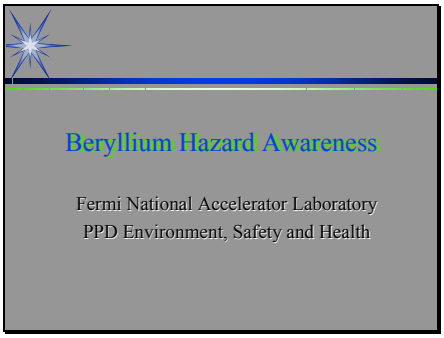
Slide 1

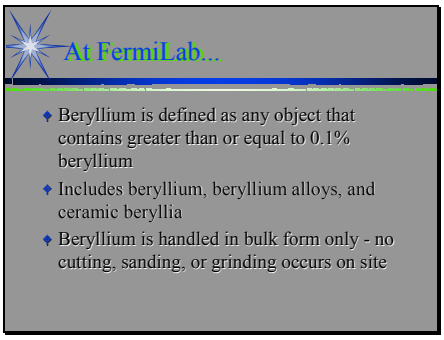


This video is designed to inform you of the hazards associated with beryllium.

Inhalation of beryllium particulate has been associated with short and long term adverse health effects to individuals with a hypersensitivity to the metal.

To assure that we never create a hazardous situation, you need to know that the safe handling procedures are and the reasons for these precautions.

Slide 2

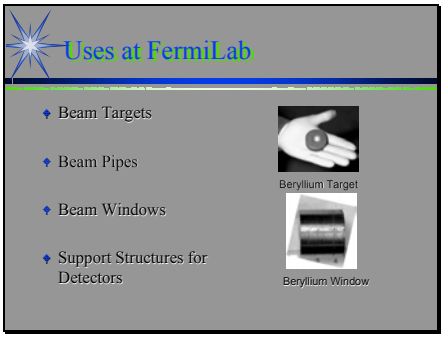


We define beryllium as any object that contains greater than or equal to 0.1 percent beryllium.

Fermilab uses beryllium, beryllium alloys, and ceramic beryllia.

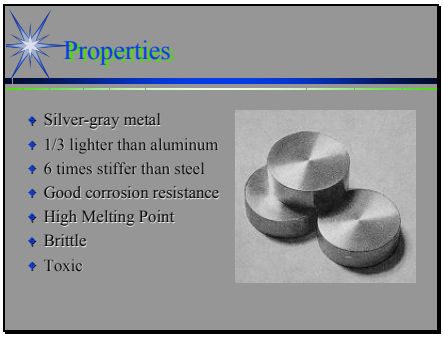
These objects are not hazardous unless they are machined or used in a manner that creates a dust, fume, or mist.

Slide 3



Beryllium, beryllium alloys, and ceramic beryllia is used for such items as beam targets, beam pipes, beam windows, and support structures for particle detectors.

Slide 4

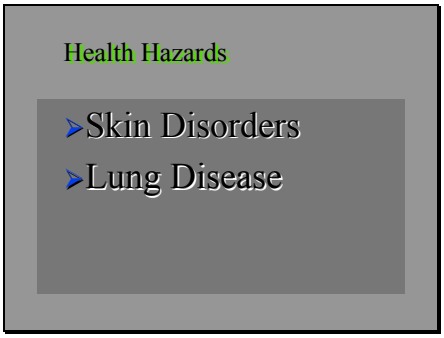


Beryllium is a silver-gray metal that is one third as light as aluminum and six times stiffer than steel.

It has good corrosion resistance and a high melting point.

These properties make beryllium a particularly attractive material for industrial applications.
Most of the beryllium ore mined is processed into beryllium hydroxide, which is further processed into beryllium metal, alloys, and oxide. Pure beryllium metal is used to make aircraft disc brakes, nuclear weapons and reactors, aircraft-satellite-space vehicle structures and instruments, X-ray transmission windows, missile parts, fuel containers, precision instruments, rocket propellants, navigational systems, heat shields, and mirrors.
Beryllium oxide is used to make specialty electrical and high-technology ceramics, electronic heat sinks, electrical insulators, microwave oven components, gyroscopes, military vehicle armor, rocket nozzles, and laser structural components. Beryllium alloys are used in electrical connectors and relays, springs, precision instruments, aircraft engine parts, nonsparking tools, submarine cable housings and pivots, wheels, and pinions.

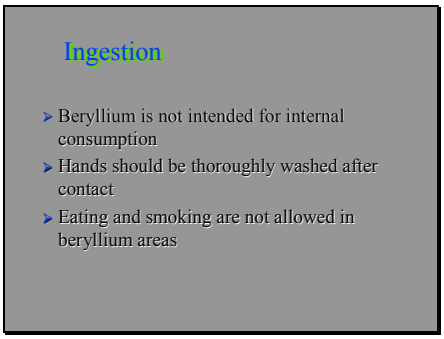
Slide 5



There are a number of health concerns associated beryllium. These fall into two categories (1) skin disorders and (2) lung disease.

Let look at the ways beryllium can causes these effects.

Slide 6



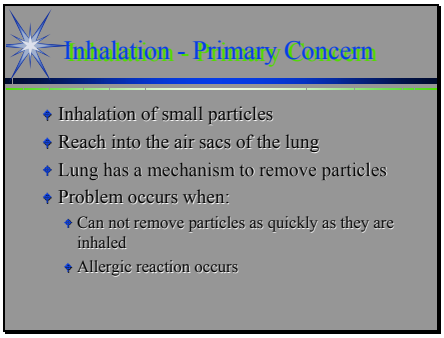
Slide 7

A skin rash, also called dermatitis, can develop when there is contact with water soluble beryllium salts. We do not use these type materials at Fermilab.

If beryllium becomes imbedded in the skin, an ulcer or corn-like lesion can develop.

These disorders usually heal completely once the beryllium is removed.

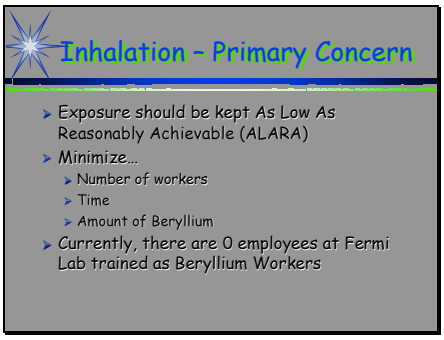
Slide 8



There are a number of health concerns associated with the inhalation of beryllium particulate. When very small particulates, less than 10 micrometers, are inhaled they reach the airsacs of the lung.

The lung has a mechanism to remove particulate, however, when that mechanism is overwhelmed or if there is an allergic reaction to beryllium, then lung disease can develop.

Slide 9



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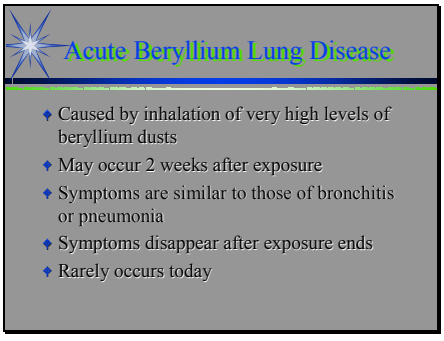
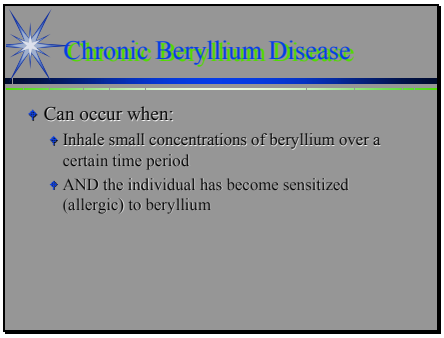


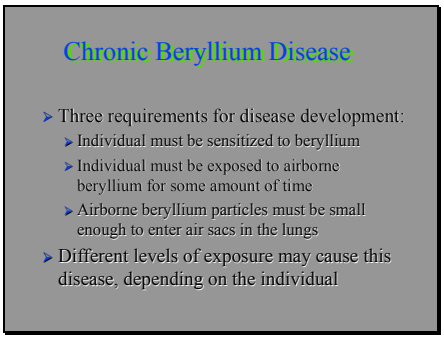
When very high concentrations of beryllium are inhaled for a short duration, pneumonia-like symptoms may occur.
This is called Acute Beryllium Disease.
The symptoms may not occur for 2 weeks after the exposure.
Acute Beryllium Disease is treatable and is completely reversible.
Such large exposures occur very rarely today.

Slide 11

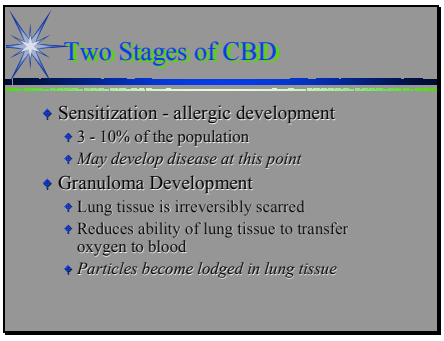


Chronic Beryllium Disease, however, is not reversible. It can occur when small concentrations of beryllium have been inhaled over a certain time period. It can only occur if the individual has become sensitized to beryllium.

Slide 12



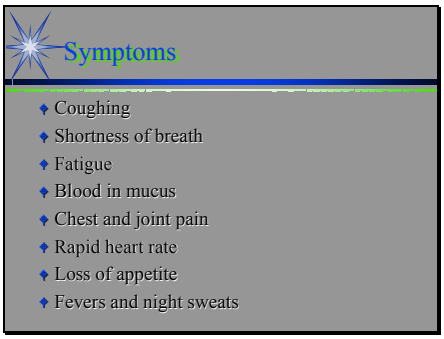
Slide 13



It is estimated that three to ten percent of the population has the potential of hypersensitivity to beryllium.
When sensitized, it seems the lung's particle removal mechanisms don't work as they should. Instead of removing the beryllium particulate, scar tissue begins to form around the particles. The scar tissue, called granuloma, gradually increases in size, reducing the amount of healthy lung tissue.

As the disease progresses, it becomes more difficult to breath.

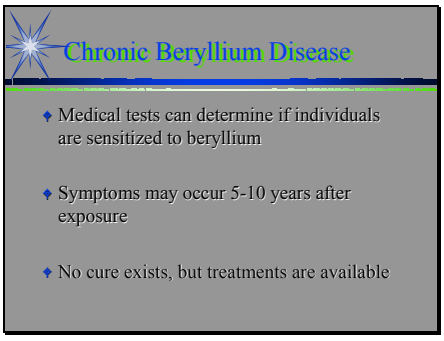
Slide 14



Symptoms include persistent coughing, shortness of breath, fatigue, blood in mucus, chest and joint pain, loss of appetite, fever, and night sweats.

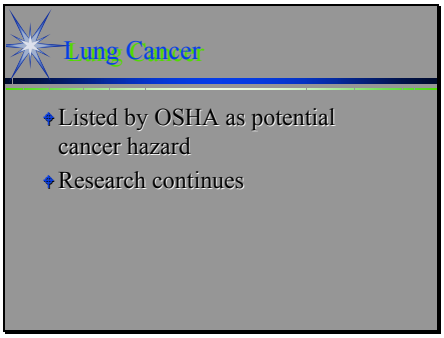
These symptoms may not occur for five to ten years. Some sensitized people never progress to the granuloma stage.

Slide 15

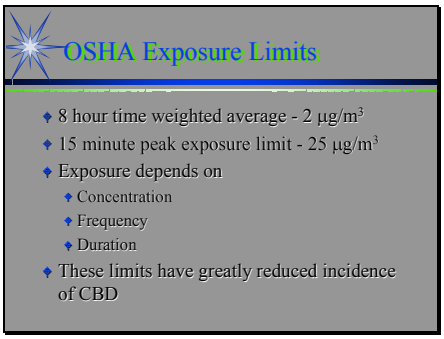


These symptoms occur for five to ten years. Some sensitized people never progress to the granuloma stage.

Slide 16



Slide 17

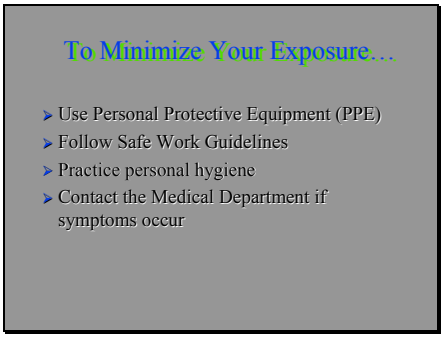


OSHA has established a permissible exposure limit for beryllium of 2 micrograms per cubic meter of air.

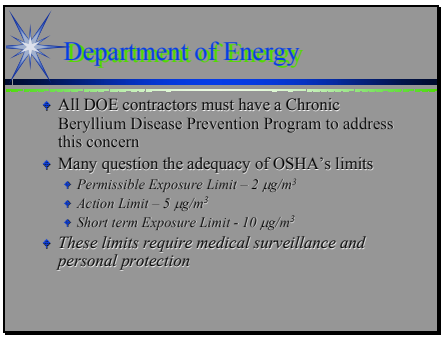
This exposure limit is very small. If you evenly distributed an amount of beryllium metallic powder the size of a pencil tip into a box that is six feet high and as wide and long as a football field, that would be equal to two micrograms per cubic meter.

This is an eight hour time weighted average which takes into account the concentration, frequency of exposure, and duration of the exposure. While this Permissible Exposure Limit has greatly reduced the incidence of Chronic Beryllium Disease, this disease is still occurring.

Slide 18

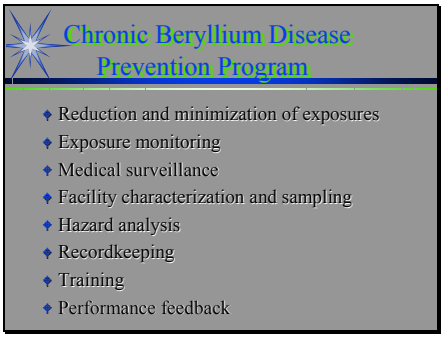


Slide 19



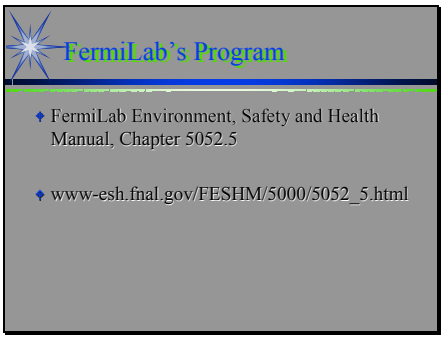
At Department of Energy facilities where beryllium is machined, a 1998 survey of 9000 workers showed that approximately 100 had Chronic Beryllium Disease and 200 had become sensitized. As a result, many people have questioned whether the OSHS Permissible Exposure Limit is protective enough. The Department of Energy, in response, has required its contractors to develop a Chronic Beryllium Disease Prevention Program to address these concerns.

Slide 20



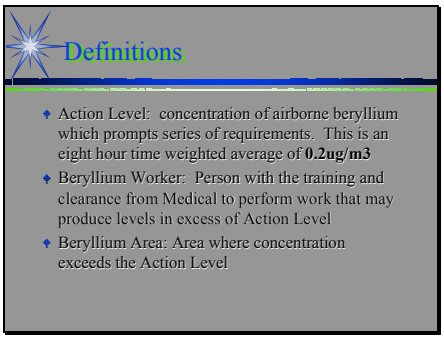
The program must contain the following elements:
Reduction and minimization of exposures
Exposure monitoring
Medical surveillance
Facility characterization and sampling
Hazard analysis
Recordkeeping
Training
Performance feedback

Slide 21

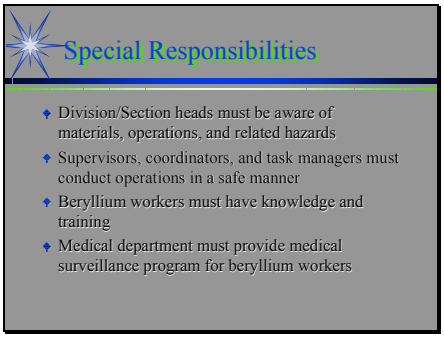


FermiLab's Chronic Beryllium Disease Prevention Program is Chapter 5052.5 of the FermiLab Environment, Safety, and Health Manual. It can also be found at the website given.

Slide 22



Slide 23



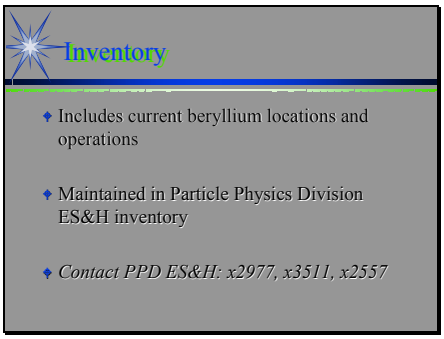
Division and Section heads shall be aware of the materials, operations, and related hazards with which their personnel may be involved. They shall assure the policies, procedures, and requirements as set forth in the Environment, Safety and Health chapter are followed.

Supervisors, construction coordinators, and task managers shall conduct their operations in a safe manner.

Individuals working with beryllium shall have sufficient knowledge and training to perform their work safely.

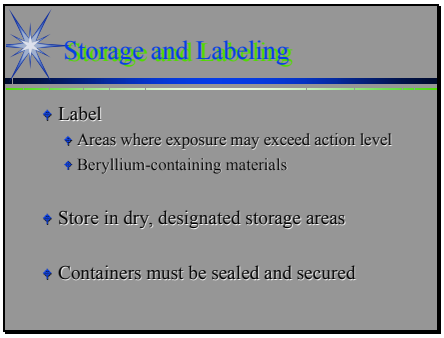
The Medical Department shall provide a medical surveillance program for beryllium workers.

Slide 24



Divisions and sections will utilize their records, process knowledge, employee interviews, and hazard assessment of beryllium locations to determine if they have beryllium or beryllium contamination areas. Locations where beryllium was previously used and residual contamination exist must be included in the inventory. An inventory of current beryllium locations and operations shall be maintained in the Particle Physics Division's Environmental, Safety, and Health Group's inventory. The inventory shall be reviewed and updated annually.

Slide 25



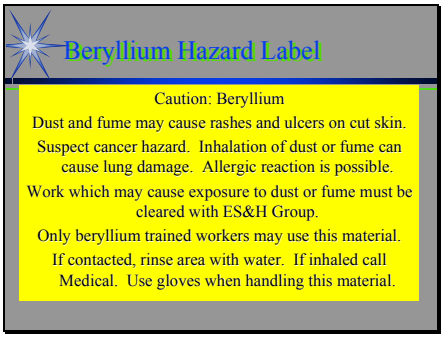
Label beryllium to identify it from other less toxic metals. Individual pieces need not be labeled if they are stored in a labeled container and/or cabinet. Whenever possible, components used in experimental areas should be labeled. It is recognized that in some cases this is impossible due to the complex nature of the component.

Beryllium must be stored in designated storage areas. It must be stored in sealed containers, labeled, and secured in a dry location. Surplus beryllium should be stored in the locked storage facility maintained by the Particle Physics Division's Environmental, Safety and Health Group or the Railhead (if above Class 1).

Slide 26

Areas where employee exposure to beryllium is at or above the Action Level shall be posted with a warning sign, which resembles the sign shown on this slide.

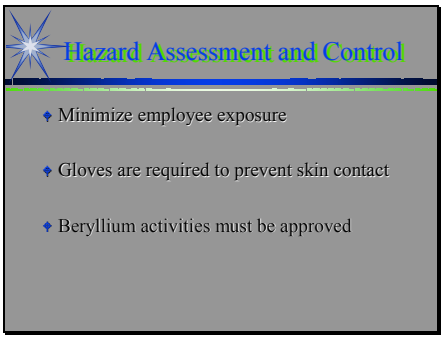
Slide 27



Containers of beryllium, beryllium compounds, beryllium-contaminated clothing, equipment, waste, scrap, or debris shall be posted with a warning sign, which looks like the sign shown on this slide.

Slide 28

Slide 29

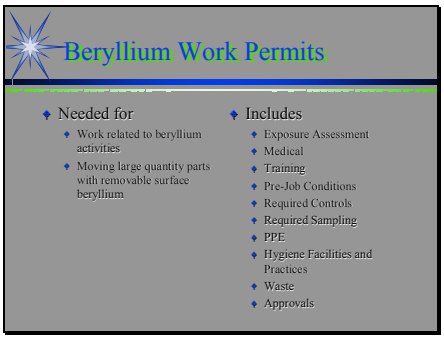


Every effort shall be made to minimize employee exposure to beryllium. Whenever handling beryllium, gloves are required to prevent direct skin contact. There may be removable beryllium on the surface due to oxidation. All beryllium activities that are performed at FermiLab must be reviewed by the division or section's Environmental, Safety, and Health Group and approved by the division or section head.

Whenever there is a potential to expose employees to beryllium

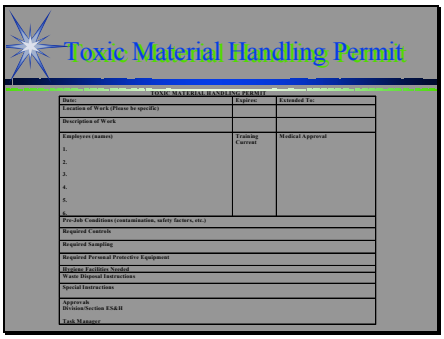
in excess of the Action Level, control measures must be implemented. The division or section shall assess the situation, determine the needed controls, and document the requirements on a beryllium work permit. The following are situations where a permit would be required

Slide 30

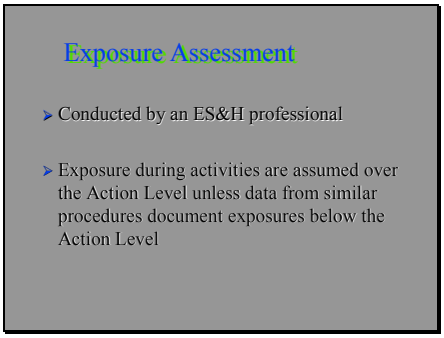


The following are situations where a permit would be required: work related to beryllium activities, and moving a significant quantity of parts with surface beryllium concentration levels in excess of the Action Level Standard.

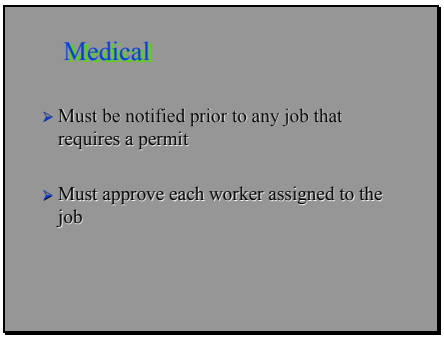
Slide 31



Slide 32



Slide 33



Slide 34

Slide 35

Pre-Job Conditions (Permit)

- Work area analysis
  - Wipe Samples
  - Beryllium Component analysis
- Job safety Analysis
  - Ergonomic concerns
  - Safety concerns

Slide 36

Required Controls (Permit)

- Engineering, work practice, and administrative controls
  - Exhaust ventilation
  - Hygiene practices
  - Enclosing the work area
  - Restricting work area access

Slide 37

Required Sampling (Permit)

- Permit indicates number and frequency of
  - Personal and area air samples
  - Surface wipe samples

Slide 38

Personal Protective Equipment (Permit)

- Respirators
- Coveralls
- Gloves
- Hoods
- Disposable shoe covers

Slide 39

Hygiene Practices

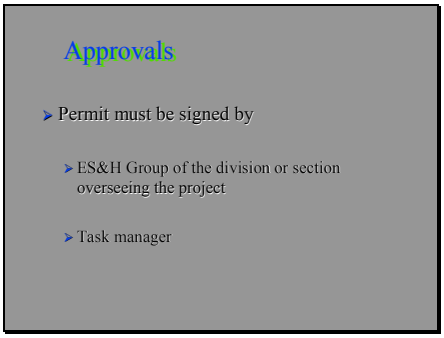
- Keep work area free of beryllium accumulation
- Food, beverages, and tobacco may not be stored or consumed in beryllium areas
- Maintain low beryllium levels at all times

Slide 40

Waste

- Beryllium–contaminated residues must be contained, collected and packaged for disposal
- Dispose of waste in accordance with Fermi Lab's regulated chemical disposal program

Slide 41



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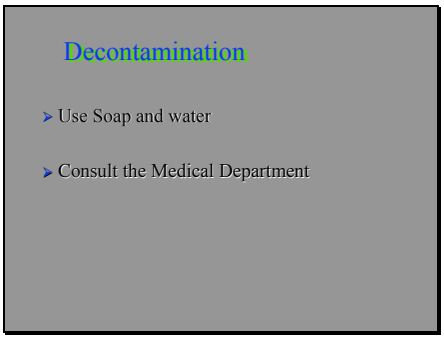

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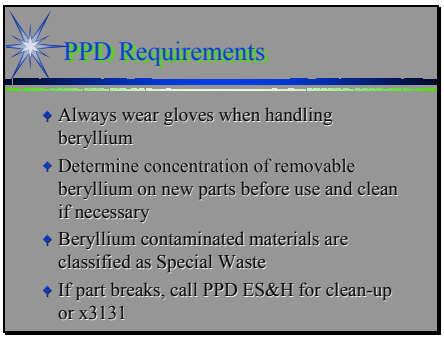

Slide 44