REVIEW OF CHEMICAL SAFETY PROGRAMS AT SELECTED NRC LICENSED FACILITIES

COMBUSTION ENGINEERING INC. HEMATITE NUCLEAR FUEL MANUFACTURING FACILITY HEMATITE, MISSOURI

Submitted to:

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1.0 INTRODUCTION

1.1 Scope of Site Visit

An information gathering site visit was conducted on the chemical safety program at the Combustion Engineering Hematite Nuclear Fuel Manufacturing Facility in Hematite, Missouri on October 18 to October 21, 1993. The information gathering effort was directed at the site's recognition and management of chemical hazards as they may impact:

a) Onsite and offsite populations directly affected by chemical releases due to incidents associated with licensed nuclear materials,

b) Operators of the plant or the operator's capacity to safely operate the plant due to chemical release, and/or

c) Potential explosions or fires from chemicals which could affect nuclear material containment or handling operations.

The CE Hematite Plant is currently covered under the OSHA Process Safety Management (29 CFR part 1910.119) and will also be covered under EPA Risk Management Program (Proposed Rule 40 CFR Part 68). As part of compliance, the facility is required to establish and maintain a program to identify and manage chemical risks to employees and offsite risk receptors (human health and the environment) at the site. The NRC is specifically concerned with how these hazards will have the potential to impact operations involving licensed materials, which are under the direct mandate of NRC to regulate.

1.2 Date and Conduct of the Site Visit

The initial site visit was conducted from October 18 to October 21, 1993 by a team of three SAIC Process Safety Management Experts and two NRC representatives. This team included the following individuals:

Mr. Phuoc Le, SAIC - Project Manager
Mr. Peter McKnight, SAIC - Senior Engineer
Ms. Padmavati Chitrapu, SAIC - Project Engineer
Mr. Richard Milstein, NRC - Project Manager
Mr. William Troskowski, NRC - Enforcement Officer.

Members of CE management team which met with SAIC and NRC included:

Mr. Hal Eskridge, Regulatory Compliance Manager
Mr. Mark Michaelson, Licensing Engineer
Mr. Bob Griscom, Manager of Engineering
Mr. Kevin Hayes, Industrial & Fire Safety

2.0 PURPOSE

NRC management has decided to exercise its regulatory authority to require assurances from licensees that certain types of chemical hazards are recognized and managed. The chemical hazards that NRC is concerned about are:

1. Significant hazard (either clinically observable or irreversible health effect) to onsite operators and the offsite public resulting from the failure of nuclear materials operations. Examples of this would be the HF that would be generated by the release of UF_6, as well as the chemical toxicity of uranium, or the NO_x plume that would be generated by the failure of a U_3O_8 dissolver system.

2. Significant hazard (incapacitation) to a process operator actively involved in the operation of a nuclear material processing or handling operation, or a fire or explosion of flammable materials could cause an accident involving nuclear materials.

NRC also recognizes that hazardous materials are being regulated by various other Federal and State agencies. At the Federal level, OSHA has promulgated the Process Safety Management (PSM) Standard under 29 CFR 1910.119 and the EPA will shortly release its Risk Management Program (RMP) under 40 CFR Part 68.

As a result, NRC would like to develop criteria for requirements of a Chemical Safety Program for the licensed facilities in a way that is both effective and sensitive to the needs of both the regulatory side and licensee side. NRC's objective is not to overburden the licensee with unnecessary duplication of effort in achieving "chemically safe" operations at the plant.

To this end, NRC and its contractor, SAIC, have set up a series of site visits such as the one at CE Hematite to collect information on how the plant looks at chemical safety and the type of program implemented for maintaining such a safety effort. NRC would like to work with the licensees to establish a chemical safety program that is sensible and achievable by the licensees. Similar cooperative efforts between industry and regulating bodies have led to acceptable regulations development in the past, such as the OSHA PSM standard. Thus, by following a similar approach, NRC hopes that it can establish sensible requirements for the chemical safety program.

In order to evaluate and collect information on the CSP at CE plant, SAIC compiled a list of eleven (11) initial topics based on a number of existing Process Safety Management (PSM) programs that include:

OSHA's PSM (29 CFR 1910.119)
EPA's upcoming Risk Management Program (RMP) (40 CFR 68)
New Jersey's Toxic Catastrophe Prevention Act (TCPA)
California's Risk Management and Prevention Program (RMPP)
Delaware's Extremely Hazardous Substances Risk Management Act (EHSRMA)

Using these criteria, the team was able to collect useful information on the CSP at CE. The information gathering effort entailed extensive discussions with plant management and a site tour of all areas where chemicals are stored and used. Copies of informational material collected at the site with regard to the CSP are provided in Appendix A. Since this is the first trip in a series of information collection trips, SAIC has refrained from passing any judgement on the adequacy of CE's CSP. Instead, a summary of findings and comments on each criterion is provided below.

3.0 PROCESS OVERVIEW

Combustion Engineering's Hematite, Missouri, plant produces low-enriched (less than 4.1% U-235) ceramic fuel for light water reactors.

The uranium is initially received as uranium hexafluoride from the enrichment plants and converted to uranium dioxide powder, using the dry conversion fluid bed process. The UO_2 powder is fabricated into ceramic fuel pellets onsite and then put through fuel element fabrication.

The enriched uranium hexafluoride is received as a solid in 2.5 ton cylinders. These cylinders are heated in a steam chest to vaporize the UF_6. The solid UF_6 is vaporized to a gas and, under its own vapor pressure, moves through pipes to the first fluid bed reactor. Here, it is reacted with an excess of dry steam to form fine particles of uranyl fluoride (UO_2F_2) and hydrogen fluoride (HF) gas as shown in Eq (1):

$$UF_6\ (gas) + 2H_2O\ (gas) \rightarrow UO_2F_2\ (solid) + 4HF\ (gas) \quad (1)$$

$$UO_2F_2\ (solids) + H_2\ (gas) \rightarrow UO_2\ (solid) + 2HF\ (gas) \quad (2)$$

Gaseous HF and excess dry steam exit the reactor through a porous metal filter; the solid UO_2F_2 is moved to a second and third reactor where it is pyrohydrolyzed in a reducing atmosphere of hydrogen (from "cracked ammonia"), as shown in Eq (2), to remove any residual fluoride and reduce the UO_2F_2. Gases from the second and third reactor are also filtered through porous metal filters and all gaseous reaction products are passed through scrubbing towers packed with calcium carbonate to remove the HF prior to their release to the atmosphere.

UO_2 powder from the third reactor is cooled and pneumatically transferred to storage silos. The powder is withdrawn from the storage silos, milled to a specified particle size range in a fluid energy mill, and pneumatically transferred to blenders prior to use in the pellet plant.

The chemicals which are used or produced at the Hematite plant include: uranium hexafluoride, hydrogen fluoride, anhydrous ammonia, nitric acid, trichloroethane, sodium hydroxide, hydrogen peroxide, nitrogen, potassium hydroxide, hydrochloric acid and cracked hydrogen. Of these, the chemicals in greatest quantity stored on site are anhydrous ammonia, nitrogen and uranium hexafluoride. The chemicals that are covered under OSHA and EPA regulations are ammonia, and potentially HF and hydrogen.

4.0 INFORMATION GATHERING RESULTS

4.1 Hazard Identification and Assessment

CE has established a program called the Integrated Safety Assessment Program (ISAP) that is used to look at all safety issues in an integrated manner instead of separate programs for different safety topics such as criticality and chemical hazards. The methodology for the ISAP has not been formally documented, but appears to be based on the "what-if?" and "fault tree analysis" techniques. The ISAP team includes experienced senior members of the plant in the managerial positions. It appears that no hourly operators were included in the team. However, it was noted that some members of the team are shift supervisors who moved up the ranks from hourly operators, thus, in the plant's opinion, making up for the lack of hourly operator participation. The participation of operators in the process hazard analysis is crucial because they provide field knowledge of the process. Their field knowledge and actual experience is valuable in identifying potential hazards and developing a strong PSM program.

From SAIC's inspection of the documentation of the ISAP conducted for the "Oxide Line", it appears that the discussions are leaning toward criticality issues with a light evaluation on the chemical hazards issue. For example, it was noted that the ISAP team has identified a potential hazard involving a release of cracked hydrogen gas, but no further analyses on how to detect, prevent or mitigate the potential accident were carried out.

The plant appears to review incident history and takes into account other plant operating errors in their hazard assessment efforts to avoid similar problems arising at the Hematite plant. The SAIC team did not verify the existence of documentation of incident history or the incorporation of information related to errors made by other plants. However, we were informed verbally by CE personnel that after the accident at Sequoyah Fuels, CE-Hematite reinforced its safety system by adding more monitoring devices, as well as adding interlocks to the smoke detectors in the ventilation system, to prevent a similar accident from happening at the facility. This was inferred as evidence of incorporating past experience into the PHA process, whether information originated at CE or at other similar facilities.

The rod line assembly area hazard evaluation lasted over a period of two months, using a "What-if?" methodology. This was for a major plant expansion. Normally, it appears that the plant performs hazard assessments for minor changes in less than a week using the "What-if?" approach. Other ISA projects completed include the safety assessment done for the Distributed Control System (DCS) conversion, which was performed using a European technique similar to the "Fault Tree Analysis (FTA)" methodology. The SAIC team was informed during the visit that a "European" method similar to Fault Tree Analysis had been used for the DCS safety assessment. This methodology had been used in Sweden by the manager of the Oxide plant. The methodology was documented in Swedish, and had been partially translated into English. We were informed that this document could be made available to the NRC if requested.

An important part of the hazard assessment is reflected in the way in which the site maintains the storage of hazardous materials onsite. During the plant tour, the team noticed some examples which indicate that this area should receive further attention. The anhydrous ammonia tank was not labelled and the exterior of the tank was visibly rusted. The area around the tank and the rear of the building where the tank was located was fairly crowded with waste materials and 55-gallon drums of waste which again were not well labelled or marked.

It is possible that the drummed waste stored near the ammonia tank might be flammable, or display other undesirable characteristics. Also, since the contents of the drums are not marked, reactions might occur if an ammonia release were to occur or if the drums themselves were spilled or contents ignited. The most significant consequences could include shrapnel or projectiles from explosion of a drum which could impact the safe containment of anhydrous ammonia. The inadvertent mixing of chemicals can have disastrous consequences, or might initiate other reactions. However, we were informed by a CE staff member that the site maintains a Master List that identifies the contents of each drum, and that care was taken to ensure that incompatible substances were not mixed in the drums.

The storage area for hydrogen peroxide and nitric acid inside a storage building behind the main plant building showed a recent response to an OSHA inspector's recommendation that the plant segregate these oxidizing materials from the oils that were previously stored together with them. These drums of oil were observed to be segregated by a wall and a containment dike from the nitric acid and hydrogen peroxide currently. The CE site engineers are responsible for ensuring adequate diking containment is provided for the segregation. The fact that the plant had to be informed of this chemical hazard by an outside agency is an indication of the potential lack of effort that has previously been placed on chemical safety concerns.

General plant awareness refers to the understanding by plant personnel of chemical hazards, radioactivity, criticality and other hazards present at the site. Under the context of the Chemical Safety Program, the team reviewed "general plant awareness" associated with ammonia, hydrogen and HF. The SAIC team questioned site personnel, both management and operators, to determine whether the chemical hazards were recognized and the Safety Program understood by these employees.

4.2 Process Safety Information (PSI)

It appears that the plant does not have up-to-date engineering information related to process safety and design intents such as piping and Instrumentation Diagrams (P&IDs), process descriptions and Equipment Specifications such as materials of construction and design limits. Without an established PSI management program, the CSP may not be complete and effective. Material and energy balances were not available for review during the site visit. The responsible person for the process safety information is the process engineer for that area. Simplified process flow diagrams (block type) for the plant were in good condition and prominently displayed in the conference room in which the meetings were held. The plant seems to recognize the need to update their Process Safety Information, and informed the team that the CE plant has allocated time in 1994 to update PSI. CE has committed verbally that future ISAPs will address chemical safety in greater depth.

4.3 Standard Operating Procedures (SOPs)

This item seems to be the brightest point of the plant's CSP. Based on the inspection of the documentation and an interview with an operator, the SOPs appear to be complete, up-to-date, and clearly written. The reviewed SOPs reviewed covered initial startup and normal operations well. The procedures did not address shutdown in emergency situations, since the normal practice is to evacuate the area and hit a shutdown button on the way out. Normal process shutdown was covered in the procedures. The operating limits for each batch are dictated by the POP (Process Operating Parameters) sheet that is given to the operators at the beginning of each product cycle. Consequences of deviation from intended operations were addressed in some of the procedures reviewed. In these instances the steps to correct abnormal conditions were provided in the SOP. The SOPs are reviewed by operators and engineering before they are issued.

Temporary operations are permitted at the site. These conditions are set forth on a "traveller", a memorandum with a limited life-span, covering operations that are not routine. The maximum time for the temporary operation is thus limited to the life of the "traveller". This ensures that changes are addressed through management approval of the "traveller" and any unsafe conditions would be corrected by management oversight. The preparation of equipment for maintenance and inspection of equipment following a maintenance project are covered by a "traveller" specific to each activity rather than through a standard procedure. Logsheets and checklists are used by the operators to track progress on operations.

SOPs are reviewed formally every two years, in accordance with the NRC site license.

4.4 Site Wide Safety Procedures

The element "Plantwide safety procedures" covers hotwork practices, contractor safety and general safe work practices. Our knowledge regarding sitewide safety procedures is limited to what information was provided to or verbally discussed with the team during the site visit. It appears that formal written procedures and the use of travellers both serve this function. For example, the plant utilizes a "traveller", a memorandum with a limited life-span, to define procedures and conditions for any temporary, non-routine operation. The maximum time for the temporary operation is thus limited to the life of the "traveller". Nitrogen purge of process lines and equipment that contained flammable or toxic materials is used. It was noted that a number of procedures were not formally documented although they seemed to be carried out properly.

The hot work procedures are also covered by a special traveller and JSA. This program is only applied to activities that could lead to fire or spark. Personal protective equipment, fire watch and other equipment protective measures are covered on the traveller.

The plant utilizes lockout of electrical equipment but does not have a formal written procedure covering this program.

There is a formal procedure covering contractors and visitors onsite. All contractors and visitors are escorted by plant personnel while onsite. General orientation training and plant safety training is provided to contractors and visitors by the Safety Department. The site has stringent control of materials entering and leaving the site. Any materials brought in to the site must be clearly described on the contractor's contract, otherwise the plant will purchase materials to be used by the contractor onsite. There are no current provisions to conduct contractor safety reviews prior to awarding contracts or to maintain safety logs for accident or illness of contractors onsite.

The development of formal procedures for confined space entry and permits for hot work and confined space is in progress. Again, the plant appears to understand this problem and has made plans to rectify it.

4.5 Training

The plant has significant documentation on its general orientation training procedures. The normal training process which the plant puts new employees through includes two weeks of classroom training followed by the assignment of the new hire to an experienced operator for on-the-job training. However, during an interview with an operator, the team noted a reduction in the "process operations" classroom training period from a suggested two-week to an actual two-day period. It is unclear whether the operator was positive on the entire set of training which he received. The site training records were not available to support the training certification claims. It appears that process operator training has not been sufficiently formalized or documented.

It is also noted that the plant indicates that there is a formal process that requires the trainee to be "certified" as "ready" by his/her supervisor. However, it appears from the operator interview that it is up to the trainee to decide whether or not he/she is ready to take on the task of a certified operator. This may just be a result of personal interpretation on the part of the operator (SAIC was able to interview only one operator). No documentation was reviewed during the site visit to confirm this.

The site does not currently classify by job title or assignment how much training is required for each position. There are no certifications required by the state, NRC or the company for maintaining operator status at the site. The site uses qualification testing for operators; however the requirement is not stringently enforced. The application differs from one supervisor to another between written tests and on-the-job oral tests. Documentation was not available to review previous tests.

The selection of trainers for operators depends on the area to be covered. The senior process engineer provides training on the process and how to operate it. The safety manager conducts reviews of trainers to determine if they are training effectively. Classroom feedback evaluation forms are used to get trainee input on course materials and trainers.

A specific agenda is prepared for each incoming new hire. There is no predetermined training objective that all trainees must meet, however. Basic skills training for operators includes: chemistry, process equipment and operations, safety and job-specific responsibilities. Refresher training is provided to operators who transfer back to a process area after two years. However, no formal refresher training is provided to operators who remain in the same process. Some safety related training is provided on an annual basis: respiratory protection, radiation safety, criticality and hazardous materials awareness, as part of NRC requirements.

Emergency response training is provided through the emergency response plan drills. The plant has a strong commitment to training and seems to be developing a program that will provide coordinated planning and tracking of training.

4.6 Maintenance

The plant has made a significant investment in acquiring a Preventive Maintenance (PM) software program. However, the real work is to provide accurate information to the software so that it can be used effectively in establishing a workable PM program. This includes establishing correct inspection and testing frequency for piping and equipment which the plant is in the process of developing.

Current maintenance activities are guided by procedures and checklists used by the Maintenance Department. The frequencies and types of inspections that will be entered into the new maintenance management system will be determined by engineering and maintenance personnel.

Current records on internal and external non-destructive testing of chemical related equipment are poorly maintained. There is very limited information on what has been done so far, e.g.

weekly testing of stand-by emergency equipment is part of the current maintenance schedule. Currently, the plant is developing detailed maintenance procedures. Inspection and testing results are maintained by the Maintenance personnel.

Training of maintenance personnel is conducted by the process engineer, along with operators, when maintenance activity involves hazards due to chemicals in the process. However, the general rule is that maintenance personnel do not "see" process chemicals, because any equipment is cleaned before being handed over to maintenance.

The plant is having difficulty obtaining information required to develop a PM program, because Process Safety Information related to the equipment is unavailable. So until the relevant PSI is developed, the plant cannot develop a meaningful PM program. Currently, there is no schedule for implementation of the system, but it is planned for completion in 1994.

4.7 Management of Change (MOC)

The plant has established a MOC procedure (OS-210). It is currently in the process of being updated and revised by the plant. Based on the discussion provided by the plant, the new procedure will be directed to weigh the chemical hazard aspects associated with the change as equal to the criticality and radioactivity issues. The procedure requires the process engineer to originate the change form and the plant Safety Committee to approve major changes. The site visit team was not able to review the new management of change form. The current form in use does not clearly define what constitutes a process change or what is replacement-in-kind. This distinction did seem to be clear to the site Regulatory Compliance Manager who is responsible for managing MOC decisions.

At present, the Regulatory Compliance Manager determines what constitutes a major change. He/she recommends whether the Safety Committee should perform a detailed analysis for the change in question. There are no established guidelines in place currently, and each case is judged on its own merit. The current form used to document MOC does not trigger follow through activities such as updating SOPs, Process Information, Training, etc.. This may be reflected in the new procedure, but could not be confirmed by the site visit team.

Major changes at the site must be extensively documented by the licensee before being approved by the NRC. This requirement puts a formal oversight on all major design and operating changes at the site.

4.8 Incident Investigation Program

The plant has performed investigation of incidents that have occurred at the plant. There are different levels of investigation ranging from the "open and close" type of incident such as minor cuts and tripping to those that require root cause analysis to be conducted. The Regulatory Compliance Manager, does the initial screening of incidents. He looks at the incident and determines whether the incident should be classified as a minor, medium or major incident, after which an investigation team is assigned, if necessary. Incidents that are investigated are generally classified as minor incidents, medium incidents and major incidents. Minor incidents are open and closed cases which require no further action. Medium incidents are investigated by the process engineer with some involvement of others. Major incidents are reviewed by the Safety Committee and a formal incident investigation team is assigned to conduct the investigation and report the findings.

Again, although it appears that the plant has conducted incident investigation in an appropriate manner, it does not have a formally established and written procedure. It was stated that the supervisor will fill out an incident investigation form describing what occurred. The form has space for incident information including equipment involved, causes of incidents and actions taken to prevent recurrence.

The Regulatory Compliance Manager maintains trends on computer for incident investigations that have been conducted. Incidents investigated could result in specific training sessions based on occurrences or near misses, but no formal commitment is maintained by the licensee.

Plant Safety Committee provides oversight and control on closure of incident investigations. Required follow-up on recommendations is managed by the Chairman of the Safety Committee.

CE's use of an incident form and informal program to manage change is promising. However, a clearly written program is needed to support incident investigations and to determine the need for and conduct root cause analyses. This program element will require further development and revision.

4.9 Emergency Response Planning

The plant has a well established Emergency Plan (EP) and Emergency Response Procedures (ERP) that are written to implement the steps outlined in the EP. The plant has also conducted both planned and unplanned drills and exercises. The team visited the emergency operations center and found that it appears to have equipment and supplies to respond to an emergency situation. Team members questioned the telecommunication capability of the site which is based solely on in-plant telephone lines and a dedicated outside line that is also used as a FAX line for the plant, but has no independent backup system such as mobile phone or radio.

At the exit meeting, the team reiterated the above concern. At that time, it was explained that the plant does not use mobile telecommunication systems due to the potential for unduly alarming the public. (NOTE: The telecommunication signals in mobile systems are not shielded.)

The plant is in the process of developing protective action guidelines (PAG) specific to emergency scenarios for the site. These PAGs will provide detailed guidance and action plans for responding to and mitigating chemical releases, fires and explosions, according to plant management.

Emergency evacuation routes are posted inside buildings and included in the EP. The site conducts evacuation drills on an annual basis. The selection of the tile barn as a safe haven seems to have been based on the size of the structure and its location near the road for subsequent offsite evacuation. The site was unsure whether any measurements had been made on the ventilation safety of the safe haven shelter for exchange with outside air if a chemical release had occurred and a hazardous vapor plume was moving in the direction of the barn.

Emergency equipment and supplies are maintained by the Health Physics Department. The site does not conduct OSHA 1910.119 training for any of its employees as of yet. All site employees are trained on the ERP and how to use fire extinguishers.

The site maintains magnesium sulfate solution in the Emergency Operations Center for treatment of HF contamination. This material does have a longer shelf-life than calcium gluconate but is not as effective as a treatment for HF contamination. The current recommendations from industry on first-aid for HF burns favor maintaining calcium gluconate for first-aid purposes.

4.10 Detection and Monitoring

The plant has few or no static detection and monitoring stations for hazardous chemicals used or existing in the facility which include H_2, NH_3, and HF. Apparently, the plant has a portable radioactivity monitor and a hand-held draeger tube analyzer for NH_3. The plant has also installed smoke detectors in the UF_6 building to detect potential leakage of UF_6, UO_2F_2, and HF. It appears that the plant personnel have a perception that olfactory sensing of chemical releases is an "adequate" alternate monitor for detecting airborne hazardous chemicals such as HF and NH_3. This approach is contrary to the use of more reliable detecting and monitoring devices such as ammonia detectors and HF monitors. A person's sense of smell does get desensitized over time.

The hazards presented by potential HF releases and the potential for dissociated ammonia providing a source for a hydrogen cloud to be released within the building and finding a source of ignition (there are open flames on drying ovens) are two areas which indicate that detection and monitoring needs should be evaluated further as the plant builds its chemical safety program. The potential for ammonia release at the tank area or through underground piping is another area where release detection decisions may need to be made. Given the right conditions, a cloud of ammonia could potentially enter the control room through the ventilation system, and affect the operators controlling operations of the licensed nuclear materials.

4.11 Audits and Inspections of Chemical Safety Program

The plant does not perform self audits on the chemical safety program regularly throughout the year. There are audits of other areas that may impact on chemical safety. These include quarterly criticality and radioactivity audits, bi-annual, and annual safety audits. The findings resulting from the audits are documented as exception reports instead of full-blown audit reports.

The site management was asked on what frequency audits should be conducted for the chemical safety program and they were confident that a yearly schedule would be adequate. Maintaining audit records for three to five years seemed a reasonable time to plant management.

5.0 DISCUSSIONS AND SUMMARY

In summary, it appears that some of the elements of the CSP have been covered in detail while others are in various stages of completion, ranging from total lack of formal written information to partial documentation. SAIC refrains from commenting on the adequacy of CE's CSP program since it is the only point of reference that is available to-date.

Some of the CSP elements that may require major revision or a whole new program include:

Hazard Identification and Assessment
Process Safety Information
Detection and Monitoring
Maintenance

Some elements that could be improved but may not need as extensive a revision as those above include:

Site Wide Safety Procedures
Management of Change
Incident Investigation
Audits and Inspections of Chemical Safety Program

Elements that may need only minimal improvement include:

Operating Procedures
Training
Emergency Response

APPENDIX A: INFORMATION GATHERING FORM

INFORMATION GATHERING FORM

CHEMICAL SAFETY PROGRAM

COMBUSTION ENGINEERING, HEMATITE PLANT
HEMATITE, MO

OCTOBER 18 - 21, 1993

1. Hazard Identification & Assessment			
	Where Maintained:	**By Whom:**	**Notes:**
1. What is considered as a chemical hazard in the context of licensed nuclear material operations?			Not clearly defined - will need to spell out clearly Chemical hazards have not been adequately addressed within the ISAP process.
2. What are the methods used to identify a chemical hazard? a. Incident history b. Similar industrial history	Hal Eskridge's office	Hal Eskridge	May need to document in some detail to make sure that it will continue to be available and used in case Hal is not available. At present, methods are not formally documented.
3. Is there a formal procedure to assure that the hazard assessment is appropriate to the complexity of the process			No formal process - project manager's decision. Frequency of ISAP is not set. Modifications: The plan only focused on the Safety issues associated with the change in the process. Need to look at high hazard areas on a more routine basis.

1. Hazard Identification & Assessment (Continued)

	Where Maintained:	By Whom:	Notes:
4. Hazard Assessment Methodologies: a. HAZOP b. What If? c. Checklist d. FMEA e. Fault tree Analysis f. Others			Integrated Safety Assessment Program (ISAP) is not a formal process. The methodology for conducting the ISAP is chosen by the project manager. Some of the earlier ISAPs have been conducted using "Fault Tree Analysis-type" and "What-If?-type" methodologies.

1. Hazard Identification & Assessment (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
5. Does the hazard assessment address the following? a. Hazards of the process b. Previous incidents c. Engineering and administrative controls d. Consequence of failure of engineering and administrative controls? e. Human factors f. Facility Siting			Documentation is not complete. Also, a composite assessment was made. So each item may not have been specifically addressed. a. Yes b. Yes c. Yes d. Yes e. Not specifically addressed f. Not specifically addressed
6. Hazard assessment team make-up:			There is no formal process in place to select the team. Team members are generally selected from the Safety Committee as needed. The Safety Committee includes persons from the top two rows of the Organization Chart, as well as other members selected on a case-by-case basis, as their expertise might be required. The Safety Committee has representation from all areas of operation in the facility.

1. Hazard Identification & Assessment (Continued)

	Where Maintained:	By Whom:	Notes:
7. Recommendation documentation and resolution: a. act in a timely manner b. document actions taken c. complete actions as soon as possible d. develop schedule for completion e. communicate to affected organizations within the plant			These are addressed under Management of Change issues

2. **Process Safety Information**			
	Where Maintained:	**By Whom:**	**Notes:**
1. Equipment List			No. Equipment list has not been maintained and is no longer current. NOTE: In 1994, per NRC's configuration control, the plant will commit design time to bring most of the PSI up-to-date.
2. Instrument List			No. A current instrument list does not exist
3. Pipeline List			No. A current piping list does not exist Only replacement-in-kind made
4. Process Flow Diagrams		Process engineer	Process Flow Diagrams exist. However, Material & Energy Balances are not available
5. Process Chemistry		Process engineer	Process Chemistry exists for the oxide unit, but not for the rest of the plant.

2. Process Safety Information (Continued)

	Where Maintained:	By Whom:	Notes:
6. Piping & Instrumentation Diagrams		Bob Griscom	The P&IDs are not current. Most of the P&IDs exist as red-line drawings. The plant intends to update drawings in Spring '94.
7. Site Plans and Topography		Bob Griscom, Hal Eskridge	Site plans exist
8. Equipment Specifications			The plant was built in 1967. Original specifications no longer exist. Generally, only replacement-in-kind.
9. Piping Specifications			" "
10. Instrument Specifications			" "

2. Process Safety Information (Continued)

	Where Maintained:	By Whom:	Notes:
11. Interlock and Logic Diagrams			Interlock (both hard & soft) diagrams are available, but logic diagrams may not be available
12. Fire Water System			Information on fire water systems is available
13. Electrical Area Classification			No hazardous area - general classification area only. Electrical one-line diagrams should be available; they don't know where
14. Protective System Design and Specifications			Design or detailed specifications do not exist. General specifications - based on thermal or pressure relief exist

3. Operating Procedures Written SOPs

	Where Maintained:	By Whom:	Notes:
1. Initial Startup		Process engineer	Yes, available
2. Normal Operations		" "	Yes, available
3. Temporary Operations			Plant does conduct temporary operations through the use of a "traveller". Generally self-limited due to the nature of the "traveller" issued which limits the time allowed for that particular temporary operation.
4. Emergency Shutdown			Yes, available
5. Conditions Requiring Emergency Shutdown - Responsibility			Yes, available

3. Operating Procedures Written SOPs (Continued)

	Where Maintained:	By Whom:	Notes:
6. Emergency Operations			Yes, available
7. Normal Shutdown			Yes, available
8. Startup Following Turnaround or Emergency Shutdown			Yes, available
9. Operating Limits		Process engineer	Process Operating Parameters (POP) sheet. At the start of every shift, the operator is given the POP sheet with that shift's operating parameters.
10. Consequences of Deviation			Detailed consequences listed in the SOPs

3. **Operating Procedures Written SOPs** (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
11. Corrective Actions for Deviations or to Avoid Deviations			Need more information. Yes, it started from a note, then there is a section for responding to the deviation
12. Personal Safety and Health Considerations a. Properties and hazards of materials. b. Personal Protective Equipment Required, Engineering Controls and Administrative Controls to Prevent Exposure c. Control Measures if Physical Contact Occurs d. Quality Control and Inventory Control e. Special or Unique Hazards			a. Yes b. Yes c. Yes, but included in the Plant Wide Safety Procedures, and not in each SOP d. Yes e. Yes

3. **Operating Procedures Written SOPs** (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
13. Safety Systems and their Functions			Functions of safety systems covered in training. Their operation explained in OS. Alarms - operating system and not design system
14. Accessibility of SOPs to Employees			Yes - Accessible to operator. Each section has its own SOP. SOP and checklist available in the Control Room. Operators do not have their own copies of the SOP. Checklist is made by factory manager, who also approves the SOPs. The factory manager ensures that both SOP and Checklist are current
15. Review Frequency of SOPs and Certification of Currency			Every two years - license requirements
16. Preparation of Equipment for Maintenance			Specific rule - equipment and lines are to be cleaned, e.g. with nitrogen purge, before turning equipment to maintenance. This ensures that maintenance personnel do not "see" the process chemicals. "Travellers" are issued to cover special, non-routine jobs.

3. Operating Procedures Written SOPs (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
17. Inspection of Maintenance Work Prior to Restart			Normally, maintenance will test their work after completing any repair work. High hazard areas have special procedures for testing prior to start up, e.g. extensive checks & pressure testing in oxide area. Formal transfer of responsibility between maintenance and operations is handled through work orders.
18. Sampling Procedures			Included in the SOPs
19. Logsheets and Checklists			POP sheet handled differently than the normal checklist. Normal checklists include those used in walkthrough inspections

4. Site Wide Safety Procedures			
	Where Maintained:	**By Whom:**	**Notes:**
1. Hotwork Procedures			Yes - only applicable to activities that could lead to fire or spark. Permits required for cutting & welding operations. The Health Physics Technician is on floor all the time. There is no special electrical classification. Radiation hazards are covered under special travellers.
2. Confined Space Entry Permits			Special "travellers" are issued by the process engineer for this purpose, but nedd to be signed off by other departments, including the Safety Department. New procedure being written to comply with new OSHA regulation conce~ning Confined Space Entry.
3. Lock Out, Tagout Procedures			Yes, they exist - All locks controlled by maintenance
4. Opening Process Equipment			Nitrogen purge on lines before opening.
5. Contractor Program Management			Minimal use of contractors at the facility. OS-220 covers contractor program. Contractors are escorted at all times unless in a clear area.

4. Site Wide Safety Procedures (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
6. Contractor Safety Training and Documentation			Yes. General orientation and safety training is conducted by the safety department. Contractor furnishes detailed specifications for the material brought into the plant, but normally material is bought by the plant. Control of access into the facility is strictly enforced. Unrestricted access requires 2 hrs of training in emergency procedures and restricted access may require 45 mins - 1 hr training.
7. Contractor Safety Performance Reviews			None conducted
8. Contractor Safety Logs			None right now

5. Training			
	Where Maintained:	By Whom:	Notes:
1. Operator Training Program in Place?			Yes - 2 weeks Safety Indoctrination and 2 weeks process training, then hands-on training (i.e. assigned to senior, experienced operator). Tests on classroom training conducted during first 4 weeks of training. Process training are more flexible - oral tests, depend on the individual process trainer (The operator we spoke to had only 2 days of in-class process training, instead of 2 weeks)
2. Skills and Training Requirements Identified for Each Job Classification /Assignment?			No certification by NRC, State, etc. required No skills & training requirements specified for each job classification/ assignment. Most operators have at least one year college
3. Selection and Qualifications of Training Instructors?			Senior process engineer trains the operators on the job. The Regulatory Compliance Manager informally measures the instructor's skills and qualifications. (Not required by OSHA/EPA). NRC requires certification that operator is medically fit.
4. Initial Training - Basic Skills - Job Specific - Safety Procedures - Process Overview (Certification in lieu of initial training)			All these areas are covered, such as safety, chemistry, etc. There is one quiz in the indoctrination training procedure. Currently, no certification in lieu of initial training.

5. **Training** (Continued)	**Where Maintained:**	**By Whom:**	**Notes:**
5.1 Refresher Training			Radiation & criticality refresher - biennial. Annual training provided for operators that transfer back from another operation, but no refresher for operator remaining on the same job.
5.2 Employee Input on Frequency of Refresher Training			Employee input was used to change frequency of criticality training from annual to biennial.
6. Emergency Response Training			Included in ERP - see plan for details
7. Procedure for Establishing Skills/Training Requirements			No formal procedure to establish skills/training requirements. Have established qualifications for more professional positions, but not for the operator level. However, most operators have at least one year of college.

5. **Training** (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
8.1 Classroom Training 8.2 Field Training 8.3 Hands-on Training by Student 8.4 Training on SOP		Document control person	1. Yes 2. Yes - new operator takes over operation one piece of equipment at a time, until he/she can operate the entire section. 3. Yes 4. Yes
9.1 Effectiveness of Training Program 9.2 Feedback for Program Improvement		Document Control Person	Training records exist for each employee as part of personnel records. Effectiveness of the training program determined informally by observation by senior management personnel. Feedback for process improvement is informal.

5. Training: (Continued)

	Where Maintained:	**By Whom:**	**Notes:**
10. Qualification Testing			No
11. Specified Time Periods of Training? Each Job Classification/Assignment?			No

6. Maintenance	Where Maintained:	By Whom:	Notes:
1. All equipment for PM identified?			Yes - have identified critical equipment. Have bought new PM software package (MP2 Datastream) - in the process of making it operational.
2. How is the internal/external inspection frequency determined?			Determined by the maintenance department based on operational history and experience, since original design specifications do not exist for most of the equipment. NDT for UF_6 cylinders done every 5 yrs. Boiler recertified every year
3. How is the frequency of inspection and testing of safety devices (i.e., interlocks, alarms, PSVs, etc.) determined?			From operational history and experience. Original design specifications do not exist for most devices.
4. Commissioning/ decommissioning procedures for all equipment			Such procedures do not exist and there is no plan to develop them, as they are considered unnecessary. If maintenance work is required on any equipment, then operations have to clean the equipment before turning it over to maintenance.

7. **Management of Change** (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
5. Time Required to Complete Change			No specific time frame, except that they try to follow the general rule that all recommendations should be addressed and implemented in a timely fashion.
6. Contractor Safety Training and Documentation			Not specifically addressed
7. Training Required to Complete Change			Not specifically addressed
8. Updating of Process Safety Information			May be part of the future revised procedure

8. Incident Investigation Program			
	Where Maintained:	By Whom:	Notes:
1. Is there a written procedure for incident investigation which includes: a. Which types of incidents and near-misses are investigated? b. What is the timeframe for initiating investigation? c. Are incident investigation teams established?			Supervisor fills out Incident Report form, describing what happened, process equipment involved, the apparent cause, and operator concurrence, to be submitted at the end of the shift. This report is distributed to the Safety Committee. Incidents are classified as "minor", "medium" or "major". Minor incident - open/shut case - no further action required; Medium incident - generally handled by process engineer; Major case - Safety Committee selects investigation team for root cause analysis. (2 - 3 incidents investigated by Safety Committee per year). Timeframe for initiating investigation not specified - but generally ASAP Operations personnel are encouraged to report near misses - an incentive program has been set up. But few persons want to report a near-miss. Most cases are treated on a case-by-case basis. Serious injuries or incidents that involve federal agencies are considered "major incidents".
2. Preparation of incident investigation file and report which includes: a. Date of incident b. Description of incident c. Contributing factors, initiating events and root cause analysis d. Recommendations and finding			Initial report is filled out by the supervisor. Not always - depends on the Safety Committee's determination of whether a detailed analysis is required or not. Closure of the incident is determined by the Safety Committee if an investigation team has been set up for root cause analysis.

8. **Incident Investigation Program** (Continued)			
	Where Maintained:	**By Whom:**	**Notes:**
3. Is there a mechanism for tracking recommendations to completion?		Hal Eskridge	Certain kinds of incidents, such as those regulated by OSHA are tracked by computer. The Safety Committee ensures that recommendations are implemented, in order to correctly apply closure to that incident investigation.
4. Is there a standard review cycle and training program for incident investigation?			There is no formal method for disseminating information gathered during an incident investigation. Some of the information is posted on bulletin-boards and in the company newsletter which devotes a column to address health and safety matters.
5. How long are records maintained?			No fixed time - They feel 3 - 5 years would be acceptable.

9. Emergency Planning			
	Where Maintained:	**By Whom:**	**Notes:**
1. **Is the Written Emergency Response Plan current - How frequently is it updated?**			They have one plan - updated annually. Emergency Plan (EP) is for management. The Emergency Response Procedures (ERP) is a detailed implementation of the EP.
2. **Are all copies on site the same version - What is mechanism to maintain all ERP's current?**			Yes. Tight document control - one person is responsible for ensuring that every time the ERP is updated, all old versions are replaced with the current version. NRC has a copy of both the EP and ERP.
3. **Does the ERP detail steps to be taken to mitigate accidental releases, fires or explosions?**			ERP includes detailed steps to be taken to mitigate accidental releases, fires or explosions. Protective Action Guidelines (PAG) will be developed to provide additional details in mitigating accidents

9. Emergency Planning			
	Where Maintained:	**By Whom:**	**Notes:**
4. Does the plan include: a. evacuation routes or protective actions b. procedures for response to releases including personal protective equipment use c. descriptions of mitigation equipment and systems available d. procedures for informing employees, agencies, and the public			a. Routes are posted thorughout the site. Emergency Director (or next in command, i.e. Plant manager or shift supervisor) has the authority to evacuate the site. b. Yes c. Yes d. Currently being developed as PAG to supplement information available in ERP. Notification of offsite personnel covered in ERP. Emergency responders not trained in OSHA 1910.120. The local fire department does not have a hot line to the plant emergency system and has to be called in, in the event of an emergency.
5. Are written procedures available for the use, maintenance, and inspection of Emergency Response equipment			Health Physics Group is responsible for Emergency Response Equipment. Health & Safety Technicians are trained to use the equipment.

9. Emergency Planning			
	Where Maintained:	**By Whom:**	**Notes:**
6. Is the inspection and maintenance of emergency equipment documented and are records maintained? for how long?			No documentation reviewed - no formal procedure for this.
7. Are first aid and emergency medical procedures addressed in the plan for chemicals			There is no nurse on site. A doctor is on contract at the local hospital who is aware of the various hazards that can occur at the site, and is familiar with the necessary treatment protocol, specifically for HF and ammonia. Gallon bottles of $MgSO_4$ are kept ready for neutralizing HF in case of an accidental release. (This is only for first-aid, until the ambulance arrives).
8. What current Emergency Response Training is provided to employees?			All employees are trained in the use of fire extinguishers. All employees undergo training in ERP. Responders receive additional training.
9. Are there scheduled drills or emergency exercises? How often? How is this documented?			Drills scheduled on a regular basis. Each year the drill handles a different hazard. After the exercise, ERP is revised to address any shortcomings discovered during the drill.

9. Emergency Planning			
	Where Maintained:	**By Whom:**	**Notes:**
10. Are recommendations and findings from the critiques of drills or exercises documented and is the plan or procedures revised in response to these?			Yes - actions initiated are similar to those from other assessment studies.
11. How is plan coordinated with local emergency planning committees?			Part of the plan is coordinated with the LEPCs. New plans are being developed which will feature a full-scale drill every two years that would involve the LEPC and potentially NRC. NOTE: Nearest resident - about 190 m away, but on a hill.
12. Have release scenarios been analyzed and modeled for preparations in case of off-site release? How is this information coordinated with ERP?			Not many scenarios involve offsite consequences. They have considered an ammonia release scenario.

9. Emergency Planning	Where Maintained:	By Whom:	Notes:
13. What on-site communication system(s) are used for emergency notification?			An alarm system is used for emergency notification. The PA system is not considered part of the notification system.
14. Is there an alarm which provides distinctive warning for each type of incident on site?			Yes
15. What type of monitoring and detection devices are available to determine airborne concentrations around a release? Who is trained to use these?			Hand-held devices available to detect radiation. Nothing available for HF or ammonia - the presence of HF is a certainty, given the presence of uranyl fluoride. HF reacts with atmospheric moisture to form drofluoric acid. Health Physics department is trained to use the monitoring and detection devices available.

9. Emergency Planning			
	Where Maintained:	By Whom:	Notes:
16. How is the Incident Command Center and procedures for managing incidents addressed?			Incident Command Center is located at the Barn, in the event of a major accident. Otherwise, it would be located in the front office.

10. Detection and Monitoring			
	Where Maintained:	**By Whom:**	**Notes:**
1. Is there a site diagram showing all leak detection devices on site?			No - there is no site diagram showing all the leak detection devices on site. Also, there are very few monitoring points site-wide.
2. What types of detection and monitoring are provided for? a. toxic releases b. explosivity c. fires, smoke, and excessive heat			a. Radiation detectors are provided. Smoke detectors are available for det[illegible]ing presence of HF cloud and uranyl fluoride. b. No c. Smoke detectors in the ventilation system. Sprinkler system in combustible storage area, warehouse None in the furnace area.

10. Detection and Monitoring (Continued)

	Where Maintained:	By Whom:	Notes:
3. What is the frequency of personal monitoring of process equipment as opposed to control room monitoring?			One of the two operators is in the control room about 75% of the time. There are very few local monitors or controls in the field. All important control devices and monitors are displayed on the DCS.
4. What is the logic in deciding which monitors sound alarms versus which activate automatic active mitigation system (i.e., water curtains, deluge, foam, etc.)?			Interlock system is designed on a fail safe philosophy

11. Audits and Inspections of Chemical Safety Program (CSP)			
	Where Maintained:	By Whom:	Notes:
1. Is there a periodic examination of the management systems and safety management program?			Yes - plant walkthrough by both technicians and management about 1 - 3 times per week. Any abnormalities are reported in the form of exception reports. Plant management complained about onerous report writing which took away time from performing safety checks. In the past, walkthroughs were conducted on a daily basis, but now with personnel being reassigned to report writing, fewer resources are available.
2. How often are audits conducted?			Quarterly audits on all aspects of safety as per license requirements. Corporate team audits on an annual basis. Safety audits every six months.
3. How are they documented?			Exception reports
4. Are recommendations from the audits tracked to completion? How?			Any item not addressed and corrected by the next audit will be flagged.
5. How long are audits reports maintained?			Between 3 - 5 years.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Docket No. 40-8794
License No. SMB-1408

JAN 14 1994

Molycorp, Inc.
ATTN: Robert B. Brown
Plant Manager
350 N. Sherman Street
York, Pennsylvania 17403

Dear Mr. Brown:

SUBJECT: RADIOACTIVITY IN LEAD CARBONATE

The purpose of this letter is to respond to your May 12, 1993 and September 9, 1993, letters regarding the disposition of 11,000 pounds of lead carbonate contained in 16 drums at the Molycorp Inc. (Molycorp) facility in York, Pennsylvania. According to your May 12th letter, Molycorp considers this material "Naturally Occurring Radioactive Material" (NORM), because the uranium and thorium content of this material is below 0.05 weight percent. Based on this designation, Molycorp believes that this material is not "Mixed or Low-Level Radioactive" waste and does not require disposal at a low-level radioactive waste disposal site or preclude the transfer of this material to an unlicensed recycler. Molycorp considers the lead carbonate to be RCRA hazardous waste (D008 under 40 CFR 261.24) due to its lead content.

In the Nuclear Regulatory Commission staff's view, this material results from a licensed process and is waste or material subject to the disposal or transfer regulations in 10 CFR Parts 20 and 40. The 11,000 pounds of lead carbonate are the residuals from processing source material licensed under 10 CFR Part 40. The question that needs to be addressed is whether the content of uranium and thorium in the lead carbonate is low enough to permit its release from NRC regulatory control.

If Molycorp were to dispose of this material, the residual radioactivity levels that normally provide the basis for the release of uranium and thorium in soils are contained in NRC 1981 Branch Technical Position (BTP), "Disposal or Onsite Storage of Thorium or Uranium Waste from Past Operations." If the residual concentrations of uranium and thorium are below the BTP's Option 1 level, then the material may generally be considered suitable for unrestricted use. The Option 1 level for natural uranium and thorium is 10 pCi/g; the concentration level for depleted uranium is 35 pCi/g. The analytical results referred to in your September 9, 1993, letter indicate that the concentration of natural uranium (^{238}U, ^{234}U, and ^{235}U) in the lead carbonate is 49.7 pCi/g and that the concentration of natural thorium is less than 1 pCi/g. Therefore, the thorium concentrations in the lead carbonate meet the Option 1 level. However, the uranium concentration exceeds the Option 1 level. Further, the concentration of ^{210}Pb is elevated relative to the ^{238}U and ^{234}U concentrations indicating that the uranium decay products are not in equilibrium. With the exception of ^{210}Pb, the daughter products of uranium have low concentrations. The BTP states that the concentration level for

NH17 1/1
Delete: ACNW

NRC FORM 383 (11-88)

U.S. NUCLEAR REGULATORY COMMISSION

CALCULATION WORKSHEET

PROJECT	CALCULATED BY	DATE
Molycorp - York	MW	12/23/93
DOCKET NUMBER: 40-8794 — SUBJECT: Release of $PbCO_3$ with elevated ^{210}Pb concentration	CHECKED BY	DATE

^{210}Pb in Molycorp-York's $PbCO_3$ = 42 pCi/g [65 pCi/g in Pb metal]*

What would the dose be to someone who might inhale or ingest the lead after it has been recycled and reduced in metallic form (e.g., Pb sheet, battery, solder)?

I. INHALATION DOSE

Assume the Pb in the $PbCO_3$ was diluted 10:1 in producing the Pb metal; the resulting concentration of ^{210}Pb would be reduced by a factor of 10 to yield

$65\ pCi/g / 10 = 6.5\ pCi/g$ ^{210}Pb in blended Pb metal

Assume the material was used in soldering by a member of the public who solders for 2 hr a week for an entire year. In the absence of information on Pb volatility + suspension in soldering applications, assume that air mass loading factor is no greater than that for a dusty commercial operation at 100 mg/m³. Given these assumptions, the annual committed effective dose equivalent would be projected as follows:

$(2\ hrs/wk)(52\ wk/yr) = 104\ hr/yr$

$(104\ hr/yr)(100\ mg/m^3)(1.2\ m^3/hr)\left(\frac{g}{1000\ mg}\right)\left(\frac{6.5\ pCi}{g}\right) = 81.1\ pCi/yr$

(exposure duration; mass loading; breathing rate; activity concentration)

Using Table 2.1 of Federal Guidance Report #11 (EPA/520/1-88-020),

Inhalation of 81.1 pCi/yr of ^{210}Pb would result in a CEDE (50 yr) of 1.36E-2 mrem/pCi or

$(3.67E\text{-}6\ Sv/Bq)(3.7E9\ mrem/Ci) = 1.36E4\ mrem/\mu Ci = 1.36E\text{-}2\ mrem/pCi$

$81.1\ pCi/yr \times 1.36E\text{-}2\ mrem/pCi = 1.1\ mrem/yr$ ✓

Increasing the exposure time by 1 order of magnitude (up to 20 hrs/wk) would still result in a projected dose far below NRC's public dose limit of 100 mrem/yr in 10 CFR 20.1301(a). The toxic effects from inhalation of the Pb would probably far exceed the significance of any radiological effects from the ^{210}Pb.

NRC FORM 383 (11-88)

U.S. NUCLEAR REGULATORY COMMISSION

CALCULATION WORKSHEET

SHEET 2 OF 3

PROJECT	CALCULATED BY	DATE

DOCKET NUMBER	SUBJECT	CHECKED BY	DATE

footnote for rs-1

* Assume $PbCO_3$ is essentially pure $PbCO_3$ (no impurities);
∴ molecular weight is 207 g/mole 12 g/mole 3(16 g/mole) or 267 g/mole.
Of the 267 g/mole, the Pb accounts for 207 g/mole ~ 77%.

Consequently, the activity concentration of ^{210}Pb in the lead carbonate must be adjusted to reflect the conversion of the $PbCO_3$ to Pb metal.

If [^{210}Pb] in $PbCO_3$ is ~ 50 pCi/g, then the [^{210}Pb] will increase in the Pb metal by $\frac{1}{0.77}$ or approximately 30%. Consequently, the projected [^{210}Pb] in lead metal without dilution by blending w/ scrap lead would be ~ 65 pCi/g.

It is important to note that the assumed mass loading factor of 100 mg/m³ Pb in breathing zone air **far exceeds** the Pb exposure limit for work places of 0.05 mg/m³, the NIOSH standard of <0.1 mg/m³ (10 hr TWA), and the ACGIH (American Conference of Industrial Hygienists) level of 0.15 mg/m³. If the airborne lead level were maintained to 0.15 mg/m³, the resulting annual dose to a worker (2000 hrs/yr) would be, assuming all other conditions described above,

Ref NIOSH Pocket Guide to Chemical Hazards, HHS, September 1985, Publication No 78-210.

$$= (2000\ hrs/yr)(0.15\ mg/m^3)(1.2\ m^3/hr)\left(\frac{g}{1000\ mg}\right)(65\ pCi/g)(1.36E\text{-}2\ mr/pCi)$$

$= 0.032$ mr/yr CEDE.

NRC FORM 383 (11-88)

U.S. NUCLEAR REGULATORY COMMISSION

CALCULATION WORKSHEET

SHEET 3 OF 3

PROJECT	CALCULATED BY	DATE

DOCKET NUMBER	SUBJECT	CHECKED BY	DATE

II INGESTION DOSE

FOR INGESTION DOSE, ASSUME THAT THE $PbCO_3$ IS SHIPPED FOR RECOVERY TO A Pb FABRICATOR, BUT NEVER USED. CONSEQUENTLY, IT REMAINS AS A PILE ONSITE. AT SOME POINT, THE RECOVERY FACILITY CLOSES + BECOMES A RESIDENTIAL PROPERTY WITHOUT ANY REMEDIATION. ASSUME AN ADULT EATS 50 mg/dy OF THE SOIL THAT CONTAINS THE $PbCO_3$ AT AN ACTIVITY CONCENTRATION OF ~ 50 pCi/g.

THE RESULTING ANNUAL CEDE WOULD BE:

Dose Conversion Factor from Table 2.2 of EPA-520/1-88-020

$(1.45E\text{-}6\ Sv/Bq)(3.7E9\ \text{mrem/Sv} \ldots)$

$= 5.37E3\ \text{mrem}/\mu Ci$

$= 5.37E\text{-}3\ \text{mrem/pCi}$

$$= (50\ mg/dy)\left(\frac{365\ d}{yr}\right)\left(\frac{g}{1000\ mg}\right)\left(\frac{50\ pCi}{g}\right)\left(\frac{5.37E\text{-}3\ mrem}{pCi}\right)$$

$= 4.9$ mr/yr CEDE

THIS SCENARIO IS FAR-FETCHED BECAUSE IT IS HIGH LIKELY THAT REMEDIATION OF THE SITE TO ADDRESS AMBIENT Pb CONTAMINATION (NOT ASSOCIATED W/ THE CONTAMINATED $PbCO_3$) WOULD INCLUDE DISPOSAL OF THE $PbCO_3$ IN A HAZARDOUS WASTE LANDFILL OR REUSE / RECOVERY OF THE Pb AS DESCRIBED IN SECTION I. NEVERTHELESS, THE PROJECTED DOSE FROM DIRECT INGESTION OF THE $PbCO_3$ AS DESCRIBED ABOVE IS A SMALL FRACTION OF THE NRC PUBLIC DOSE LIMIT IN § 20.1301(a).

III CONCLUSION

THEREFORE, RELEASE OF THE $PbCO_3$ CONTAMINATED WITH UP TO 50 pCi/g of ^{210}Pb, UNDER OPTION I (for Uranium at 35 pCi/g) OF NRC'S 1981 BRANCH TECHNICAL POSITION, FOR RECOVERY OF THE Pb VALUES SHOULD NOT POSE A SIGNIFICANT RADIOLOGICAL RISK FROM POTENTIAL INGESTION OR INHALATION OF THE ^{210}Pb AS DESCRIBED ABOVE.

Inhalation Dose is in the range of 0.02% 11 mrem/yr; Ingestion Dose in the range of 5 mr/yr } UNDER CONSERVATIVE CONDITIONS

equilibrium. With the exception of ^{210}Pb, the daughter products of uranium have low concentrations. The BTP states that the concentration level for natural thorium and uranium wastes containing daughters not at equilibrium can be calculated on a case-by-case basis using the applicable isotopic activities data.

Based on our September 30, 1993 telephone conversation, we understand that Molycorp now proposes to remove additional uranium from the lead carbonate. If Molycorp reduces the uranium concentration in the lead carbonate to a level below 35 pCi/g and demonstrates that these concentrations are As Low As Reasonably Achievable (ALARA), NRC would consider the release of this material to an unlicensed processor for lead recycling. After removing additional uranium from this material, Molycorp should provide NRC with the analytical results demonstrating that the concentration of uranium is below 35 pCi/g and ALARA. Molycorp may also need to consult with the U.S. Environmental Protection Agency or State and obtain the necessary approval for its plans to process and dispose of any residual with a hazardous component.

If you have any additional questions concerning this matter, please do not hesitate to contact me on 301-504-2546.

Sincerely,

/s/

Chad Glenn, Project Manager
Decommissioning and Regulatory
Issues Branch
Division of Low-Level Waste Management
and Decommissioning
Office of Nuclear Material Safety
and Safeguards

cc: R. Benvin, PA-DER
J. Kinneman, NRC Region I

In small Box on "OFC:" line enter: C = Cover E = Cover & Enclosure N = No Copy

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natural thorium and uranium wastes containing daughters not at equilibrium can be calculated on a case-by-case basis using the applicable isotopic activities data.

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In regard to the elevated ^{210}Pb concentrations, we believe that it does not present a radiological concern when blended with uncontaminated lead based on the enclosed conservative analysis. However, in addition to the above conditions, our approval for the release of this material is contingent upon your informing the lead processor of the ^{210}Pb concentrations and informing them that NRC does not believe the concentrations present a radiological concern provided that the ^{210}Pb is diluted with uncontaminated lead by a factor of 10. Given the conditions outlined in this letter, the transfer of this material to an unlicensed processor is hereby authorized under 10 CFR 40.51(b)(7).

Please inform us if these conditions are acceptable to you.

Sincerely,

Original Signed By

Chad Glenn, Project Manager
Decommissioning and Regulatory
Issues Branch
Division of Low-Level Waste Management
and Decommissioning
Office of Nuclear Material Safety
and Safeguards

cc: R. Benvin, PA-DER
J. Kinneman, NRC Region I

OFC	LLDR*		LLDR*		LLDR*		OGC*		LLDR	E
NAME	CGLENN/CV		JCOPELAND		MWEBER		RFONNER		JAUSTIN	
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