CHAPTER 3
RADIATION PROTECTION

3.1 Restricted Areas - Access Control

3.1.1 The only permanently restricted area at Cabot Performance Materials Boyertown Plant is the sludge storage buildings. The acid nature of the sludge residues, along with the radiation and dust hazard, are the main reason for restricting this area. The sludge storage buildings are large concrete vaults with one entrance containing a locked chain, link gate. The mausoleums are located on an access road secured by a locked, chain link fence. The plant area is policed periodically by plant security. Persons desiring entry must sign a log book at the guard station to obtain a key.

3.1.2 Posting and Labeling

All areas where radioactive materials are stored or handled are marked with "Caution - Radioactive Material" signs. If the material exhibits external radiation greater that 2 mR/hr, the area is roped and marked with a sign indicating that radiation levels exceed 2 mR/hr. NRC Form 3 is posted at various locations throughout the plant.

3.1.3 Protective Clothing

Cabot Performance Materials provides all protective clothing required by the National Institute of Occupational Safety and Health (NIOSH), for normal and maintenance conditions, including work clothes (coveralls, gloves, etc.), hard hats, respirators, safety glasses, ear plugs and other hearing protection, and safety shoes. Since the radiation hazard to workers at the plant is primarily from the transportation of dust.

Cabot Performance Materials provides a changing room for employees to wash and to change clothes and shoes before they leave the plant. All employees have access to the same changing room. The RSO (or his designee) takes smear samples in the changing room to determine if any contamination has occurred. To date, the samples have not indicated a need to provide separate changing rooms for workers in the ore handling areas. Cabot Performance Materials provides protective clothing to all employees. The company clothing is picked up by an industrial laundry for washing. Any protective clothing that is contaminated above the acceptable levels as quoted in Regulatory Guide 8.30 will be sent to a laundry facility that is specifically authorized to process clothing

with radioactive contamination. Contamination surveys for clothing will be performed on a quarterly basis as recommended in Regulatory guide 8.30.

3.2 Instruments

The RSO maintains various radiation survey instruments for conducting surveys and analyzing air samples. These instruments are calibrated by a licensed contractor at appropriate frequencies (i.e., six month or twelve month intervals). Cabot has selected the following radiation measurement instruments based on the recommendation of the Consultant Health Physicist:

MODEL	TYPE	RANGE
Ludlum 19	micro-R meter	0 - 5 mR/hr
SEI M-4	GM	0 - 50 mR/hr 0 - 50K cpm
Ludlum 2224	Scaler/Ratemeter (alpha/beta)	0 - 500K cpm
Ludlum 3	GM	0 - 200 mR/hr 0 - 400K cpm
Ludlum 177-73	GM	0 - 500K cpm
Ludlum 2929	Dual Scaler (alpha/beta)	

3.3 Occupational Exposure Control

Cabot Performance Material's program for conducting radiation surveys to ensure that occupational radiation exposures are ALARA is described in the procedures contained in Attachment C.

3.3.1 External Radiation - Personnel Monitoring

Personnel monitoring (TLDs) has been used for personnel handling materials under license SMB-920. Also, Cabot Performance Materials uses TLDs for employees that work around sealed sources. Personnel monitoring equipment available are TLD 3-chips badges. TLD processing is presently, and will

continue to be, processed by a laboratory accredited under the National Voluntary Laboratory Accreditation Program. TLDs are presently processed by Tech/Ops Landauer, Inc. of Glenwood, Illinois. Due to the negligible external radiation exposures received under License SMB-920, Cabot Performance Materials will continue to evaluate the need to provide TLDs.

3.3.2 Internal Exposure Analysis

Bioassay monitoring and exposure analysis conducted by Cabot indicates that worker exposure are well within allowable levels. No adverse trends have been identified.

Cabot Performance Materials has set an administrative action level to investigate internal exposures. This administrative action level is for any individual who are suspected of having received more than 40 DAC-hours in one week.

The Respiratory Protection Program at Cabot is conducted in accordance with 10CFR20.

3.4 Ventilation

The ore handling equipment in Building 073 is a closed system, once the drum of ore has been loaded into the conveyer processor. Minimal dirt is generated externally to the closed ventilator, scrubber and bagger system. Equipment used to prevent the release of radioactive material through the ventilation system are:

Scrubber - Heil #739 Packed Tower Fume Scrubber with fan rated @ 30,000 CFM and 3" static pressure.

Baghouse - Industrial Clean Air Modular Pulse-Clean Fabric Collector, size 500-3, rated 12,000 CFM @ 6" static pressure.

Dust Collector - Torit/Day Division, Model 4DF32, rated @ 12,000 cfm @ 5" static pressure.

Cabot Performance Materials is designing the ventilation system requirements for the revised process based on the same ventilation requirements as the existing process buildings.

3.5 Work-Area Air Sampling

The air sampling program at Cabot Performance Materials is directed towards supporting the objective of keeping occupational exposures below 10% of the regulatory limits. This objective will be achieved through the implementation of engineering controls and respiratory protection.

The Air Sampling Program (see Attachment V) consists of taking grab (low and high volume) air samples as well as using lapel samplers on a periodic basis. Counting equipment is used to analyze samples onsite. The target MDC is 0.1 DAC.

Using historical air sample data, the air sampling program will focus on periodically updating the results for various jobs to determine the effectiveness of the ALARA improvements being pursued. Relief from the current respiratory protection requirements will be considered as the sampling data shows that it is feasible and prudent.

Also, CPM maintains two integrating Track Etch radon samplers in the grinding and digestion part of Building 073 to monitor radon progeny. Those levels have been in the range of 1-2 pCi/l. CPM will also monitor the digestion area of the revised process facilities with radon samplers.

3.6 Surface Contamination

It is the responsibility of the operating staff to provide proper housekeeping in the work areas. In the ore grinding area, a vacuum system has been installed as an engineering control to facilitate clean-up. Maintenance personnel are also instructed to clean the affected areas (as appropriate) prior to and following performance of their activities.

Based upon historical results, the unrestricted areas are maintained below the contamination limits. (note: the limit for alpha contamination is 200 dpm/100 cm^2.) Smear samples have been taken in the plant on a quarterly basis; however, the frequency is being revised to be monthly.

3.7 Bioassay Program

As a check to verify that the air sampling and respiratory protection programs are effective, on an annual basis Cabot Performance Materials will perform whole body counts for those individuals who would have spent consequential time (e.g., >100 hours in an area) in radiologically controlled areas. Any result that shows an internal deposition of radioactive material will be investigated. To date, there have been no whole body counts indicating internal deposition.

If any unusual or emergency condition arises and individual(s) are suspected of having an intake of radioactive material, whole body counting will be performed as soon as practical to assess the actual internal deposition and hence, exposure.

3.8 Radioactive Waste Management

The only "radioactive waste" from the current processing operations is the ore residue, which are stored on site in concrete bins. These bins are secured with locked chain link gates and posted as containing radioactive material. Currently, there are seven (7) bins containing approximately 36 million pounds of ore residue. These residues have been stored for metals recovery as they contain about 2.5% tantalum and as such are a valuable source material, not a waste. However, this tantalum was not recoverable until the development of the Cabot process for increasing the yields from the ore dissolution facility. This process revision is discussed in Attachment N, with additional detail in Figure 8-1, Figure 8-2, and Figure 7-1.

The projected time table for processing the existing inventory of ore residues is approximately 5 years at 250 operating days a year, once the modifications are installed. It will take this long because during the same period, the modified process will also be serving as a final-stage digestor of new ores and ore concentrates, rather than being dedicated solely to redigestion of previously accumulated residues.

The only radioactive component from the modified process will be a dry, sintered solid. This material will be classed as low level radioactive waste unless it can be employed as a feedstock for an uranium mill. Additional detail on this material is in Section 5.4.

The groundwater in the area of the storage bins is monitored per SMB-920 by means of dedicated monitoring wells which are sampled quarterly. The results of this sampling are provided in Figure 3-2.