1. INTRODUCTION

1.1 Purpose

The objective of the chronic beryllium disease prevention program (CBDPP) is to reduce, minimize, or eliminate exposure to *beryllium* (See def.) and *beryllium compounds* (See def.), thereby helping to ensure the safety and health of workers and subcontractors at CH2M-WG Idaho, LLC (CWI).

1.2 Scope and Applicability

This procedure provides instructions for protecting workers at CWI from chronic beryllium disease, in accordance with 10 CFR 850. This procedure addresses beryllium inventory, hazard assessment, permissible exposure limit, action level, exposure monitoring, exposure reduction and minimization, regulated areas, hygiene facilities and practices, respiratory protection, protective clothing and equipment, housekeeping, release criteria, waste disposal, beryllium emergencies, medical surveillance, training, warning signs and labels, recordkeeping and performance feedback.

This procedure applies to workers and subcontractors of CWI performing activities with beryllium and/or beryllium-containing compounds in a beryllium activity that may present a *worker exposure* (See def.). This procedure also applies, for medical surveillance, to CWI employees who were potentially exposed to beryllium at other DOE facilities. This procedure does not apply to naturally occurring, background beryllium.

CWI subcontractors are informed of the requirements of 10 CFR 850, through the subcontracting process which includes the Subcontractor Requirements Manual's requirements document PRD-2105 "Heavy Metals."

This procedure does not apply to laboratories where personnel follow MCP-3635, "Research & Development Laboratory Chemical Hygiene Plan."

Under normal conditions, this procedure does NOT apply to *beryllium articles* (See def.).

2. RESPONSIBILITIES

Performer	Responsibilities
Industrial Safety and Health Directorate	Appoint beryllium subject matter expert.
BEA Division of Occupational Medicine (DOM)	Maintain CBDPP health/medical records in accordance with applicable regulations and perform medical surveillance.
Line Management	Manage beryllium operations in compliance with applicable regulations and within the recommended controls. Ensure that employees comply with regulations, controls, and monitoring requirements.
Site Occupational Medical Director (SOMD)	BEA physician responsible for the overall direction and operation of the Site occupational medical program.
Beryllium Subject Matter Expert (SME)	Support aspects of the chronic beryllium disease prevention program (CBDPP).
Worker	Perform beryllium-related work in compliance with applicable regulations and within the recommended controls and training.
Industrial Hygienist	Perform exposure assessments and monitoring as required. Support implementation of the CBDPP.
Training Directorate	Develop and provide training to beryllium workers and others working at a site where beryllium activities occur.

3. PREREQUISITES

None

4. INSTRUCTIONS

4.1 General Program Administration

4.1.1 Directorate of Industrial Safety and Health: Appoint a qualified individual to serve as the company beryllium Subject Matter Expert (SME) to support the aspects of this program.

4.1.2 Line Management: Ensure work with beryllium is evaluated through the work planning and control process with appropriate work control documents. (*See def.)*

4.1.3 Notify IH prior to starting work with or changes to work with beryllium or beryllium compounds.

4.1.4 Receive approval to procure beryllium or beryllium-containing compounds from the area industrial hygienist through the chemical inventory tracking system.

4.1.5 Area IH: Identify all operations and locations involving work with beryllium which may include assessing the chemical inventory tracking system or in the case of waste, the Hazardous Waste Inventory, to identify all operations and locations involving work with beryllium.

4.1.6 Provide necessary beryllium inventory information, locations of beryllium operations, beryllium quantity, operation/activity, status of operation/activity (historical/active) to the beryllium SME for inclusion in the beryllium inventory.

4.1.7 Beryllium SME: Update and maintain the beryllium inventory as information is received. The beryllium inventory is located on the CWI Industrial Hygiene home page.

NOTE: *The beryllium inventory is a table which contains the location, beryllium quantity, operation/activity, status of operation/activity (historical/active).*

4.1.8 BEA Division of Occupational Medicine: Maintain and document a list of past and current beryllium-associated workers on the Occupational Medical Surveillance System (OMSS).

NOTE: *The OMSS is used in conjunction with the beryllium inventory to identify personnel exposed or potentially exposed (See def.) to beryllium. Line Management provides this information through the process described in Section 4.13.*

4.1.9 Beryllium Worker: Perform beryllium related work in accordance with work control documents and training.

4.1.10 Training Directorate: Develop and provide training to beryllium workers and others working at a site where beryllium activities occur.

4.2 Hazard Assessment and Performance Feedback

4.2.1 Beryllium SME: Perform a self-assessment of the beryllium exposure assessments in the Hazard Assessment and Sampling System (HASS) database every six months.

4.2.2 Perform a biennial assessment of the existing beryllium operations, exposure assessments, medical surveillance trends, planned activities, monitoring activities, hazards, medical surveillance, exposure reduction and minimization, and occurrence reporting data.

4.2.2.1 Apply a risk-based analysis to the items listed in 4.2.2 to determine which elements of the CBDPP to assess.

4.2.3 Perform a review/assessment of the beryllium inventory every six months with area industrial hygienist.

NOTE: *The baseline beryllium inventory hazard assessment has been completed and documented in PLN-1747, "Idaho National Engineering and Environmental Laboratory Site Beryllium Contamination Sampling and Analysis Plan," and RPT-107, "INEEL Site Legacy Beryllium Contamination Survey Results."*

4.2.4 Provide information on assessment performance to the IH Functional Organization.

4.2.5 Industrial Safety and Health Directorate: Provide analyses and assessment information to line managers, planners, IH, workers, medical staff, and labor organizations representing *beryllium-associated workers* (*See def.*) upon request.

4.2.6 Line Management: Provide job specific hazard assessments through the work control process. (*See ref*).

4.3 Exposure Assessment

4.3.1 Area IH: Perform an exposure assessment for beryllium work in accordance with MCP-153, "Industrial Hygiene Exposure Assessment," prior to work with beryllium, including entry of exposure assessment information in to the Hazard Assessment Sampling System (HASS). Ensure that applicable control requirements and exposure information is communicated to line management. Assist with implementing needed beryllium information into work control.

4.3.2 Determination of workers *potentially exposed* (*See def.*) to *airborne beryllium* (*See def.*) will be conducted using one or more of the following methods:

4.3.2.1 Use of air monitoring including representative monitoring for workers involved with beryllium work, used to determine which classifications of workers are potentially exposed, may include using statistical analysis and similar exposure groups.

4.3.2.2 Use of work area swipe sampling, where swipe sampling exceeds the release criteria beryllium level of 0.2 *u*g/ 100 square centimeters, then the work activity will be assumed to have workers potentially exposed.

4.3.2.3 Use of work practice knowledge, where work activities that are likely to generate airborne beryllium, (such as drilling, grinding, sanding, or abrading beryllium containing materials), where heavy equipment can disturb beryllium containing materials, or when intrusive handling, (such as direct contact during segregation or separation) of beryllium containing waste is conducted, then the workers will be assumed to be potentially exposed.

4.3.2.3.1 Determination of whether waste contains beryllium can be conducted using reviews of historical data and information, which may include but is not limited to characterization plans, acceptable knowledge documents, waste characterizations, previous sampling data, and information from the waste generator.

NOTE: *The term potentially exposed (See def.) does not include disturbances to beryllium or beryllium-contaminated surfaces that occur through processes using engineering control methods such as, remote handling systems, glove boxes, and underwater storage, which eliminate or maintain exposures below the limit of quantitation (LOQ see def.). These engineering control methods do not include controls with single points of failure, such as disturbances controlled solely via ventilations systems.*

4.3.3 When determining a *beryllium activity* (See def.) or an *operational area* (See def.) for beryllium work, Industrial Hygiene will classify these areas using the potentially exposed criteria of 4.3.2, past, similar exposure assessments, or current exposure assessments. This will including statistical analysis of sample data to make a classification.

4.3.3.1 Industrial Hygiene may reclassify a beryllium activity or an operational area based upon the determination of the airborne levels of beryllium for that activity. The air sampling results can be compared to the laboratory's reported *limit of quantitation* (LOQ) (See def.), if the value equals or exceeds the LOQ, the beryllium is considered to be airborne, if the value is less than the LOQ, then it is classified as no airborne beryllium present and the determination can be made that a beryllium activity or operational area does not exist.

4.3.3.2 Any task or operation previously defined as "Potentially Exposed" my be reclassified as "Not Potentially Exposed" based on Industrial Hygiene air sampling showing levels to be less than the LOQ.

4.3.4 Line Management: For employees determined to be potentially exposed to beryllium as determined in 4.3.2, do the following:

A. Define employees as *Beryllium workers* (See def.)

B. Define the work as a *Beryllium Activity* (See def.) in an *operational area* (See def.)

C. Ensure that all *beryllium workers* (See def.) receive 00TRN804 as per Section 4.14.

D. Ensure that all *beryllium associated workers* (See def.) are enrolled in medical surveillance.

4.3.5 Area IH: Perform initial monitoring for beryllium in areas identified as involving work with beryllium.

4.3.5.1 Conduct initial monitoring by taking personal breathing zone samples and determine the worker's 8-hour time-weighted average (TWA).

NOTE: *Monitoring performed within 12 months of the work activity may be used to satisfy the initial monitoring requirement.*

4.3.6 Apply a statistically-based monitoring strategy to obtain a sufficient number of samples to adequately characterize exposures, before reducing or terminating monitoring, to determine potential exposure, to determine an area as being a beryllium area or operational area, or to reclassify a beryllium activity.

NOTE: *The HASS statistical spreadsheet provides the appropriate statistical methodology. This spreadsheet was adapted from the AIHA (See ref.) Industrial Hygiene Statistics Spreadsheet.*

4.3.7 Provide appropriate workplace monitoring. Guidance for monitoring is found in GDE-196, "Industrial Hygiene Sampling Guide."

4.3.7.1 Provide written notification of monitoring results to affected employees within 10 working days after receipt of any monitoring results.

4.3.7.2 If monitoring results indicate that worker exposure is at or above the AL, include a statement in the written notice that the AL was met or exceeded and describe the corrective action being taken by line management to reduce the worker's exposure to below the action level, if practicable.

4.3.7.3 If the monitoring results indicate that the worker exposure is at or above the AL, notify DOE-ID and the *Site Occupational Medical Director* (*SOMD*; see def.) of these results within 10 working days after receipt.

4.3.7.4 For beryllium areas where the airborne concentration is above the LOQ but below the action level, perform quarterly exposure monitoring of workers.

4.3.8 Beryllium SME: Contact contracted and onsite laboratories to define reporting *limit of quantitation* (*LOQ*; *see def.*).

4.3.9 BEA Division of Occupational Medicine: Access exposure assessment information, as provided by the industrial hygienist, from the HASS industrial hygiene database.

4.4 Exposure Reduction and Minimization

4.4.1 Line Management: Ensure that no worker is exposed above the *permissible exposure limit* (*PEL*; see def.) of 2 $\mu g/m^3$ without proper worker protection.

NOTE: *If sufficient information is not available to make a determination about the beryllium exposure levels for a work activity, controls will be established as if the exposure levels are at or above the action level, until enough data is obtained to complete the exposure level determination. Exposure determinations are completed using the work control process (See ref.), and the exposure assessment process (See ref.) described in company procedures.*

4.4.2 For areas in which the exposure levels are at or above the AL, establish a formal exposure reduction and minimization plan to reduce exposure levels to below the AL, if practicable.

4.4.2.1 The exposure reduction and minimization plan must include the following:

A. Annual goals for exposure reduction and minimization

B. A rationale for and a strategy for meeting the goals

C. Actions that will be taken to achieve the goals

D. A means of tracking progress towards meeting the goals or demonstrating that the goals have been met.

4.4.2.2 Submit a copy of the exposure reduction and minimization plan to the beryllium SME and IH Functional Organization for concurrence.

4.4.3 For areas in which employees are exposed to *airborne beryllium* (*See def.*) that is below the AL, implement the conventional hierarchy of IH controls (that is engineering controls, administrative controls, and personal protective equipment, in that order) for reducing and minimizing exposures, if practicable.

4.4.3.1 Consider the following mitigations to reduce and minimize exposure:

A. Provide ventilation

B. Use wet methods

C. Perform housekeeping

D. Use personal protective equipment (PPE).

4.4.3.2 Implement the chosen mitigations through the work planning and control process.

4.5 Regulated Areas

4.5.1 Line Management: If airborne concentrations of beryllium are measured at or above the AL, complete the following steps.

4.5.1.1 Establish *regulated areas* (*See def.).*

4.5.1.2 Demarcate those regulated areas from the rest of the workplace in a fashion that adequately warns workers of the area boundaries. (See Section 4.15, Warning Signs and Labels)

4.5.1.3 Limit access to the regulated areas to *authorized personnel* (*See def.)*.

4.5.1.4 Keep records of all individuals who enter the regulated areas including name, date, activity, time in, and time out.

4.6 Hygiene Facilities and Practices

4.6.1 Line Management: In areas where worker exposure is at or above the AL, apply the following rules:

A. Food or beverage and tobacco products are prohibited.

B. Cosmetics are not applied, except in change rooms or shower facilities.

C. *Beryllium workers* (*See def.*) with contamination on their bodies or personal clothing are prevented from exiting areas that contain beryllium.

D. Separate facilities free of beryllium are provided for beryllium workers to change into and store personal clothing and clean protective clothing and equipment to prevent cross contamination.

E. Areas and change rooms provided are maintained under negative pressure or located to minimize dispersion of beryllium into clean areas.

F. Hand washing and shower facilities are provided to beryllium workers who work in regulated areas, and line management ensures their use at the end of the work shift.

G. Lunchroom facilities that are readily accessible to beryllium workers and that are free of beryllium are provided. No personal protective equipment worn for beryllium contamination will be allowed in the eating area.

H. These lunchrooms, hand washing, and shower facilities must comply with the following:

1. General washing facilities must be maintained in a sanitary condition.

2. One shower will be provided for each 10 employees of each sex, or numerical fraction thereof, who are required to shower during the same shift.

3. Body soap or other appropriate cleansing agents convenient to the showers will be provided.

4. Showers must be provided with hot and cold water feeding a common discharge line.

5. Employees who use showers must be provided with individual clean towels.

6. No employee will be allowed to consume food or beverages in a toilet room or in any area exposed to a material above the applicable exposure limits.

7. No food or beverages will be stored in toilet rooms or in an area exposed to a toxic material above the applicable exposure limits.

4.7 Respiratory Protection

4.7.1 Line Management: Provide respiratory protection to workers, and ensure appropriate use, cleaning, and maintenance following the requirements for respirators per MCP-2726, "Respiratory Protection."

4.7.2 Area IH: Prescribe respirators for beryllium workers who:

A. Are exposed at or above the action level

B. Request a respirator for protection against airborne beryllium, regardless of measured exposure levels.

4.8 Protective Clothing and Equipment

4.8.1 Line Management: Provide personal protective clothing and equipment to beryllium workers, and ensure its appropriate use and maintenance where dispersible forms of beryllium may contact worker's skin or eyes, including where:

A. Exposure monitoring has established that airborne concentrations of beryllium are at or above the AL

B. Surface contamination levels measured or presumed prior to initiating work are at or above 3 µg/100 cm^2

C. Any beryllium worker has requested protective clothing and equipment for protection against airborne beryllium.

4.8.2 When workers use personal protective clothing and equipment, comply with MCP-2716, "Personal Protective Equipment."

4.8.3 Ensure work control documents establish the process for donning, doffing, handling, and storing protective clothing and equipment, and prevent workers with contamination on their bodies or their personal clothing from exiting areas that contain beryllium.

4.8.3.1 The work control documents will direct workers using protective equipment to perform the following:

A. Exchange personal clothing for full-body protective clothing and footwear before beginning work in regulated areas.

B. Prohibit the removal of beryllium-contaminated protective clothing and equipment from areas that contain beryllium, except when authorized to dispose of the clothing and equipment.

C. Prohibit the removal of beryllium from protective equipment and clothing by blowing, shaking, or other means that may disperse beryllium into the air.

4.8.3.2 Ensure that protective equipment and clothing is replaced as needed.

4.8.3.3 Ensure that beryllium-*contaminated protective clothing* (*See def.*) and equipment, when disposed of, is placed in containers that prevent dispersion of beryllium dust and that are properly labeled in accordance with Section 4.15of this procedure.

NOTE: *Beryllium-contaminated protective clothing is disposed of and not laundered.*

4.9 Housekeeping

4.9.1 Area IH: For *operational areas* (See def.), conduct *routine surface sampling* (See def.) in accordance with the following guidelines:

A. Utilize pre-moistened smears (Ghost wipes, Wash'n Dri) or moisten sample/filter with distilled water.

B. Wipe approximately 100 cm^2 area using maximum pressure to obtain a surface sample without tearing the smear.

C. Fold the smears/filter, exposed side in, and place in a clean sample bag.

4.9.1.1 Sample to ensure that surfaces contaminated with beryllium dust and waste do not exceed a *removable contamination* (See def.) level of 3 µg/100 cm^2 during non-operational periods.

4.9.1.1.1 It is not necessary to include the interior of installed, closed systems used as beryllium engineering controls such as enclosures, glove boxes, chambers, or ventilation systems in the sampling

4.9.2 Line Management: Ensure floors and surfaces in areas where beryllium is at or above the removable contamination level of 3 µg/100 cm^2 is cleaned using a wet method, HEPA vacuuming, sticky tack cloths, or other methods that avoid the production of airborne dust.

4.9.2.1 Ensure compressed air or dry cleaning methods are not used.

4.9.3 If portable and mobile vacuum units are used to clean beryllium-contaminated areas, ensure the following:

A. They are equipped with HEPA filters

B. The filters are changed as often as needed to maintain capture efficiency.

4.9.4 Ensure that the cleaning equipment used to clean beryllium-contaminated surfaces is labeled (see Section 4.15), controlled, and not used for non-hazardous materials.

4.10 Release Criteria

4.10.1 Line Management: Ensure that beryllium-contaminated equipment and other items are cleaned to the lowest contamination level practicable, but not to exceed 0.2 µg/100 cm^2 removable contamination, or the concentration level of beryllium in soil at the point of release, whichever is greater when the area is to be reclassified or the equipment is to be released.

4.10.2 Ensure that any equipment or item to be transferred to another beryllium facility is cleaned of removable contamination to levels not to exceed 3 µg/100 cm^2.

4.10.2.1 Label equipment or items to be transferred to another beryllium facility in accordance with Section 4.15of this procedure.

4.10.2.2 Place equipment or items to be transferred in enclosed, sealed, impermeable bags or containers to prevent release of beryllium dust during handling and transportation.

4.11 Waste Disposal

4.11.1 Line Management: Use sound waste minimization principals, per waste management direction, to control and minimize beryllium-containing waste and beryllium-contaminated equipment and other items that are to be disposed of as waste.

4.11.2 Contact a representative from waste management before or upon generating beryllium-containing waste and complete Form 435.39, "ICP Waste Determination and Disposition Form," for a new waste stream, or obtain a waste stream identification number for an existing waste stream. Submit the completed form to Wast Management.

4.11.3 Ensure that beryllium-containing waste, beryllium-contaminated equipment, and other items that are to be disposed of as waste, are disposed of in sealed, impermeable bags, containers, or enclosures to prevent the release of beryllium dust.

4.11.4 Label bags, containers, and enclosures used for disposal in accordance with Section 4.15of this procedure.

4.12 Beryllium Emergencies

4.12.1 Line Management: Comply with PLN-114, "INL Emergency Plan/RCRA Contingency," and appropriate appendix for all beryllium emergencies, including those related to decontamination and decommissioning operations.

4.13 Medical Surveillance

4.13.1 Line Management: Submit Form 340.02 as listed in the requirements defined by SOW-3962 , "Employee Job Function Evaluation," or 325.01 "Position Description" to the BEA Division of Occupational Medical (DOM) and area industrial hygienist to initiate employee inclusion in the Medical Surveillance Program for beryllium-associated workers

NOTE 1: *For beryllium-associated workers electing not to participate in this program, document this decision with the BEA DOM.*

NOTE 2: *All employees submitted to the medical surveillance program are included in the OMSS database which generates the list of current and past beryllium workers to fulfill the requirements of the beryllium inventory.*

NOTE 3: *Current beryllium workers, past beryllium workers, sub-contractors, workers from other DOE facilities and self-identified workers are eligible to participate in the medical surveillance program.*

4.13.2 Ensure *Beryllium Workers* exposed at or above the AL, participate in all portions of the beryllium medical surveillance program administered by the BEA Department of Medicine. At the action level, all portions of the medical surveillance program are mandatory for beryllium workers.

4.13.3 BEA DOM: Administer medical surveillance, medical removal and/or medical consent in accordance with the Idaho National Laboratory Division of Occupational Medicine (DOM) Beryllium Medical Surveillance Technical Procedure, 6.01-3.

4.13.4 Workers: Participate in the medical surveillance program.

4.14 Training

4.14.1 Training Directorate: Develop and provide a training program for beryllium workers, and a general awareness training program for all other individuals who work at a site where beryllium activities are conducted.

NOTE 1: *00TRN804, Beryllium Safety Training, provides the appropriate training for beryllium workers.*

NOTE 2: *000TRN51, ESH Awareness Training Initial or RRBERY07 provides the appropriate training for general beryllium awareness. 000TRN52, ESH Awareness Training Refresher, provides the awareness refresher.*

NOTE 3: *Any medical counseling needed is provided by BEA OMP.*

4.14.2 Provide 00TRN804, Beryllium Safety Training, to beryllium workers every two years.

4.14.3 Line Management: Ensure beryllium workers and employees who work at a site where beryllium activities are conducted have completed appropriate training.

4.14.4 Workers: Participate in appropriate beryllium training.

4.15 Warning Signs and Labels

4.15.1 Line Management: Ensure that warning signs containing the following information are posted at each access point to a regulated area:

DANGER
BERYLLIUM CAN CAUSE LUNG DAMAGE
CANCER HAZARD
AUTHORIZED PERSONNEL ONLY.

4.15.2 Ensure that warning labels that contain the following information and comply with MCP-2715, "Hazard Communication," are affixed to all containers of beryllium, beryllium compounds, or beryllium-contaminated clothing, equipment, waste, scrap or debris:

DANGER
CONTAMINATED WITH BERYLLIUM
DO NOT REMOVE DUST BY BLOWING OR SHAKING
CANCER AND LUNG DISEASE HAZARD

NOTE: *Final disposition containers managed by waste management personnel can be labeled with a Hazardous Waste Label or CERCLA Label but must still list beryllium.*

4.16 Recordkeeping and Use of Information

4.16.1 Industrial Hygiene: Establish and maintain accurate records of exposure assessments and exposure measurements in HASS.

4.16.2 Beryllium SME: Maintain beryllium inventory information and beryllium assessments; provide this information to the IH Functional Organization.

4.16.3 Industrial Safety and Health Directorate: Maintain records of beryllium inventory and beryllium assessments.

4.16.4 Line Management: Ensure beryllium activity work control documents are maintained in accordance with *work control procedures* (*See ref.).*

4.16.5 BEA DOM: Establish and maintain beryllium medical surveillance records and a list of past and current beryllium-associated workers on the OMSS.

4.16.6 Records Management: If CWI ceases to be involved in the CBDPP, convey all CBDPP records to DOE or its designee.

4.16.7 BEA DOM: Ensure confidentiality of all CBDPP work-related records generated by making sure that all records transmitted to other parties are purged of names, social security numbers or any other variables, or combination of variables that could be used to identify particular individuals.

4.16.8 BEA Directorate of Safety, Fire Protection, Industrial Hygiene: Semiannually, with support from the CWI Beryllium SME, transmit to the DOE Office of Epidemiologic Studies within the Office of Environment, Safety, and Health an electronic registry of beryllium-associated workers (OMSS) that protects confidentiality, including, but not limited to, a unique identifier, date of birth, gender, site, job history, medical screening test results, exposure measurements, and results of referrals for specialized medical evaluations.

5. RECORDS

Beryllium Inventory

Hazard Assessments (Work Control Document)

Exposure Measurements (HASS)

Exposure Controls (Work Control Document)

Medical Surveillance (OMSS)

Form 435.39, "INEEL Waste Determination and Disposition"

Work Control Documents (per STD-101 and MCP-3562)

NOTE: *The Records Schedule Matrix located on the internet at http://edms.inel.gov/docs/matrix/mtx_menu.html, and the applicable facility, organization, program, or project records management plan and record types list provide current information on uniform file codes, disposition authorities, and retention periods for these records. The records retention period for these beryllium records is 75 years.*

6. DEFINITIONS

Airborne beryllium. Beryllium, other than naturally occurring, measurable above the analytical Limit of Quantitation (as defined below) in the air.

Action Level (AL). The level of airborne beryllium (0.2 $\mu g/m^3$) expressed as an 8-hour, time weighted average.

AIH. The American Industrial Hygiene Association.

Authorized personnel. Any person required by work duties to be in a regulated area.

BEA Division of Occupational Medicine. BEA medical services provided by a Statement of Work (*see ref.*).

Beryllium/Beryllium Compound. Elemental beryllium and any insoluble beryllium compound or alloy containing 0.1% beryllium or greater that may be released as an airborne particulate.

Beryllium activity. An activity taken for, or by, DOE at a DOE facility that can expose workers to airborne beryllium, not including naturally occurring beryllium in background soil, including but not limited to design, construction, operation, maintenance, or decommissioning, and which may involve one DOE facility or operation or a combination of facilities and operations.

Beryllium article. A manufactured item that is formed to a specific shape or design during manufacture, that has end-use functions that depend in whole or in part on its shape and end use, and that does not release beryllium or otherwise result in exposure to airborne concentrations of beryllium under normal conditions of use.

Beryllium-associated worker. A current worker, who is or was exposed or potentially exposed to airborne concentrations of beryllium at a DOE facility, including:

A. A beryllium worker

B. A current worker whose work history shows that the worker may have been exposed to airborne concentrations of beryllium at a DOE facility

C. A current worker who exhibits signs or symptoms of beryllium exposure

D. A current worker who is receiving medical removal protection benefits.

Beryllium worker. A current worker who is regularly employed in a DOE *beryllium activity* (See def.).

Contaminated Protective Clothing. Protective clothing worn in an area having airborne beryllium above the action level or where areas known to exceed a surface level of 3 $\mu g/100\ cm^2$ are being disturbed.

Head of DOE Field Element. An individual who is the manager or head of the DOE Operations Office or Field Office, or any official to whom this function has been delegated.

High-efficiency particulate air filter (HEPA). A filter capable of trapping and retaining at least 99.97% of 0.3 µm monodispersed particles.

Limit of Quantitation (LOQ). The lowest concentration that can be reported reliably, that is, with a high degree of statistical certainty. This is determined by the analytical laboratory using the product of the laboratory's Limit of Detection (LOD) and estimate of uncertainty of measurements.

Operational area. An area where workers are routinely in the presence of beryllium, not including naturally occurring beryllium in background soil, as part of their work activity.

Permissible Exposure Limit (PEL). The level of airborne beryllium ($2\ \mu g/m^3$) expressed as an 8-hour, time-weighted average.

Potentially exposed. A worker who is or was exposed to airborne concentrations of beryllium above the analytical limit of quantitation (LOQ), without regard for respiratory protection, as determined through personal sampling, representative sampling, or by the industrial hygienist applying their professional knowledge and experience regarding beryllium hazards, or a worker who participates in activities which disturb beryllium or when working in an area where beryllium contaminated surfaces concentrations exceed the release criteria of .2ug/100 squared cm. (This does not include disturbances to beryllium or beryllium contaminated surfaces that occur through processes using engineering control methods such as remote handling systems, glove boxes, underwater storage, etc. which prevent exposures above the LOQ.)

Regulated area. An area demarcated by the *responsible employer* in which the *airborne beryllium* exceeds the action level, or has been determined by the cognizant IH to be likely to exceed the action level.

Removable contamination. Beryllium contamination that can be removed from surfaces by nondestructive means such as casual contact, wiping, brushing, or washing.

Responsible employer. CWI or for DOE employees, the DOE office that is directly responsible for the safety and health of DOE Federal employees while performing a beryllium activity or another activity at a DOE Facility. Also, any person acting directly or indirectly for such office with respect to terms and conditions of employment of beryllium-associated workers.

Routine surface sampling. Wipe sampling performed on a minimum monthly basis or more as conditions change based on sound industrial hygiene techniques.

Site Occupational Medical Director (SOMD). The BEA physician responsible for the overall direction and operation of the site occupational medicine program.

Work control documents. Work orders, Technical Procedures (TPRs), Health and Safety Plans (HASPs), Safe Work Permits (SWPs), Job Safety Analysis (JSA) etc. which control the work process at CWI.

Worker exposure. The exposure of a worker to airborne beryllium above the LOQ while performing a beryllium activity that would occur if the worker were not using respiratory protection equipment.

7. REFERENCES

10 CFR Part 850, "Chronic Beryllium Disease Prevention Program"

10 CFR Part 851, "Worker Health and Safety"

29 CFR 1910.141, "Sanitation"

DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees"

GDE-196, "Industrial Hygiene Sampling Guide"

MCP-153, "Industrial Hygiene Exposure Assessment"

MCP-2715, "Hazard Communication"

MCP-2716, "Personal Protective Equipment"

MCP-2726, "Respiratory Protection"

MCP-3562, "Hazard Identification and Control for Operational Activities"

MCP-3635, "Research and Development Laboratory Chemical Hygiene Plan"

NIOSH 9100, "Lead in Surface Wipe Samples"

PLN-114, "INL Emergency Plan/RCRA Contingency"

PLN-1747, "Idaho National Engineering and Environmental Laboratory Site Beryllium Contamination Sampling and Analysis Plan"

PDD-14503 "BEA Beryllium Medical Surveillance Program"

PRD-2105, "Heavy Metals"

STD-101 "ICP Integrated Work Control Process"

SOW-3727 "Occupational Safety and Health Databases" Statement of Work"

SOW-3962 "Occupational Medical Program" Statement of Work"

8. APPENDIXES

Appendix A, Procedure Basis

Appendix A

Procedure Basis

Step	Basis	Source Document	Citation
4.1.1	A qualified individual, that is, a company qualified Industrial Hygienist, must be appointed to serve as subject matter expert to manage the aspects of this program	10 CFR 850	20
4.1.2	Management must ensure work with beryllium is evaluated through the work planning and control process, with appropriate work control documents to maintain potential exposures as low as reasonably achievable.	10 CFR 850	.22
4.1.3and 4.1.4	Management must notify IH prior to starting work with or changes to work with beryllium or beryllium compounds; and receive approval from the area industrial hygienist through the chemical inventory tracking system to procure beryllium or beryllium-containing compounds.	10 CFR 850	.20
4.1.5	Area industrial hygienist must Identify all operations and locations involving work with beryllium which may include assessing the chemical inventory tracking system or in the case of waste, the Hazardous Waste Inventory to identify all operations and locations involving work with beryllium.	10 CFR 850	.20, .21
4.1.7	Beryllium SME update and maintain the beryllium inventory as information is received.	10 CFR 850	.20
4.1.8	BEA DOM must maintain and document a list of past and current beryllium associated workers on the OMSS.	10 CFR 850	.34
4.1.9	Worker must perform beryllium related work in accordance with work control documents and training.	10 CFR 850	.22

Step	Basis	Source Document	Citation
4.1.10	Training develops and provides training to beryllium workers and others working in at a site where beryllium activities occur.	10 CFR 850	.37
4.2.2	Beryllium SME must perform a biannual assessment of the existing beryllium operations, exposure assessments, medical surveillance trends, planned activities, monitoring activities, hazards, medical surveillance, exposure reduction and minimization, and occurrence reporting data.	10 CFR 850	.40, .21
4.2.5	Industrial Safety and Health Directorate must provide analyses and assessment information to line managers, planners, IH, workers, medical staff, and labor organizations representing beryllium-associated workers upon request.	10 CFR 850	.40
4.3.1	Area industrial hygienist performs an exposure assessment for beryllium work in accordance with MCP-153 prior to work with beryllium.	MCP-153, 10 CFR 850	.21
4.3.2Through 4.3.7	Area industrial hygienist provides appropriate workplace monitoring.	10 CFR 850	.24, .21
4.3.7.1	Occupational Safety and Health must provide written notification of monitoring results to affected employees within 10 working days after receipt of any monitoring results.	10 CFR 850	.24
4.3.7.2	If monitoring results indicate that worker exposure is at or above the AL, Occupational Safety and Health must include a statement in the written notice that the action level was met or exceeded and describe the corrective action being taken to reduce the worker's exposure to below the action level, if practicable.	10 CFR 850	.24, .23

Step	Basis	Source Document	Citation
4.3.7.3	If the monitoring results indicate that the worker exposure is at or above the action level, Occupational Safety and Health must notify DOE and the Site Occupational Medical Director of these results within 10 working days after receipt.	10 CFR 850	.24
4.4.1	Management ensures that no worker is exposed above the permissible exposure limit of 2 $\mu g/m^3$ without proper worker protection.	10 CFR 850	.22, .23, .25
4.4.2	For areas in which the exposure levels are at or above the AL, management must establish a formal exposure reduction and minimization program to reduce exposure levels to below the AL, if practicable, including: • Annual goals for exposure reduction and minimization • A rationale for and a strategy for meeting the goals • Actions that will be taken to achieve the goals • A means of tracking progress towards meeting the goals or demonstrating that the goals have been met.	10 CFR 850	.25, .23
4.4.3	For areas in which employees are exposed above the LOQ of airborne beryllium that is below the AL, implement the conventional hierarchy of IH controls (that is engineering controls, administrative controls and personal protective equipment, in that order) for reducing and minimizing exposures if practicable.	10 CFR 850	.25

Step	Basis	Source Document	Citation
	Consider the following mitigations to reduce and minimize exposure: A. Provide ventilation B. Use wet methods C. Perform Housekeeping D. Use Personal Protective Equipment (PPE).		
4.5.1	If airborne concentrations of beryllium are measured at or above the AL, management must: • Establish regulated areas. • Demarcate those regulated areas from the rest of the workplace in a fashion that adequately warns workers of the area boundaries. • Limit access to the regulated areas to authorized personnel. Keep records of all individuals who enter the regulated areas, including name, date, activity, time in, and time out.	10 CFR 850	.26, .23
4.6.1	In areas where workers are exposed to beryllium at or above the action level (without regard to respiratory protection), management must apply the following rules: • Food or beverage and tobacco products are prohibited. • Cosmetics are not applied, except in change rooms or shower facilities. • Beryllium workers are prevented from exiting areas that contain beryllium with contamination on their bodies or personal clothing. • Separate facilities free of beryllium are provided for beryllium workers to change into and store personal clothing and clean protective clothing and equipment to prevent cross contamination.	10 CFR 850	.27, .23

Step	Basis	Source Document	Citation
	• Areas and change rooms provided are maintained under negative pressure or located to minimize dispersion of beryllium into clean areas. • Hand washing and shower facilities are provided to beryllium workers who work in regulated areas and line management ensures their use at the end of the work shift. • Lunchroom facilities that are readily accessible to beryllium workers, and free of beryllium, are provided. (No worker in this area may at anytime be exposed to at or above the action level or enter these areas with protective equipment on unless all surface contamination has been removed by HEPA Vacuuming or another method that removes the contamination without dispersing it.) • These lunchrooms, hand washing, and shower facilities must comply with 29 CFR 1910.141, Sanitation.		
4.7.1	Management must provide respiratory protection to workers and ensure appropriate use, cleaning and maintenance in accordance with MCP-2726, "Respiratory Protection."	10 CFR 850	.28, .23
4.7.2	Industrial hygiene must prescribe respirators for beryllium workers who: • Are potentially exposed or are exposed at or above the action level. • Request a respirator for protection against airborne beryllium in excess of the LOQ, regardless of measured exposure levels, this includes beryllium-associated workers.	10 CFR 850	.28, .23

Step	Basis	Source Document	Citation
4.8.1	Management must provide personal protective clothing and equipment to beryllium workers and ensure its appropriate use and maintenance where dispersible forms of beryllium may contact worker's skin or eyes, including where: • Exposure monitoring has established that airborne concentrations of beryllium are at or above the AL. • Surface contamination levels measured or presumed prior to initiating work are at or above 3 µg/100 cm^2 • Any beryllium-associated worker has requested protective clothing and equipment for protection against airborne beryllium in excess of the LOQ, regardless of measured concentration.	10 CFR 850	.29, .23
4.8.2	When workers use personal protective clothing and equipment, they must comply with MCP-2716, "Personal Protective Equipment."	10 CFR 850	.29
4.8.3	Management ensure work control documents establish the process for donning, doffing, handling, and storing protective clothing and equipment, and prevents workers from exiting areas that contain beryllium with contamination on their bodies or their personal clothing.	10 CFR 850	.29
4.8.3.1	The work control documents shall direct workers using protective equipment to perform the following: • Exchange personal clothing for full-body protective clothing and footwear before beginning work in regulated areas.	10 CFR 850	.29

Step	Basis	Source Document	Citation
	• Do not remove beryllium-contaminated protective clothing and equipment from areas that contain beryllium, except when authorized to dispose of the clothing and equipment. • Prohibit the removal of beryllium from protective equipment and clothing by blowing, shaking, or other means that may disperse beryllium into the air.		
4.8.3.2	Management must ensure that protective equipment and clothing is replaced as needed.	10 CFR 850	.29
4.8.3.3	Management must ensure that beryllium-contaminated protective clothing and equipment, when disposed of is placed in containers that prevent dispersion of beryllium dust and that are properly labeled in accordance with Section 4.15of this procedure.	10 CFR 850	.29
4.9.1	Area industrial hygienist, in operational areas, conduct routine surface sampling to determine housekeeping conditions, including sampling to ensure that surfaces contaminated with beryllium dusts and waste do not exceed a removable contamination level of 3 µg/100 cm^2 during non-operational periods, not to include the interior of installed, closed systems such as enclosures, glove boxes, chambers, or ventilation systems in the sampling.	10 CFR 850	.30
4.9.2	Employees must clean floors and surfaces in areas where beryllium is present using a wet method, HEPA vacuuming, sticky tack cloths, or other methods that avoid the production of airborne dust.	10 CFR 850	.30

Step	Basis	Source Document	Citation
4.9.3	If portable and mobile vacuum units are used to clean beryllium contaminated areas, employees must ensure that they are equipped with HEPA filters and ensure that the filters are changed as often as needed to maintain capture efficiency.	10 CFR 850	.30
4.9.4	Management must ensure that the cleaning equipment used to clean beryllium-contaminated surfaces is labeled, controlled, and not used for non-hazardous materials.	10 CFR 850	.30
4.10.1	Management must ensure that beryllium-contaminated equipment and other items are cleaned to the lowest contamination level practicable, but not to exceed 0.2 µg/100 cm^2 removable contamination, or the concentration level of beryllium in soil at the point of release, whichever is greater.	10 CFR 850	.31
4.10.2	Management must ensure that any equipment or item to be transferred to another beryllium facility is cleaned of removable contamination to levels not to exceed 3 µg/100 cm^2.	10 CFR 850	.31
4.10.2.1	Employees must label equipment or items to be transferred to another beryllium facility with the following: DANGER CONTAMINATED WITH BERYLLIUM DO NOT REMOVE DUST BY BLOWING OR SHAKING CANCER AND LUNG DISEASE HAZARD	10 CFR 850	.31
4.10.2.2	Equipment or items to be transferred must be placed in enclosed, sealed, impermeable bags or containers to prevent release of beryllium dust during handling and transportation.	10 CFR 850	.31

Step	Basis	Source Document	Citation
4.11.1	Management must use sound waste minimization principals, per waste management direction, to control and minimize beryllium containing waste and beryllium contaminated equipment and other items that are to be disposed of as waste.	10 CFR 850	.32
4.11.2	Management must contact a representative from waste management before or upon generating beryllium-containing waste and complete Form 435.39, "INEEL Waste Determination and Disposition Form," for a new waste stream, or obtain a waste stream identification number for an existing waste stream.	CWI Management Requirement	
4.11.3	Management must ensure that beryllium-containing waste, beryllium contaminated equipment, and other items that are to be disposed of as waste, are disposed of in sealed, impermeable bags, containers, or enclosures to prevent the release of beryllium dust during handling and transportation.	10 CFR 850	.32
4.11.4	Management must ensure that employees label bags, containers, and enclosures used for disposal as follows: DANGER CONTAMINATED WITH BERYLLIUM DO NOT REMOVE DUST BY BLOWING OR SHAKING CANCER AND LUNG DISEASE HAZARD	10 CFR 850	.32
4.12.1	Management must comply with PLN-114, "INL Emergency Plan/RCRA Contingency," and appropriate appendices for all beryllium emergencies, including those related to decontamination and decommissioning operations.	10 CFR 850	.33

Step	Basis	Source Document	Citation
4.13.1	Management submits Form 340.02, "Employee Job Function Evaluation," to the BEA DOM and area industrial hygienist to initiate employee inclusion in the Medical Surveillance Program for beryllium-associated workers.	10 CFR 850	.34
4.13.3	BEA DOM administers medical surveillance, medical removal and or medical consent in accordance with the INL DOM Beryllium Medical Surveillance Technical Procedure, 6.01-3.	10 CFR 850	.34, .35, .36
4.14.1	Before working with beryllium, employees must have specific beryllium training, which may include a number of different types of training, depending on the specific beryllium program and its parameters.	10 CFR 850	.37
4.15.1	Management must ensure that warning signs containing the following information are posted at each access point to a regulated area: DANGER BERYLLIUM CAN CAUSE LUNG DAMAGE CANCER HAZARD AUTHORIZED PERSONNEL ONLY.	10 CFR 850	.38
4.15.2	Management must ensure that warning labels that contain the following information and comply with MCP-2715, "Hazard Communication," are affixed to all containers of beryllium, beryllium-compounds, or beryllium contaminated clothing, equipment, waste, scrap or debris: DANGER CONTAMINATED WITH BERYLLIUM DO NOT REMOVE DUST BY BLOWING OR SHAKING CANCER AND LUNG DISEASE HAZARD	10 CFR 850	.38
4.16.1	Industrial hygiene must establish and maintain accurate records of exposure assessments and exposure measurements in HASS.	MCP-153	

Step	Basis	Source Document	Citation
4.16.3	Industrial Safety and Health Directorate must maintain records of beryllium inventory and beryllium assessments.	10 CFR 850	.39
4.16.5	BEA DOM must establish and maintain beryllium medical surveillance records and a list of past and current beryllium associated workers on the OMSS.		
4.16.6	Records management personnel must convey all CBDPP records to DOE or its designee if the INEEL ceases to be involved in the CBDPP.	10 CFR 850	.39
4.16.7	BEA DOM must ensure confidentiality of all CBDPP work-related records generated by making sure that all records transmitted to other parties are purged of names, social security numbers or any other variables, or combination of variables that could be used to identify particular individuals.	10 CFR 850	.39
4.16.8	Semiannually the BEA Directorate of Safety, Fire Protection, Industrial Hygiene, with support from the CWI Beryllium SME, must transmit to the DOE Office of Epidemiologic Studies within the Office of Environment, Safety, and Health an electronic registry of beryllium-associated workers (OMSS) that protects confidentiality, including, but not limited to, a unique identifier, date of birth, gender, site, job history, medical screening test results, exposure measurements, and results of referrals for specialized medical evaluations.	10 CFR 850	.39