial Hygiene Exposure Assessment (IHEA)* (Site Form A-6007-296) - Section 3.2
- *Industrial Hygiene Sample Plan* (Site Form A-6007-395) - Section 3.3
- *Industrial Hygiene Work Permit* (Site Form [A-6007-313](#)) - Section 3.4
- *Industrial Hygiene Work Permit (IHWP) Acknowledgement/Review Record* (optional) (Site Form A-6007-634) - Section 3.4
- *Industrial Hygiene Technical Evaluation* (Site Form A-6006-552) - Section 3.5

Heat stress exposures may be documented on the IHEA form or documented on Site Form A-6007-263, *Heat Stress Evaluation*.

Asbestos exposures may be documented in the IHEA or via a Thorough Asbestos Inspection Report, in accordance with CPCC-PRO-EP-53065, *Asbestos Requirements for Demolition and Renovation Activities*.

3.1 Industrial Hygiene Hazard Screening Form

When reviewing work activities, the IH may use the *Industrial Hygiene Hazard Screening [IHHS] Form* (Site Form A-6007-295) to determine if an IHEA or other hazard evaluation document is required. This form can also be used to document and communicate to the work planner or Responsible Manager that an evaluation of the work scope has been performed. The IH may use the IHHS Form to document hazards common to a specific work scope (e.g., heat stress, noise, beryllium) or to document hazard-specific IHEAs that apply to a particular work package. Additionally, an IHHS Form may document that no work-specific IHEA is needed.

The IHHS Form is typically used as a checklist to help streamline the evaluation and documentation for, among other hazards, the following:

- Asbestos/Mineral Fiber
- Beryllium
- Biological/Chemical/Ergonomic Hazards

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- Confined space
- Hot work/Welding/Cutting
- Toxic Metals
- Noise
- Thermal stress

The instructions for completing this form can be found in the Site Forms document A-6007-295i, *Industrial Hygiene Hazard Screening Form Instructions*.

3.2 Industrial Hygiene Exposure Assessment (IHEA)

The *Industrial Hygiene Exposure Assessment (IHEA)* (Site Form A-6007-296) provides a template for documenting details about the potential hazard exposures, to include, but not be limited to the following:

- Title
- IHEA number
- Start Date/Expiration Date
- Associated Hazard Evaluation(s)
- Description of the work to be performed
- Potentially exposed workers, potential similar exposure groups (SEG), and an evaluation of each SEG's potential exposure
- Previous survey data
- Controls for each hazard, along with required training, medical monitoring, and PPE
- Recommended monitoring and sampling

The instructions for completing this form can be found in the Site Forms document A-6007-296i, *Industrial Hygiene Exposure Assessment Instructions*. The IHEA is often used in conjunction with the Industrial Hygiene Sample Plan (IHSP) and the Industrial Hygiene Work Permit (IHWP).

3.3 Industrial Hygiene Sample Plan (IHSP)

Sampling instructions are placed into either the *Industrial Hygiene Sample Plan* (Site Form A-6007-395) or the *Industrial Hygiene Work Permit* (Site Form A-6007-313; see Section 3.4) when sampling is performed by an Industrial Hygiene Technician (IHT) or IH Surveyor. Either of these documents is completed prior to collection of samples to identify technical sampling and analytical information and help identify decision outcomes based on sampling results.

The instructions for completing the IHSP form can be found in the Site Forms document A-6007-395i, *Industrial Hygiene Sample Plan Instructions*.

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3.4 Industrial Hygiene Work Permit (IHWP)

The *Industrial Hygiene Work Permit* (Site Form A-6007-313) can be used for creating a silica, lead, or cadmium compliance plan when the applicable compliance section and the other parts of the permit are completed. It can also be used in the field to direct sampling (in lieu of the IHSP) and prescribe control sets identified in the IHEA. The IHWP may be used:

- In a space that contains hazards that affect all or most work performed within it. It allows space entrants to follow the hazard control set and sampling requirements on a permit instead of embedding those instructions into every work package or procedure that directs work within that space. When used, each of the work packages or procedures can direct personnel to follow the permit when working in the space.
- For repetitive activities where a long list of chemicals may be potentially used, such as for maintenance activities/procedures. An example might be specific PPE and controls for long chemical lists are identified by chemical name so the user can easily determine PPE/controls for the chemical they are using. When used, work packages, preventative maintenance instructions or procedures can direct personnel to follow the permit when using the evaluated chemicals.
- As a compliance plan for silica, lead and cadmium work. If a compliance plan is required, to ensure the requirements of the standard are met, the IHEA and IHWP must be used together, along with the IHWP Acknowledgement/Review Record.

If an IHWP is used, an *Industrial Hygiene Work Permit (IHWP) Acknowledgement/Review Record* (Site Form A-6007-634) may be used to document employee review of the IHWP. If used, the acknowledgement form is retained in project documents (e.g., work package or procedure) and managed in accordance with CPCC-PRO-WKM-12115, *Work Management*.

Sampling instructions are placed into either the IHWP or IHSP when IH Technicians or IH Surveyors perform the work. Sampling instructions are documented prior to the collection of samples to identify sampling/monitoring activities, analytical method information, and make decisions based on sampling/monitoring results.

Sampling instructions may be documented in the IHEA if an IH is performing the work.

The instructions for completing this form can be found in the Site Forms document A-6007-313i, *Industrial Hygiene Work Permit Instructions*.

3.5 Industrial Hygiene Technical Evaluation (IHTE)

The IH may use an *Industrial Hygiene Technical Evaluation* (Site Form A-6006-552) to establish a decision basis or process not otherwise specified by regulation or industry standard. This type of document is sometimes referred to as a “white paper” or interpretive guidance document, but is not required. The IHTE or white paper can be a useful tool when dealing with unusual situations not covered elsewhere. The IHTE can be used to support an IHEA, and may reference an IHEA, but cannot be used as a substitute for an IHEA. The IHEA may reference a technical evaluation, such as ventilation calculations performed in support of a work activity, but the IHTE is a separate standalone document.

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The instructions for completing this form can be found in the Site Forms document A-6006-552i, *Industrial Hygiene Technical Evaluation (IHTE) Instructions*.

4.0 FORMS

A-6006-552, *Industrial Hygiene Technical Evaluation*

A-6007-263, *Heat Stress Evaluation*

A-6007-295, *Industrial Hygiene Hazard Screening Form*

A-6007-296, *Industrial Hygiene Exposure Assessment (IHEA)*

A-6007-313, *Industrial Hygiene Work Permit*

A-6007-395, *Industrial Hygiene Sample Plan*

A-6007-634, *Industrial Hygiene Work Permit (IHWP) Acknowledgement/Review Record*

5.0 RECORD IDENTIFICATION

All records are generated, processed, and maintained in accordance with CPCC-PRO-IRM-10588, *Records Management Processes*.

Records Capture Table

Name of Document	Submittal Responsibility	Retention Responsibility
<i>Industrial Hygiene Technical Evaluation, A-6006-552</i>	SWIHD Administrator	IRM Service Provider
<i>Heat Stress Evaluations, A-6007-263 (and Negative Exposure Assessments)</i>	SWIHD Administrator	IRM Service Provider
<i>Industrial Hygiene Hazard Screening Form, A-6007-295</i>	SWIHD Administrator	IRM Service Provider
<i>Industrial Hygiene Exposure Assessments (IHEA), A-6007-296</i>	SWIHD Administrator	IRM Service Provider
<i>Industrial Hygiene Work Permit, A-6007-313</i>	SWIHD Administrator	IRM Service Provider
<i>Industrial Hygiene Sample Plan, A-6007-395 (or A-6005-784 Job Hazard Analysis/Activity Hazard Analysis for Subcontractors)</i>	SWIHD Administrator	IRM Service Provider
<i>Industrial Hygiene Work Permit (IHWP) Acknowledgement/Review Record, A-6007-634</i>	SWIHD Administrator	IRM Service Provider

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6.0 SOURCES**6.1 Requirements**

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910, *Occupational Safety and Health Standards*

29 CFR 1926, *Safety and Health Regulations for Construction*

American Conference of Governmental Industrial Hygienists (ACGIH), *TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (2016)

CPCC-MP-SH-32219, *10 CFR 851 CPCCo Worker Safety and Health Program Description*

DOE-0342, *Hanford Site Chronic Beryllium Disease Prevention Program (CBDPP)*

6.2 References

10 CFR 830, *Nuclear Safety Management*

CPCC-PRO-EP-53065, *Asbestos Requirements for Demolition and Renovation Activities*

CPCC-PRO-IRM-10588, *Records Management Processes*

CPCC-PRO-SH-40463, *Ergonomics*

CPCC-PRO-SH-40479, *Occupational Noise Exposure and Hearing Conservation*

CPCC-PRO-WKM-12115, *Work Management*

CPCC-STD-TQ-54470, *Industrial Hygiene Training Program Description*

DOE-0342-001, *Hanford Site Beryllium Work Permit (BWP) and Hazard Assessment Procedure*

DOE-0360, *Hanford Site Confined Space Procedure (HSCSP)*

6.3 Bases

CPCC-MP-SH-54469, *Industrial Hygiene Program Management Plan*

CPCC-PRO-SH-121, *Heat Stress Control*

CPCC-PRO-SH-409, *Industrial Hygiene Monitoring, Reporting and Records Management*

CPCC-PRO-SH-40143, *Bloodborne Pathogens*

CPCC-PRO-SH-40498, *Toxic Metals Exposure Control*

CPCC-PRO-SH-40516, *Chemical Management Program*

CPCC-PRO-SH-52755, *Employee Job Task Analysis*

CPCC-PRO-WKM-079, *Job Hazard Analysis*

CPCC-STD-SH-40518, *Personal Protection*

DOE-0352, *Hanford Site Respiratory Protection Program (HSRPP)*

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Appendix A - Statistical Evaluation of Exposure Data

Appendix A provides guidance for use when statistically looking at monitoring/sampling data. After a “sufficient” number of *representative* samples have been collected for compliance assessment, or for agents with an AL or OEL exceedance, statistical evaluation may be performed to determine the:

- Type of distribution (normal versus lognormal)
- Measure of central tendency (geometric or arithmetic mean)
- Upper Confidence Limit (UCL) as a value, and as a percent (%) of the OEL
- Homogeneity of the exposures

Update the IHEA to reflect conclusions of statistical analysis of data collected during implementation of this procedure.

NOTES:

1. *Following the AIHA Exposure Assessment Strategy, a “sufficient” number of samples for an SEG having little variability is six (6). If results are more variable, up to twelve (12) samples may be collected.*
2. *If the SEG cannot be defined with twelve (12) samples, consider re-defining the SEG.*
3. *When calculating any statistical metric it is critical to include all data, including those values reported as less than Limit of Detection (LOD) or Reporting Limit (RL), which are reported in summary statistics as the numeric value of the LOD/RL.*
4. *Metrics such as the 95th percentile or the exceedance fraction or Upper Tolerance Limit (UTL) may also be useful in describing the potential to exceed the exposure limit for the exposure profile.*
5. *When evaluating noise exposure data, use the % Dose to calculate summary statistics, rather than the dBA results.*

An exposure profile is a “snapshot” of the exposures experienced by members of a SEG. The use of statistical tools to characterize the exposure profile provides the IH with a technically sound basis for determining the acceptability of a SEG or exposure profile. While SEG exposures show some variability, a SEG should reflect a fairly stationary exposure condition.

Critical SEGs are those having exposure profiles near, but below, the OEL. When critical SEGs are present, the IH should review the number of samples required to demonstrate with 95% confidence that the true 95th percentile exposure result is less than the OEL.

Analysis of variance (ANOVA) is another statistical technique that may be used to determine if a SEG has been appropriately defined. For additional information, review the chapters on Sampling Strategy Design and Quantitative Exposure Data, and, Appendix V in the 4th edition of AIHA’s *A Strategy for Assessing and Managing Occupational Exposures*.

E-Tools such as IHSTAT, a Microsoft® Excel e-tool from the AIHA, approved for use at CPCCo, may be used to assist in the determination of the most appropriate data distribution (normal or log-normal) and in the calculation of summary statistics (e.g., mean, standard deviation, UCL, UTL).

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Appendix A - (Cont.)

To conduct statistical review and validation of a SEG perform the following:

1. Calculate the mean, standard deviation, UCL, and UTL

- Calculate the UCL for the dataset as a percent of the OEL (% OEL-UCL) and determine if all data points fall below the upper confidence limit.
- Calculate the 95% UTL and determine if it is below the OEL. If the UTL exceeds the OEL, then determine the exceedance fraction for the dataset.
- If a data point falls beyond the 95% OEL-UCL, and/or if the geometric standard deviation is greater than 3, re-evaluate the SEG and consider subdivision into two or more SEGs.

2. Evaluate the homogeneity of the exposures

- Arithmetic mean exposures are the average of a data set (e.g., of individual surveys), calculated by adding all sample results, and dividing by the number of samples in the data set.
- To be considered an SEG, the arithmetic mean of exposures from different surveys should not differ by more than a factor of 2, for 95% of the workers evaluated.

3. Verify the SEG

- If data points are all below the 95% OEL-UCL, AND, the data set meets a criterion for homogeneity, then the SEG may be considered as validated. Ideally, the 95% UTL will also be below the OEL.

4. Update the IHEA