

K/HS-629

**East Tennessee Technology Park (ETTP)
Chronic Beryllium Disease Prevention
Program Description, Rev. 1**

This document has been approved by the
East Tennessee Technology Park
Technical Information Office
for release to the public. Date: 03/13/98

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Chronic Beryllium Disease Prevention
Program Description, Rev. 1**

Date Revised—July 1998

Prepared for the
U.S. Department of Energy
Office of Environmental Management
under budget and reporting code EW 20

Environmental Management Activities at the
EAST TENNESSEE TECHNOLOGY PARK
Oak Ridge, Tennessee 37831
managed by
BECHTEL JACOBS COMPANY LLC
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-98OR22700

**Oak Ridge East Tennessee Technology Park
Chronic Beryllium Disease Prevention Program
Environment, Safety, and Health Program Description**

The Oak Ridge East Tennessee Technology Park Environment, Safety and Health Program Description (K/HS-629) provides guidance to ensure that personnel in the workplace are protected from unnecessary exposure to beryllium or beryllium compounds in accordance with the requirements of U.S. Department of Energy (DOE) Order 440.1, "Worker Protection Management for DOE Federal and Contractor Employees," and DOE N 440.1, "Interim Chronic Beryllium Disease Prevention Program." Any changes to this document will require approval of the author, listed below, and the current East Tennessee Technology Park Environment, Safety, and Health Functional Manager.

T. C. Helms
Environment, Safety, and Health Organization at ETTP

Date

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APPENDIX A

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APPENDIX B

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ABBREVIATIONS

ALARA	as low as reasonably achievable
Bechtel Jacobs Company	Bechtel Jacobs Company LLC
CBD	Chronic Beryllium Disease
CBDPP	Chronic Beryllium Disease Prevention Program
<i>CFR</i>	<i>Code of Federal Regulations</i>
DOE	U.S. Department of Energy
ETTP	East Tennessee Technology Park
HEPA	high-efficiency particulate air
TSCA	Toxic Substances Control Act

DEFINITIONS

Beryllium and beryllium compounds. Beryllium is a grayish-white metallic substance with an atomic weight of 9.01. The U.S. Department of Energy (DOE) Notice 440.1 applies to elemental and any insoluble beryllium compound or alloy containing 0.15% (1500 ppm) or greater by volume or weight that may be released as an airborne particulate (the soluble forms of beryllium are not covered because they apparently do not cause Chronic Beryllium Disease). Beryllium materials present in mixtures at concentrations of 0.10% (1000 ppm) or greater by volume or weight will be considered as containing beryllium. It should be noted that DOE has interpreted that beryllium soluble metal salts or silicate slag, such as those found in the Toxic Substances Control Act Incinerator ash, have been excluded from the scope of the 440.1 notice for the East Tennessee Technology Park Chronic Beryllium Disease Prevention Program.

Beryllium control area. An area where beryllium and/or beryllium compounds/mixtures are stored or contained such that these materials are not disturbed. Beryllium control areas are established for the purpose of informing individuals that beryllium-containing materials may be present. Control areas will be posted with appropriate warning signs. Access to the control area will require beryllium awareness training as a minimum.

Beryllium regulated area. An area where beryllium and/or beryllium compounds/mixtures are processed or handled such that these materials are likely to be disturbed. Beryllium regulated areas are established to exclude nonauthorized personnel from beryllium work; or to identify where airborne concentrations of beryllium exceed or can reasonably be expected to exceed the administrative level for airborne concentration of $0.2 \mu\text{g}/\text{m}^3$. These areas shall be posted with appropriate warning signs. Access to the regulated area will require beryllium worker or supervisor training.

Beryllium worker. An individual, who is authorized through training and medical approval, to perform work activities in beryllium regulated areas where beryllium-containing materials are likely to be disturbed.

Chronic Beryllium Disease (CBD). A chronic lung disease caused by immunologic hypersensitivity to beryllium particles less than 10 microns in diameter.

Hazard analysis. A general term encompassing activities or processes that result in reviews of a defined work or task scope to identify known or potential safety or health hazards and appropriate protective control measures. Hazard analysis can be accomplished via a variety of approaches from formal to informal. The risks and complexity of the work or tasks are the basis for determining the analysis approach selected, the appropriate detail of documentation of results, and the individuals to involve in the hazard analysis. Various tools such as the Job Hazard Analysis, Safety Work Permit, health and safety plan, Health Hazard Information Module, etc., may be used alone or in combination to identify hazards and arrive at appropriate protective control measures. SH-120PD entitled "Safe Work Controls Program" and SH-118INS entitled "Job Hazard Analysis" should be used as references for conducting hazard analysis.

Occupational exposure limit (OEL). The concentration of airborne beryllium to which workers are permitted to be exposed on a daily basis. The three types of OELs are:

1. 8-hour time-weighted average (TWA) = 0.002 milligrams (mg)/m³ of air or 2 μg/m³.
2. 15-minute peak limit = 0.025 mg/m³ or 25 μg/m³.
3. Ceiling limit = 0.005 mg/m³ or 5 μg/m³.

Site administrative action level. Site administrative action levels are established as the level at which controls, including respiratory protection, are implemented or actions taken to reduce and minimize exposure. The administrative action level for surface contamination is 5 μg/100 cm². The ETTP site administrative level for airborne concentrations of beryllium is 0.2 μg/m³ of air is conservatively set at the one-tenth of the Occupational Safety and Health Administration permissible exposure limit based on it being a known human carcinogen.

EXECUTIVE SUMMARY

This executive summary will serve to describe how the program description K/HS-629, entitled *East Tennessee Technology Park (ETTP) Chronic Beryllium Disease Prevention Program Description*, will be implemented at the East Tennessee Technology Park (ETTP). This program description applies to operations involving the processing and storage of beryllium and beryllium compounds at ETTP facilities, including requirements for beryllium storage areas; management of beryllium-contaminated wastes; transfer of items and parts; worker training, awareness, and information sessions; and medical surveillance.

This program description applies to ETTP and Bechtel Jacobs Company LLC subcontractors to the extent that such requirements are incorporated into contract documents. These requirements do not apply to the Bechtel Jacobs construction manager except as communicated through contract SE-CM001C and applicable divisions of the engineering technical specifications. Laboratory operations involving beryllium that fall within the scope of Title 29, *Code of Federal Regulations*, Pt. 1910 Sect. 1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, are excluded.

This document is organized into a main section that includes the purpose, scope, identification of use or storage areas, posting of signs and use of labels, responsibilities, exposure monitoring, medical surveillance, education and training, and record keeping, along with two appendixes. Appendix A references actions and responsibilities based on the requirements of U.S. Department of Energy (DOE) Notice 440.1, *Interim Chronic Beryllium Disease Prevention Program*. Appendix B includes a summary of historical and current uses of beryllium at ETTP. This summary has been extracted from several sources, including K/ER-47/R1, *Site Descriptions of Environmental Restoration Units at the Oak Ridge K-25 Site, Oak Ridge, Tennessee*, and from interviews with present and former, long-term employees.

Most of the beryllium and/or beryllium compounds located at ETTP are present as minor constituents of waste materials generated at the Oak Ridge Y-12 Plant, abandoned facilities, and/or in laboratory standards. Small amounts of beryllium are shipped to the K-1435 Toxic Substances Control Act (TSCA) Incinerator facility as part of the overall wastes to be burned. In general, the wastes entering the incinerator are at very low levels (most are below detection levels). These shipments are retained for a limited amount of time before being incinerated. The concentration of beryllium in ash at TSCA is very low and is kept wetted. An interpretation was received from the DOE Headquarters as to whether the trace amounts of beryllium in the ash would fall within the scope of the DOE Notice 440.1. DOE stated that

...beryllium introduced into an incinerator that remains in bottom ash would have chemically reacted with other materials to form either metal salts or silicate slag. The metal salts would be soluble. In going from a beryllium health protection program to a chronic beryllium disease prevention program, we [DOE] dropped soluble compounds from the scope of the notice. The insoluble slag should have less than 0.15% Be. The bottom ash from a waste incinerator is the kind of thing we meant to exclude from the scope of the notice.

Areas at the TSCA Incinerator that may contain trace levels of beryllium are summarized in Appendix B of this document.

1. PURPOSE

This program description applies to the handling, processing, and/or storage of beryllium and beryllium compounds at the East Tennessee Technology Park (ETTP), including requirements for beryllium hazard analyses, beryllium control areas and beryllium regulated areas, management of beryllium-contaminated items outside beryllium control areas and beryllium regulated areas, worker education and training, and medical surveillance.

2. SCOPE

This program description applies to operations involving the handling, processing, and storage of beryllium and beryllium compounds at ETTP facilities, including requirements for beryllium storage areas, management of beryllium-contaminated wastes, worker awareness and information sessions, and medical surveillance. These actions and responsibilities are based on the requirements of the draft U.S. Department of Energy (DOE) Notice 440.1, *Interim Chronic Beryllium Disease Prevention Program* (see Appendix A).

This program description applies to ETTP subcontractors to the extent such requirements are incorporated into contract documents. These requirements do not apply to the Bechtel Jacobs construction manager except as communicated through contract SE-CM001C and applicable divisions of the engineering technical specifications. Laboratory operations involving beryllium that fall within the scope of Title 29, *Code of Federal Regulations (CFR)*, Pt. 1910 Sect. 1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, are excluded.

An ad hoc Chronic Beryllium Disease Prevention Program (CBDPP) Advisory Committee has been established to provide oversight of the CBDPP and to ensure that elements of the program are fully integrated into safety and health requirements. The committee is also responsible for providing feedback to line managers, worker protection staff, workers, medical staff, and others.

The CBDPP will be implemented by interdisciplinary teams that integrate line management, workers, maintenance, and worker protection and other support functions. Various Integrated Safety Management System (ISMS) tools such as the job hazard analysis, safety work permit, health and safety plan, health hazard information module, and others as referenced in SH-120PD and SH-118 INS may be used alone or in combination to identify hazards and arrive at appropriate protective control measures. ISMS includes understanding the scope of the work, knowing the hazards for jobs, knowing safety controls, having the right procedures, training and tools, and having workers involved. Worker involvement is the key when planning work, identifying hazards, or during other activities where the worker may provide valuable insights into local beryllium hazards and effective controls.

This program description will become effective 30 days after the date of issue.

3. IDENTIFICATION OF BERYLLIUM USE OR STORAGE AT ETTP

3.1 BERYLLIUM EXPOSURE AND MINIMIZATION GOALS

Exposure reduction and minimization goals are essential and are explicitly required by DOE Notice 440.1, Appendix E. A plan for exposure reduction and minimization will be established and reestablished periodically through the use of an implementation strategy. The strategy defines what is important, provides focus, establishes direction, and provides a basis for measuring performance over time. DOE Notice 440.1, which applies directly to contractors and subcontractors, is performance based and does not include an implementation date. The ETTP implementation strategy will be to initially utilize available resources within current budget allotments. Future funding will need to be estimated and submitted through budgeting processes on a prioritized basis. Responsible parties for implementation include line management, safety and health, health services, bargaining units, and others detailed herein. Elements of the ETTP implementation strategy for implementing CBDPP goals include the following:

- Charter Beryllium Advisory Committee to advise and monitor program implementation [committee to meet periodically or as needed to review overall plan implementation (ongoing)].
- Finalize and issue *East Tennessee Technology Park (ETTP) Chronic Beryllium Disease Prevention Program Description (K/HS-629)*. The program description will address all elements of the notice in detail.
- Develop cost estimates of implementation of K/HS-629 and each phase of the implementation strategy.
- Conduct beryllium baseline inventory and sampling of past and current storage, process, and potentially contaminated activated and shutdown areas at ETTP.
- Establish areas meeting definition as being beryllium control areas and beryllium regulated areas per K/HS-629. Post beryllium control and regulated areas with appropriate warning signs, and flag off or isolate control areas where feasible.
- Conduct hazard assessment of each work activity in beryllium regulated areas (areas in which beryllium is disturbed). The hazard assessments and work planning/controls will be implemented through the safety work permit system, job hazard analysis, or other mechanism on a task-by-task basis.
- Develop strategy for cleanup of leaking containers and restaging of beryllium-containing wastes in drums.
- Develop and implement a strategy for placarding containers with beryllium warning labels.
- Establish policy and criteria for acceptance of beryllium wastes from the Oak Ridge Y-12 Plant and other facilities, such as requiring sample results of its contents for beryllium and labeling of containers that contain greater than 1000 ppm **before shipping to ETTP**.

- Identify current employees who are active or former beryllium workers and ensure that they are entered in medical surveillance program.
- Develop and initiate training for individuals via a two part phased approach. Individuals assigned to work in controlled areas will be provided awareness or information sessions, while those assigned to work in beryllium regulated areas will be provided beryllium-specific worker/supervisor training as appropriate.
- Comply with requirements of K/HS-629 for proposed/new beryllium tasks. Incorporate DOE Order 440.1 requirements into ETTP Work Smart Standards.
- Develop exposure reduction and minimization strategy. Develop goals, plans, and performance measures to reduce potential exposures to as low as reasonably achievable.
- Develop record keeping strategy by using existing Industrial Hygiene Air Sampling database for records and Medical Occupational Health Information System or other appropriate database for medical records.
- Revise *East Tennessee Technology Park (ETTP) Chronic Beryllium Disease Prevention Program Description* as needed. Revise plan based on future changes at ETTP involving the management and integration contractor, privatization, and personnel changes.

3.2 IDENTIFICATION OF BERYLLIUM CONTROL AREAS AND BERYLLIUM REGULATED AREAS

Baseline inventory, hazard analysis, and sampling are the first steps in determining potential beryllium exposures. A baseline inventory of current as well as historical ETTP operations and storage locations that contain beryllium have been reviewed to ascertain the locations of beryllium and the potential for beryllium exposures. The current listing is referenced in Appendix B. Beryllium areas have been identified through the use of the following steps:

1. Conduct employee interviews and historical document searches.
2. Document the presence and locations of beryllium on-site through baseline inventories. This processes will also be used in determining future beryllium usage areas.
3. For areas previously identified and future operations, conduct a hazard analysis and, where appropriate, monitoring as needed to assess exposure potential.

3.3 REQUIREMENTS FOR IDENTIFIED BERYLLIUM CONTROL AREAS AND/OR BERYLLIUM REGULATED AREAS

1. Eating, drinking, smoking, chewing gum or tobacco, applying cosmetics, taking medication, and/or storing food is not permitted in control or regulated areas.
2. Beryllium control areas and beryllium regulated areas shall be delineated by posting warning signs. In addition to posting signs, regulated areas shall be isolated where feasible with restricted access via flagging along the perimeter or by structural barriers, such as walls.

3. Beryllium regulated areas shall be entered only by individuals that are authorized, worker trained, and medically qualified. Requirements for personal protective equipment shall be in accordance with safety work permit or procedural requirements. Visitors are not allowed in beryllium regulated areas when there is a potential for airborne beryllium.
4. Awareness training is required for individuals assigned to work in beryllium control areas.
5. Requirements for entry/exit, personal protective equipment, and other controls in regulated areas will be specified on the hazard analysis, safety work permit, or other command media.
6. Employees sensitive to beryllium or those having Chronic Beryllium Disease (CBD) or other chronic lung disease shall be restricted from entering beryllium regulated and control areas.
7. Work surfaces (e.g., bench tops, hood floors) on which beryllium or beryllium compounds are used or stored, unless they are of a disposable nature, where feasible shall be nonporous and easily decontaminated. Contaminated surfaces shall be decontaminated or disposed of in an appropriate manner.
8. Beryllium and beryllium compounds should be segregated from other materials/chemicals when feasible. Storage containers shall be labeled appropriately.
9. General housekeeping methods that control release of airborne dust, such as the use of a wet mop or a vacuum cleaner equipped with a high efficiency particulate air (HEPA) filter, shall be used. Dry sweeping and dry mopping are prohibited.
10. Ventilation from primary containment equipment, such as glove boxes or hoods, should be HEPA filtered and discharged to the outdoors.

4. POSTING OF SIGNS AND USE OF LABELS

Proper exposure control of beryllium requires that its presence be clearly identified to all who might be exposed. The purpose of warning signs and labels is to ensure that all affected individuals, not only those identified as potentially exposed to beryllium, are apprized of the potential hazards of beryllium exposures. All containers of beryllium, beryllium compounds, beryllium parts, or beryllium-contaminated waste, scrap, and debris shall have a prominent warning label and conform to OSHA's Hazard Communication Standard 29 *CFR* 1910.1200. Examples of beryllium signs and labels are shown in Appendixes C, D, and E, and descriptions of the signs follow:

1. Beryllium control area: The sign is approximately 10 × 14 in. with colors (see Appendix C). Signs shall be posted at all entrances to beryllium control areas.
2. Beryllium regulated area: The sign is approximately 10 × 14 in. (see Appendix D). Signs shall be posted at all entrances to beryllium regulated areas. Entry into beryllium regulated areas will be limited to individuals that have completed either beryllium-specific worker or supervisory training.

3. Container labels: Label size is commensurate with the size and shape of the container (see Appendix E). Labels shall be placed on all containers of beryllium or beryllium oxide and beryllium-contaminated clothing, waste, scrap, or debris.

5. RESPONSIBILITIES

5.1 ENVIRONMENT, SAFETY AND HEALTH ORGANIZATION

1. Assist line management in developing a baseline inventory of beryllium storage locations and operations, identifying operations and areas in which workers must be monitored and exposed and potentially exposed current workers by location.
2. Upon request and assistance from management, as well as workers and their representatives, conduct a site characterization and subsequent hazard analysis for all identified beryllium locations and operations (at the task level).
3. Include in the beryllium hazard analysis existing conditions, exposure data, medical surveillance trends, and the exposure potential of planned activities.
4. Conduct personal breathing zone sampling for all workers exposed and potentially exposed to beryllium, or provide a rationale for monitoring a limited subset of workers.
5. Provide personal sampling reports to the sampled individual's supervisor and the individual sampled, inform line management of personal breathing zone samples exceeding the administrative action level, and provide recommendations for controls.
6. Conduct area sampling and coordinate surface sampling, where appropriate, to determine operational control.
7. Conduct additional monitoring when warranted as a result of changes in operations or procedures, or as necessary to support exposure reduction and minimization initiatives.
8. Provide line management with safety and health recommendations for working with beryllium on a task-specific basis.
9. Conduct periodic analysis, assessments, and surveillances in conjunction with line organizations schedule. Provide performance feedback of analysis and assessment results to ensure needed information is available to maintain and improve all elements of the CBDPP. Personnel to receive feedback include managers, planners, workers, health and safety professionals, medical staff, and others as appropriate.
10. Conduct follow-up investigations on potential occupational illnesses as a result of workplace exposure to beryllium as determined by the Site Health Services Center.
11. Maintain, in a readily retrievable manner, electronic copies of beryllium inventory information, hazard analyses, exposure measurements, sampling data, controls, and all reports generated as a result of the CBDPP.

12. Assign a member of the Safety and Health Organization to serve as the Beryllium Program Manager. This individual's responsibilities will include the following:
 - a. develop, maintain, and interpret the requirements for the CBDPP at ETTP,
 - b. perform annual program assessment of operations to evaluate performance and compliance with the program description, and
 - c. prepare report(s) as necessary on the attainment of exposure reduction and minimization goals. As low as reasonably achievable (ALARA) principles are to be followed when setting goals.

5.2 LINE MANAGEMENT

1. Prepare and maintain a baseline inventory for all beryllium storage and activities where potential beryllium contamination exists.
2. Notify the ETTP Industrial Hygiene (IH) for a hazard analysis when activities will involve potential employee exposure to beryllium.
3. Identify and establish, with the assistance of an industrial hygienist, a list of beryllium workers and individuals who may be potentially exposed.
4. Incorporate the principles of integrated safety management into the CBDPP.
5. Notify the ETTP IH of changes in status (active, inactive) of beryllium regulated areas.
6. Set goals for exposure reduction and minimization reduction goals by using ALARA principles. Goals may be based on site characterization and reduction of beryllium regulated and/or storage areas.
7. Establish beryllium regulated areas or beryllium control areas consistent with this program description.
8. Minimize the number of workers at risk and minimize the number of opportunities and time spent in beryllium regulated areas.
9. Identify beryllium workers and ensure training, monitoring, and medical surveillance. Conduct periodic analysis and assessment of monitoring results, hazards identified, medical surveillance results, attainment of exposure reduction and minimization goals, and occurrence reporting data. Feed back results to supervisors, planners, worker protection staff, workers, medical staff, and others to ensure that needed information is available to continuously improve all elements of the CBDPP.
10. Provide necessary personal protective equipment per safety and health instructions. Provide special change room and shower facilities when required by safety and health instructions.
11. Ensure the labeling of containers that have internal beryllium contamination and posting of appropriate warning signs for beryllium control and regulated areas.

12. Notify the ETTP IH when exposure is possible. IH will determine when air and/or surface samples are needed.
13. Operate in accordance with established waste minimization practices.
14. Provide job-specific information and awareness sessions for work in beryllium control areas. For beryllium regulated areas, ensure that the worker is listed as an approved beryllium worker and that appropriate training is current.
15. Ensure that visitors do not enter beryllium regulated areas whenever there is a potential for airborne beryllium.
16. Document general employee beryllium information and awareness sessions.

5.3 HEALTH SERVICES DIRECTOR OR DESIGNEE

1. Develop and periodically review medical surveillance criteria for beryllium workers.
2. Examine individuals assigned to work with beryllium periodically, as determined by the Health Services Director.
3. Maintain a current roster of current employees at risk for CBD and beryllium sensitivity.
4. Review the medical records to determine whether workers have medical conditions that would disqualify them as a beryllium worker.
5. Notify workers of the procedures and associated risks involved in testing. Current employees who have been beryllium workers or believe they have been incidentally exposed to beryllium will be offered the peripheral blood lymphocyte proliferation test (LPT). The physician will determine the frequency of repeat testing of the employee on a voluntary basis.
6. Notify the employee and supervisor of any medical restrictions, in writing, including restrictions from work with beryllium.

Note: Individuals with medical restrictions for beryllium cannot enter a beryllium control area or a beryllium regulated area and are to be offered alternative employment in areas with no exposure potential.

7. Notify the ETTP Environment, Safety, and Health Organization of all diagnosed beryllium-related occupational illnesses and medical restrictions, in writing, including restrictions from work with beryllium.
8. Provide copies of investigation reports of recordable beryllium disease (see DOE Order 231.1) to ETTP Environment, Safety, and Health Organization, Industrial Safety Reporting and Case Management responsible party. The investigation reports shall include workers' occupational histories and clinical stages of the disease.

6. EXPOSURE MONITORING

6.1 EXPOSURE MONITORING ELEMENTS

Exposure assessments for beryllium should be conducted to document and maintain confidence that an individual's exposure to beryllium and its compounds in any 8-hour work shift of a 40-hour work week has not exceeded $2 \mu\text{g}/\text{m}^3$ per 29 *CFR* 1910.1000. In addition, monitoring should be adequate to document and maintain confidence that an employee's exposure to beryllium does not exceed $5 \mu\text{g}/\text{m}^3$ at any time during an 8-hour shift (note: a 15-min time-weighted average should be used to determine compliance with this requirement). The ETTP CBDPP has established a protocol that utilizes an administrative action level of $0.2 \mu\text{g}/\text{m}^3$ to trigger action to reduce or minimize worker exposure by the use of respiratory protection. Respiratory protection shall be in accordance with requirements of the ETTP site procedure governing the Respiratory Protection Program. Other required personal protective equipment as deemed necessary by the site safety and health organization shall be used to reduce the potential for exposure.

Exposure monitoring elements of the CBDPP include the following:

1. Identify any operations and areas in which workers must be monitored.
2. Conduct personal breathing zone sampling for all workers exposed and potentially exposed to beryllium, or provide the rationale for monitoring a limited subset of workers.
3. Conduct area sampling where appropriate to determine operational control.
4. Conduct surface sampling to determine housekeeping conditions and identify contamination that has the potential to become airborne.
5. Establish the required frequency of monitoring by using a risk-based (tailored) approach in accordance with the hazard analysis.
6. Require additional monitoring when warranted as a result in changes in operations or procedures, or as necessary to ensure exposure minimization and reduction goals are met.

6.2 TYPE(S) OF REQUIRED SAMPLING

1. Personal air monitoring: Personal air monitoring will be conducted as 8-hour time-weighted average, ceiling, or 15-min peak samples.
2. Area air monitoring: Area air monitoring will be used as determined by the safety and health organization industrial hygienist to characterize the source of beryllium exposure, check the effectiveness of beryllium control systems, make an initial determination of the level of respiratory protection and other personal protective equipment as needed, and confirm acceptable beryllium concentrations in general work areas.
3. Surface monitoring: Surface monitoring is used to monitor the effectiveness of housekeeping efforts, identify legacy contamination, and determine the sources of beryllium contamination, not as a measure of personal exposure. A protocol to initiate surface contamination cleanup has been set at $5 \mu\text{g}/100 \text{ cm}^2$.

6.3 FREQUENCY AND NUMBER OF SAMPLES FOR EACH SAMPLING TYPE

The frequency and number of samples for each type of sampling will be determined in accordance with the hazard analysis and/or reduction and minimization goals.

7. EXPOSURE REDUCTION AND MINIMIZATION

ETTP line management will manage and control exposures to beryllium by reducing airborne levels of beryllium, minimizing the number of workers exposed and potentially exposed to beryllium, minimizing the number of opportunities to be exposed, and setting reasonable exposure reduction goals by using a risk-based (tailored) approach. The goal is to maintain and control beryllium usage at or below current levels. Elements of reduction and minimization strategies include the following:

1. Developing exposure reduction and minimization goals by using a risk-based (tailored) approach, a plan of meeting goals and measures that will be used to assess status of attaining goals, and the rationale for determining reduced and minimized exposures. Factors for setting of goals include the following:
 - a. Baseline inventory of current and former beryllium locations and operations. In areas in which the history of beryllium usage cannot be well defined, the offering of medical screening as detailed in Chap. 8 may be a more effective method for determining past exposures.
 - b. Number of workers at risk.
 - c. Exposure levels.
 - d. Frequency and time spent in beryllium areas.
 - e. Applicability of control options.
2. Establishing contamination control action levels.
3. Implementing work control strategies to reduce worker exposures to as low as practical through the use of the established hierarchy of industrial hygiene controls (i.e., engineering and administrative controls, personal protective equipment). The ETTP administrative action level that triggers action for the use of respiratory and other protective equipment is $0.2 \mu\text{g}/\text{m}^3$ for airborne beryllium.

8. MEDICAL SURVEILLANCE

Workers at risk for CBD as a result of either past or current potential exposures will be provided an opportunity to enroll in a medical surveillance program and will be notified in writing by medical. Self-identification of workers is available through medical history questionnaires completed at the time of medical physical examinations.

1. Updated rosters of former and current workers at risk for CBD will be maintained on the Medical Occupational Health Information System or other appropriate database.
2. Pulmonary medical histories and lung function tests will be conducted as part of the preplacement examination for workers to be assigned to beryllium areas. If the occupational medicine physician concludes that the medical history and the lung function test results warrant a chest x-ray, it will be offered to the worker.
3. Beryllium-specific peripheral blood lymphocyte proliferation testing, or other available preferred beryllium-specific tests considered appropriate by a physician, to screen for beryllium sensitization and provide early detection of CBD will be offered to current employees as detailed in Sect. 9.2, items 1, 2, and 3, on a request basis. Physicians will notify workers of the procedures and associated risks of the tests.
4. Reports of workers' occupational histories will be sent to DOE (EH-6). Clinical stages of the disease will be included in investigation reports of recordable beryllium disease (see DOE Order 231.1).

9. INFORMATION/AWARENESS AND TRAINING SESSIONS

9.1 TRAINING ELEMENTS

Training for beryllium workers and information/awareness sessions for individuals in beryllium control areas will meet the hazard communication requirements of 29 *CFR* 1910.1200 and will be presented by technically qualified individuals. Training (see Appendix A.f) will incorporate the following elements:

1. Proper handling and control of beryllium.
2. Hazards of exposure to beryllium.
3. Controls, including engineering, administrative, and personal protective equipment.
4. Work practices of the assigned job.
5. Minimization of worker exposures.
6. Purpose and use of personal protective equipment.
7. Medical monitoring availability.
8. Waste handling and decontamination procedures.

9.2 PERSONNEL TARGETED FOR TRAINING

Training will be provided as needed to the following personnel:

1. Workers assigned to activities in beryllium regulated areas in which there is a potential for exposure to beryllium.
2. Supervisors and managers of those workers, as appropriate.
3. Medical personnel, safety and health personnel, and others involved in activities in beryllium regulated areas as deemed necessary.

10. RECORD KEEPING

Records of all beryllium inventory information, hazard analyses, exposure measurements, controls, and medical surveillance will be maintained pursuant to DOE Order 440.1 paragraph 4.i.(2) to demonstrate program effectiveness. Records will be maintained, where possible, in an electronic, easily retrievable manner for transmittal to DOE Headquarters upon request.

Records are to include the following:

1. Beryllium inventories.
2. Hazard assessments.
3. Exposure (personal and area) measurements and trends.
4. Exposure controls.
5. Medical surveillances.

Medical personnel, safety and health personnel, and others involved in activities in beryllium regulated areas as deemed necessary.

11. WASTE ACCEPTANCE CRITERIA

A policy and criteria for acceptance of beryllium wastes from Y-12 and other facilities such as requiring sample results of its contents for beryllium and labeling of containers (containing greater than 1000 parts per million beryllium-containing material as defined in this document) prior to being shipped to ETTP. The policy was established in March, 1998 and implemented in April, 1998. The waste acceptance criteria policy specifically lists wastes the ETTP will not accept. In some special cases, wastes may be accepted through a special review and approval of Waste Management.

APPENDIX A

**DRAFT DOE N 440.1, INTERIM CHRONIC BERYLLIUM
DISEASE PREVENTION PROGRAM**

ATTACHMENT 2, *CONTRACTOR REQUIREMENTS DOCUMENT*

**DRAFT DOE N 440.1, INTERIM CHRONIC BERYLLIUM
DISEASE PREVENTION PROGRAM
ATTACHMENT 2, CONTRACTOR REQUIREMENTS DOCUMENT**

Implement the following that augments and is integrated into the worker protection program requirements specified in DOE Order 440.1, Attachment 2, *Contractor Requirements Document*.

- a. Baseline Inventory and Sampling. Develop a baseline inventory of beryllium locations and operations; identify exposed and potentially exposed current workers by location; and conduct sampling.
 - (1) Conduct a records review and employee interviews.
 - (2) Document the presence and locations of beryllium on site.
 - (3) Conduct, where appropriate, required monitoring.
- b. Hazard Analysis.
 - (1) Conduct a beryllium hazard analysis and determine whether in-depth analysis is warranted.
 - (2) Conduct in-depth analysis, where appropriate, to ascertain the nature of the exposure risk to beryllium.
 - (3) Include in the beryllium hazard analysis existing conditions, exposure data, medical surveillance trends, and the exposure potential of planned activities.
- c. Exposure Monitoring.
 - (1) Identify the operations and areas in which workers must be monitored.
 - (2) Conduct personal breathing zone sampling for all workers exposed and potentially exposed to beryllium, or provide the rationale for monitoring a limited subset of workers.
 - (3) Conduct area sampling where appropriate to determine operational control.
 - (4) Conduct surface sampling to determine housekeeping conditions and to identify contamination that has the potential to become airborne.
 - (5) Establish the required frequency of monitoring by using a risk-based (tailored) approach.
 - (6) Require additional monitoring when warranted due to changes in operations or procedures, or as necessary to ensure that exposure reduction and minimization goals are met.
- d. Exposure Reduction and Minimization. Manage and control exposures to beryllium by: reducing airborne levels of beryllium to as-low-as practical, minimizing the number of current workers exposed and potentially exposed to beryllium, minimizing the number of opportunities to be exposed, and setting reasonable exposure reduction and minimization goals using a risk-based (tailored) approach. Elements of reduction and minimization strategies include:

- (1) Developing a documented program that includes exposure reduction and minimization goals using a risk-based (tailored) approach, a plan for meeting goals, measures that will be used to assess status of attaining goals, and the rationale for determining reduced and minimized exposures.
 - (2) Using administrative action levels that trigger actions to reduce or minimize worker exposure and the potential for exposures.
 - (3) Establishing contamination control to preclude exposures to the extent practical.
 - (4) Implementing work control strategies to reduce exposures to as-low-as-practical using the established hierarchy of industrial hygiene controls (engineering and administrative controls, and personal protective equipment) and to reduce the potential for worker exposure.
 - (5) Documenting the rationale used for determining reduced and minimized exposures.
- e. Medical Surveillance. Offer to enroll in a medical surveillance program all workers at risk for chronic beryllium disease (CBD) due to exposure or potential exposure to beryllium.
- (1) Maintain an updated roster of workers at risk for CBD.
 - (2) Conduct pulmonary medical histories and lung function tests as part of the pre-placement examination for workers to be assigned to beryllium areas. If the occupational medicine physician concludes that the medical history and the lung function test results warrant a chest x-ray, it must be offered to the worker.
 - (3) Provide on a request basis, beryllium-specific peripheral blood lymphocyte proliferation testing, or other available preferred beryllium-specific tests considered appropriate by an occupational medicine physician, to screen for beryllium sensitization and provide early detection of CBD. Physicians must notify workers of the procedures and associated risks of the tests.
 - (4) Workers' occupational histories and clinical stages of the disease must be included in investigation reports of recordable beryllium disease (see DOE Order 231.1). Contact DOE (EH-6) for guidance on the content of the reports. Send copies of reports to DOE (EH-6).
- f. Training. Implement a training program that provides workers exposed and potentially exposed to beryllium, and supervisors, managers, medical personnel, industrial hygienists, and others involved in beryllium activities and processes, with information concerning the proper handling and control of beryllium, hazards of exposure to beryllium, controls (e.g., engineering, administrative, and personal protective equipment) and work practices of the job assignment, minimization of worker exposure, the purpose and use of personal protective equipment, medical monitoring, and waste management and decontamination procedures.
- g. Record keeping.
- (1) Maintain records of all beryllium inventory information, hazard analyses, exposure measurements, controls, and medical surveillance pursuant to DOE Order 440.1 paragraph 4.i.(2) to demonstrate program effectiveness.

- (2) Maintain the records in an electronic, easily retrievable manner for transmittal to DOE Headquarters on request.
 - (3) Create links between data sets on working conditions and health outcomes to serve as a basis for understanding the beryllium health risk.
- h. Performance Feedback.
- (1) Conduct periodic analysis and assessment of monitoring results, hazards identified, medical surveillance results, attainment of exposure reduction and minimization goals, and occurrence reporting data.
 - (2) Feed back results to line managers, planners, worker protection staff, workers, medical staff, and others to ensure that needed information is available to maintain and improve all elements of the CBD Protection Program continuously.

APPENDIX B

**EAST TENNESSEE TECHNOLOGY PARK
BERYLLIUM SUMMARY**

EAST TENNESSEE TECHNOLOGY PARK 1 BERYLLIUM SUMMARY

This summary represents an initial site characterization and has been extracted from several sources, including K/ER-47/R1, *Site Descriptions of Environmental Restoration Units at the Oak Ridge K-25 Site, Oak Ridge, Tennessee*, and from interviews with former, long-term employees. This summary will be updated as information is obtained from hazard analysis and monitoring.

ETTP Storage Units. Wastes containing beryllium are stored in drums in various units at the East Tennessee Technology Park (ETTP). Also, ash from the K-1435 Toxic Substances Control Act Facility is packaged and sent to the units for storage.

K-724. This building has undergone decommissioning and decontamination and was torn down in the spring of 1998 via MK-Ferguson and subcontractors. Prior to being demolished, there was probable contamination of the ventilation duct work with beryllium. A building characterization was performed in 1953 and 1975. The 1953 General Electric survey indicated that beryllium contamination was less than one microgram per 12-in. square. A 1975 memorandum from the K-25 Site Industrial Hygiene Department indicated a maximum concentration of beryllium of 0.7 micrograms per 12-in. square from surveys of the attic, light fixtures, air conditioner ducts, walls, window sills, floors, and basement floors. Old ventilation hood ducts known to contain the greatest quantities of beryllium contamination were sealed. One source had the total amount of beryllium in the attic estimated at 0.2787 grams. A concrete slab has been poured over the area formerly occupied by the building.

K-725. This building has undergone decommissioning and decontamination and was torn down in the spring of 1998 via MK-Ferguson and subcontractors. It was estimated that 13 grams of beryllium was at one time contained in a ventilation duct system. In the early 1950s and early 1960s, an effort was made to decontaminate the building interior. Attempts were made to remove residue of the beryllium fines and powders by removing floor tiles and fixtures, cleaning the walls, and decontaminating where possible. A concrete slab has been poured over the area formerly occupied by the building.

K-1004-B. Building K-1004-B contains several small laboratory-scale quantities of commercially prepared multi-element solutions reference standards containing 5 to 1000 ppm of beryllium.

K-1004-C. Beryllium was used in Building K-1004-C approximately 20 years ago for plating. It is no longer being used or stored there.

K-1008-C. This facility was used to launder and clean respiratory protective equipment. Respirators from the Oak Ridge Y-12 Plant, including from identified beryllium areas, have been brought to this area for cleaning. There is some question as to whether respirators were received from Building K-1401 (if beryllium is determined to have been machined in that area). After receiving, the bags containing the respirators are placed in a water- and detergent-filled sink in a hood, and the bag is cut open under water.

K-1015 Laundry Facility. This facility was used to launder Y-12 Plant clothing from beryllium areas starting around 1983 and possibly from other ETTP areas before then. If machining of beryllium took place at Building K-1401, clothing with trace quantities of beryllium could have been sent to this area for cleaning. Clothing from beryllium areas at the Y-12 Plant were kept wet until laundered. Sludge samples taken during the 1980s do not indicate elevated levels of beryllium. The building is now vacant.

K-1037/K-1006. Approximately one gram of beryllium metal foil was stored in Building K-1037, but it was moved to Building K-1006 approximately 2 years ago. Around the May 1997 time frame, the foil was given to Waste Management for disposal.

K-1070-B. This is known as the old classified burial ground. The approximate dimensions and capacity is 3.7 acres, estimated average depth of 30 ft with 2.5 ft soil cover. It was operated from the early 1950s to 1976. The area is now covered with grass, small shrubs, and trees. Beryllium is among the materials buried there.

K-1401. It was reported by former employees that components containing beryllium were machined in Building K-1401. Although we have been unable to identify any record of this operation, it has been reported that beryllium was machined in the Jig and Fixture Shop and on two Monarch brand lathes in the main machine shop area many years ago. One of the identified lathes is presently equipped with a glove box with a liquid filter and a high-efficiency filter. A hazard analysis will need to be conducted to assess the extent and affect of beryllium present.

K-1419 Central Neutralization Facility (CNF). The centrifuge area at CNF may contain trace levels of beryllium and the interior walls of the CNF sumps. A hazard analysis will need to be conducted to assess the extent and impact of beryllium present.

K-1420. Beryllium classified parts may have been stored in Building K-1420. Several years ago, classified material was sent to K-1420 from either the Y-12 Plant or Oak Ridge National Laboratory. This material was protected with an electroplated surface that would have prevented release of airborne or surface contamination from the beryllium parts. It has been reported through institutional memory that the west bay decontamination area may have been used to clean machines and equipment that may have come from beryllium areas at the Y-12 Plant.

K-1421 Incinerator House. An employee reported that the K-1421 Incinerator House facility may have been used to burn lint and clothing that could have contained trace amounts of beryllium from the K-1015 laundry facility.

K-1435 (TSCA). Small amounts of beryllium are shipped to the K-1435 Toxic Substances Control Act (TSCA) Facility as part of the overall wastes to be burned. In general, the wastes entering the incinerator are at very low levels (most are below detection levels). These shipments are retained for a limited amount of time before being incinerated. The concentration of beryllium in ash at TSCA is very low and is kept wetted. An interpretation was received from the U.S. Department of Energy (DOE) Headquarters as to whether the trace amounts of beryllium in the ash would fall within the scope of the DOE Notice 440.1. DOE stated that

beryllium introduced into an incinerator that remains in bottom ash would have chemically reacted with other materials to form either metal salts or silicate slag. The metal salts would be soluble. In going from a beryllium health protection program to a chronic beryllium disease prevention program, we dropped soluble compounds from the scope of the notice. The insoluble slag should have less than 0.15% Be. The bottom ash from a waste incinerator is the kind of thing we meant to exclude from the scope of the notice.

A summary of areas at TSCA that may contain trace levels of beryllium include the following: (a) ash handling system at TSCA, (b) drums containing the ash material, (c) area in and around the Rotary Kiln Seal Discharge Chute, (d) surface of brick in the Rotary Kiln and the Kiln Seal Discharge area, (e) interior walls of the sumps, (f) filter press area where the sludge is dewatered, and (g) container storage

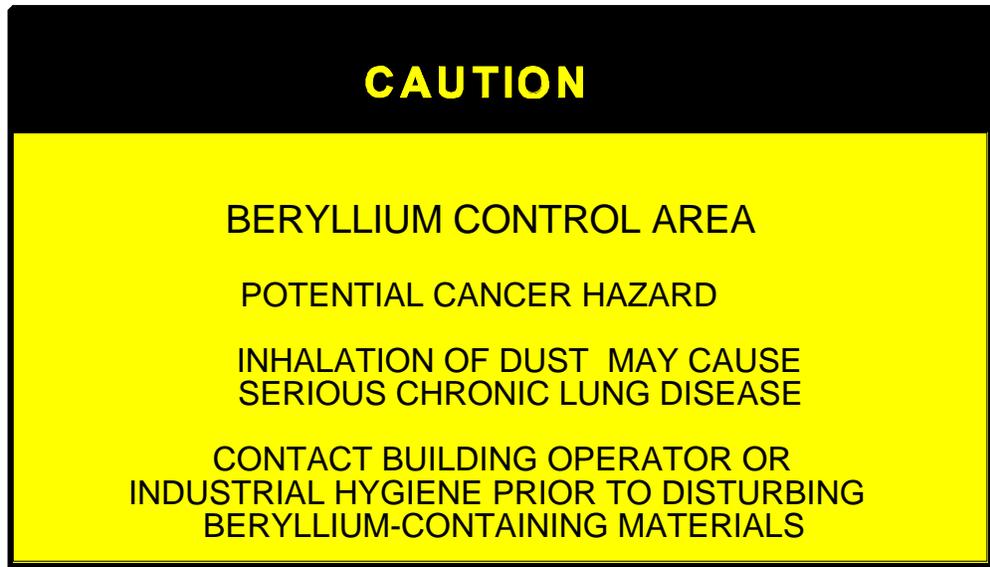
area at TSCA. A hazard analysis will need to be conducted to assess the extent and impact of beryllium present.

APPENDIX C

EXAMPLE OF SIGN FOR BERYLLIUM CONTROL AREA

1

EXAMPLE OF SIGN FOR BERYLLIUM CONTROL AREA



"Caution" is yellow on a black background. Text is black on a yellow background. The border is black.

APPENDIX D

EXAMPLE OF SIGN FOR BERYLLIUM REGULATED AREA

EXAMPLE OF SIGN FOR BERYLLIUM REGULATED AREA

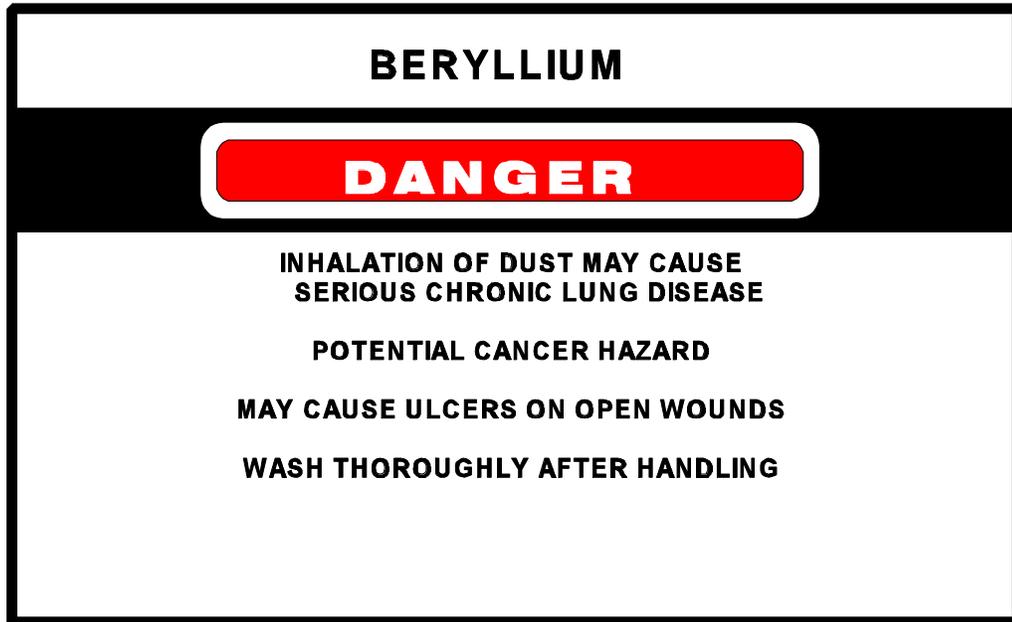


"Danger" is in white letters on a red oval, which is imposed on a larger white oval on a black rectangle. The text is black on a white background. The border is black.

APPENDIX E

EXAMPLE OF CONTAINER LABEL

EXAMPLE OF CONTAINER LABEL



“Danger” is in white letters on a red oval, which is imposed on a larger white oval on a black rectangle. The text is black on a white background. The border is black.