CHEMETRON CORPORATION
c/o SUNBEAM/OSTER COMPANY, INC.
TWO OLIVER PLAZA
PITTSBURGH, PENNSYLVANIA 15222

October 1, 1990

Document Control Desk
United States Nuclear Regulatory
Commission
Washington, D.C. 20555

Re: License No. SUB-1357

Gentlemen:

In accordance with 10 C.F.R. §40.43, Chemetron Corporation, the licensee in the captioned matter, requests renewal of its License No. SUB-1357 which authorizes the possession of depleted uranium in the form of uranium oxide contamination at the Harvard and Bert Avenue sites in Newburgh Heights, Ohio. In support of the request for renewal is an executed copy of NRC Form 2. The purpose of such license extension is to permit decontamination and release of the Harvard and Bert Avenue sites in accordance with remediation plans presently under development.

License No. SUB-1357 was revised in its entirety on October 1, 1987 to authorize, inter alia, the possession of depleted uranium in the form of uranium oxide contamination. On January 10, 1990, pursuant to Chemetron's application dated September 28, 1989, the Nuclear Regulatory Commission ("NRC") approved and issued Amendment No. 1 to the October 1, 1987 license revision. In pertinent part, Amendment No. 1 provided for the extension by one year of the decontamination activities at the Harvard and Bert Avenue sites. The expiration date of the license, as amended, is October 31, 1990. Our intent is to expeditiously decommission the sites; however, to permit maximum flexibility and recognizing the uncertainties associated with the decommissioning effort, the maximum term of five years is requested for the renewal license.

The additional time afforded by the renewal of the license is required, inter alia, because of the significant increase in volumes of contaminated soil identified since the last license extension, the complexity of the characterization, and the remediation activities confronting the licensee. In this regard, the enclosed application for license renewal contains a revised preliminary schedule for characterization and remediation of the Harvard and Bert Avenue sites.

Because of these factors and the necessity for the licensee to take a more active role in site remediation efforts, Chemetron has made project management changes to enhance the remediation efforts. These changes were described during a meeting with the NRC on August 16, 1990 and in a submittal entitled "Request for Consent to the Transfer of Control Over License No. SUB-1357" dated August 31, 1990 ("Request for Consent"), and are reflected in the attached NRC Form 2.

On September 11, 1990, the NRC consented, subject to certain provisions, to the acquisition of control over Chemetron Corporation by Sunbeam/Oster Company, Inc. as requested on August 31, 1990. Provision 4 of that consent requires the submission of an application for renewal of License No. SUB-1357 on NRC Form 2 no later than October 1, 1990. This letter and its attachments respond to that provision of the NRC's consent to transfer. Provision 4 of the September 11, 1990 letter also required the submittal of a site decommissioning funding plan as part of the license renewal application in accordance with 10 C.F.R. §40.36(c)(2). Attachment 1, which is made a part of the license renewal request, responds to that portion of Provision 4 and 10 C.F.R. §40.36(c)(2).

Pursuant to 10 C.F.R. §170.31, enclosed is a check in the amount of $600.00 for processing the renewal application.

Sincerely,

Michael G. Lederman

Michael G. Lederman
President
Chemetron Corporation

cc: Regional Administrator
Region III

9C. VENTILATION EQUIPMENT WHICH WILL BE USED IN OPERATIONS WHICH PRODUCE DUST, FUMES, MISTS, OR GASES, INCLUDING PLAN VIEW SHOWING TYPE AND LOCATION OF HOOD AND FILTERS, MINIMUM VELOCITIES MAINTAINED AT HOOD OPENINGS AND PROCEDURES FOR TESTING SUCH EQUIPMENT.

See Supplemental Sheet 9

10. DESCRIBE PROPOSED PROCEDURES TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE AND PROPERTY AND RELATE THESE PROCEDURES TO THE OPERATIONS LISTED IN ITEM 7; INCLUDE:

A. SAFETY FEATURES AND PROCEDURES TO AVOID NONNUCLEAR ACCIDENTS, SUCH AS FIRE, EXPLOSIONS, ETC., IN SOURCE MATERIAL STORAGE AND PROCESSING AREAS

The requested information is contained in the Dames and Moore Health and Safety Plan which is attached hereto as Exhibit 10-1; see also Exhibit 9-1.

B. EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE SOURCE MATERIAL

See NES Radiological Control Plan, Section 8, attached as Exhibit 9-1.

C. DETAILED DESCRIPTION OF RADIATION SURVEY PROGRAM AND PROCEDURES

See NES Radiological Control Plan, Section 7, attached as Exhibit 9-1.

11. WASTE PRODUCTS

A. QUANTITY AND TYPE OF RADIOACTIVE WASTE THAT WILL BE GENERATED

☐ NONE WILL BE GENERATED

☒ SEE ATTACHED SUPPLEMENTAL SHEET See Supplemental Sheet 11

B. DETAILED PROCEDURES FOR WASTE DISPOSAL

12. IF PRODUCTS FOR DISTRIBUTION TO GENERAL LICENSEES OR TO THE GENERAL PUBLIC UNDER AN EXEMPTION CONTAINED IN 10 CFR 40 ARE TO BE MANUFACTURED, USE A SUPPLEMENTAL SHEET TO FURNISH A DETAILED DESCRIPTION OF THE PRODUCT, INCLUDING:

A. PERCENT SOURCE MATERIAL IN THE PRODUCT AND ITS LOCATION IN THE PRODUCT.

B. PHYSICAL DESCRIPTION OF THE PRODUCT INCLUDING CHARACTERISTICS, IF ANY, THAT WILL PREVENT INHALATION OR INGESTION OF SOURCE MATERIAL THAT MIGHT BE SEPARATED FROM THE PRODUCT.

C. BETA AND BETA PLUS GAMMA RADIATION LEVELS (Specify instrument used, date of calibration and calibration techniques used) AT THE SURFACE OF THE PRODUCT AND AT 12 INCHES.

D. METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT.

N.A.

13. CERTIFICATE
(This must be completed by the applicant)

The applicant and any official executing this certificate on behalf of the applicant named in item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 40, and that all information contained herein, including any supplements attached hereto, is true to the best of our knowledge and belief.

APPLICANT SIGNATURE	PRINTED OR TYPED NAME	DATE
[signature]	Michael G. Lederman	10/1/90

President, Chemetron Corporation

TITLE OF CERTIFYING OFFICIAL AUTHORIZED TO ACT ON BEHALF OF THE APPLICANT

WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

NRC FORM 2
3-82
10 CFR 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR SOURCE MATERIAL LICENSE

APPROVED BY OMB
3150-0013
EXPIRES 12-31-83

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. LICENSE INFORMATION (Check one)

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NO.
- [X] C. RENEWAL OF LICENSE NO. SUB-1357
- [ ] D. PREVIOUS LICENSE NO.

2. NAME OF APPLICANT

Chemetron Corporation

PRINCIPAL BUSINESS ADDRESS

c/o Sunbeam Oster Company, Inc.
Two Oliver Plaza
Pittsburgh, PA 15222

3. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED

See Supplemental Sheet 3

4. NAME OF PERSON TO BE CONTACTED CONCERNING THIS APPLICATION

See Supplemental Sheet 4

TELEPHONE NUMBER (Of person to be contacted)

5. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED

See Supplemental Sheet 5

6. STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF SOURCE MATERIAL YOU PROPOSE TO RECEIVE, POSSESS, USE, OR TRANSFER UNDER THE LICENSE

A. TYPE	B. CHEMICAL FORM	C. PHYSICAL FORM (Including % U or Th)	D. MAXIMUM AMOUNT AT ANY ONE TIME (Kilograms)
NATURAL URANIUM			
URANIUM DEPLETED IN THE U-235 ISOTOPE	See Supplemental Sheet 6		
THORIUM (Isotope)			

5. MAXIMUM [illegible] (kilograms)

7. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN [illegible] SOURCE MATERIAL [illegible] USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY [illegible], AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES

See Supplemental Sheet 7

8. LIST THE NAMES AND ATTACH A RESUME OF THE TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE OF APPLICANT'S SUPERVISORY PERSONNEL AND THE PERSON RESPONSIBLE FOR THE RADIATION SAFETY PROGRAM (or of applicant if an individual).

See Supplemental Sheet 8

9. DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 7. INCLUDE:
A. RADIATION DETECTION (including film badges, dosimeters, counters, air sampling, and other survey equipment as appropriate; the description of radiation detection instruments should include the instrument characteristics such as type of radiation detected, window thickness, and the range(s) of each instrument).

See Supplemental Sheet 9

B. METHOD, FREQUENCY AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN A. ABOVE, INCLUDING AIR SAMPLING EQUIPMENT (for film badges, specify method of calibrating and processing, or name supplier)

See Supplemental Sheet 9

TABLE OF EXHIBITS AND ATTACHMENTS

Exhibit	**Description**
NRC Form 2	Application For License Renewal
3-1	Harvard Avenue Site Map
3-2	Bert Avenue Site Map
7-1	Preliminary Schedule For Characterization and Remediation
8-1	Curriculum vitae of John P. Englert
8-2	Curriculum vitae of James G. Cline
8-3	Curriculum vitae of Theodore G. Adams
8-4	Curriculum vitae of Francisco Trejo
8-5	Curriculum vitae of William J. Manion
8-6	Curriculum vitae of Leslie "Paul" Terp
8-7	Curriculum vitae of Mitchell Callahan
8-8	Radiation Worker Handbook and Training Manual for Chemetron Corporation
9-1	Radiological Control Plan for Chemetron Corporation
10-1	Health and Safety Plan

Attachment	**Description**
1.	Decommissioning Funding Plan for Chemetron Corporation
2.	Parent Company Guarantee of Sunbeam/Oster Company, Inc.
3.	Letter from Chief Executive Officer of Chemetron Corporation
4.	Letter from Treasurer of Sunbeam/Oster Company, Inc.
5.	Amendment to Standby Trust Agreement

NRC FORM 2

APPLICATION FOR LICENSE RENEWAL

NRC FORM 2 [illegible] 10 CFR 40

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB [illegible]

APPLICATION FOR SOURCE MATERIAL LICENSE

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. LICENSE INFORMATION (Check one)
   - [ ] A. NEW LICENSE
   - [ ] B. AMENDMENT TO LICENSE NO.
   - [X] C. RENEWAL OF LICENSE NO. SUB-1357
   - [ ] D. PREVIOUS LICENSE NO.

2. NAME OF APPLICANT

Chemetron Corporation

PRINCIPAL BUSINESS ADDRESS

c/o Sunbeam Oster Company, Inc.
Two Oliver Plaza
Pittsburgh, PA 15222

3. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED

See Supplemental Sheet 3

4. NAME OF PERSON TO BE CONTACTED CONCERNING THIS APPLICATION — TELEPHONE NUMBER

See Supplemental Sheet 4

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See Supplemental Sheet 5

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A. TYPE	B. CHEMICAL FORM	C. PHYSICAL FORM (Including % U or Th)	D. MAXIMUM AMOUNT AT ANY ONE TIME (Kilograms)
NATURAL URANIUM			
URANIUM DEPLETED IN THE U-235 ISOTOPE	See Supplemental Sheet 6		
THORIUM (Isotope)			

7. MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (Kilograms)

8. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE SOURCE MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES.

See Supplemental Sheet 7

9. LIST THE NAMES AND ATTACH A RESUME OF THE TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE OF APPLICANT'S SUPERVISORY PERSONNEL AND THE PERSON RESPONSIBLE FOR THE RADIATION SAFETY PROGRAM (or of applicant if an individual).

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See Supplemental Sheet 9

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The requested information is contained in the Dames and Moore Health and Safety Plan which is attached hereto as Exhibit 10-1; see also Exhibit 9-1.

B. EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE SOURCE MATERIAL

See NES Radiological Control Plan, Section 8, attached as Exhibit 9-1.

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11. WASTE PRODUCTS

A. QUANTITY AND TYPE OF RADIOACTIVE WASTE THAT WILL BE GENERATED

- [ ] NONE WILL BE GENERATED
- [x] SEE ATTACHED SUPPLEMENTAL SHEET

See Supplemental Sheet 11

B. DETAILED PROCEDURES FOR WASTE DISPOSAL

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D. METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT

N.A.

13. CERTIFICATE
(This must be completed by the applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 40, and that all information contained herein, including any supplements attached hereto, is true to the best of our knowledge and belief.

[signature] | Michael G. Lederman | 10-1-90

APPLICANT'S SIGNATURE | PRINTED OR TYPED NAME | DATE

President, Chemetron Corporation

TITLE OF CERTIFYING OFFICIAL AUTHORIZED TO ACT ON BEHALF OF THE APPLICANT

WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

SUPPLEMENTAL SHEET
RESPONSE TO ITEM 3

1. Facilities and grounds of McGean-Rohco, Inc., 2910 Harvard Avenue, Newburgh Heights, Ohio (see Exhibit 3-1). The site map reflects that the NRC has released a portion of the Harvard Avenue site for unrestricted use (see NRC letter dated October 1, 1987).

2. Grounds of McGean-Rohco, Inc., Bert Avenue between 28th and 29th Streets, Newburgh Heights, Ohio (see Exhibit 3-2).

SUPPLEMENTAL SHEET
RESPONSE TO ITEM 4

1. For management-related issues, the contact is James A. Freeman (615/255-5510).

2. For technical-related issues, the contact is Dr. Barry Koh (301/252-3180).

Chemetron Corporation
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P.O. Box 456
Pittsburgh, PA 15230

SUPPLEMENTAL SHEET
RESPONSE TO ITEM 5

The sole purpose of license renewal is to permit decommissioning and release of the authorized places of use in accordance with remediation plans to be developed and submitted to the NRC.

SUPPLEMENTAL SHEET
RESPONSE TO ITEM 6

Under the renewed license, the licensee would continue to possess depleted Uranium-238 and natural decay products in the form of depleted uranium oxide mixed with soils and rubble in very low concentrations. The contamination resulted from the processing of the depleted uranium into a chemical catalyst.

The existing license contains a possession limit of 2,000 kg of depleted uranium. As part of the development of its site remediation plans the licensee will characterize the existing waste piles and conduct surface and subsurface investigation to define levels and boundaries of contamination. Based upon a preliminary through-put analysis, it appears that amount of depleted uranium may be as high as 5,000 kg. As part of the license renewal and to account for uncertainties inherent in the estimation process, Chemetron requests that a 6,000 kg limit be established under item 6.E. In any event, the licensee is committed to remediation of the licensed sites in accordance with the remediation plans being developed.

Chemetron Corporation
Two Oliver Plaza
P.O. Box 456
Pittsburgh, PA 15230

License No. SUB-1357
(Renewal)
October 1, 1990

SUPPLEMENTAL SHEET
RESPONSE TO ITEM 7

The sole purpose of this license is to permit the decommissioning and release of the sites on which contamination exists. To reach this end, the licensee is preparing remediation plans which will be based on the results of studies of decommissioning alternatives and disposal options.

The remediation techniques will be appropriate to deal with the type and levels of contamination revealed in the site characterization studies. Based upon present knowledge, the most likely techniques are:

1. Excavate, package, transport, and dispose - This method consists of exhuming the contaminated soil and disposing of it and already excavated soils in a licensed landfill.

2. Process to isolate the contaminant and/or the most highly contaminated materials - In this case, mechanical or chemical processes are used to significantly reduce the amount of material that requires off-site disposal.

3. Investigation, design, and analysis - Methods 1 and 2 are combined and the amount of material to be removed, or processed, or otherwise dispositioned is

determined by release limits established from pathways and dose analyses.

4. Decontamination - Large contaminated areas that are easily accessible are decontaminated with the traditional techniques of wiping, washing, chipping, etc.

The alternate remediation techniques will be evaluated after reviewing the characterization data presently being developed. A single technique or a combination will be selected to achieve the objective of site release and license termination commensurate with protection of the public health and safety, and of workers on the site, with cost effectiveness also a significant consideration. The licensee's revised preliminary schedule for characterization and remediation of the Harvard and Bert Avenue sites is enclosed as Exhibit 7-1.

The final methods for accomplishing remediation, including operational and radiological safety considerations, will be discussed in the remediation plans. In the meantime, Chemetron is continuing its program of waste pile characterization and site characterization activities utilizing controls discussed in Items 8 and 9 below.

SUPPLEMENTAL SHEET
RESPONSE TO ITEM 8

Dames and Moore has been assigned the responsibility of Site Manager for purposes of development and implementation of the remediation plan and associated activities. Dames and Moore is a recognized leader in the cleanup of contaminated sites and brings considerable experience to this project for the development and implementation of the remediation plan. The Dames and Moore individuals responsible for this project are John P. Englert and James G. Cline. Their curricula vitae, which were originally provided as Exhibits b-4 and b-5, respectively, of the August 31, 1990 submittal are attached hereto as Exhibits 8-1 and 8-2, respectively. Day-to-day responsibility for site management is assigned to Theodore G. Adams, whose cirriculum vitae is provided as Exhibit 8-3.

Nuclear Energy Services ("NES") remains responsible for site radiological safety and support activities. The current NES employees responsible for radiological safety and support are Francisco Trejo, William J. Manion, Leslie "Paul" Terp and Mitchell Callahan. The resumes of these individuals, all of which had previously been provided, are attached hereto as Exhibits 8-4, 8-5, 8-6 and 8-7, respectively. Mitchell Callahan is designated as the Radiation Safety Officer. The individuals' resumes demonstrate that they have sufficient training and experience to carry out their assigned responsibilities relating to radiological safety.

The training program for individuals working in or frequenting restricted areas is described in the NES Radiation Worker Handbook and Training Manual For Chemetron Corporation attached as Exhibit 8-8.

Chemetron Corporation
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SUPPLEMENTAL SHEET
RESPONSE TO ITEM 9

9.A and B. The facilities and equipment utilized during the decommissioning effort are adequate to protect health and minimize danger to life or property. The Harvard Avenue site has a perimeter fence and locked gates. Access to the area is coordinated with McGean-Rohco, Inc., the owner of the site, which has ongoing operations adjacent to the cleanup area. The Bert Avenue site also has a perimeter fence and locked gates. Chemetron has arranged for security services for off-shift coverage. Diagrams showing the perimeter of the Harvard and Bert Avenue sites are attached as Exhibits 3-1 and 3-2, respectively.

NES has established a program for the handling and control of contaminated material. This program is described in the NES Radiological Control Plan, attached hereto as Exhibit 9-1, and assures that permissible personnel exposure limits will not be exceeded in restricted areas and that the permissible levels of radiation and radioactivity in effluents will not be exceeded in unrestricted areas. Operations involving the handling of radioactive material are set forth in detailed procedures maintained at the site.

The radiation detection and personnel monitoring equipment utilized at the Harvard and Bert Avenue sites is described in the NES Radiological Control Plan, which is attached as Exhibit 9-1. Calibration is described in the Radiological Control Plan For Chemetron Corporation the specific procedure referenced therein (See Exhibit 9-1, Section 7). Personnel monitoring devices are supplied and processed by Landauer, Inc.

9.C. No laboratory activities at the sites create situations involving airborne radioactivity and, thus, this item is not applicable.

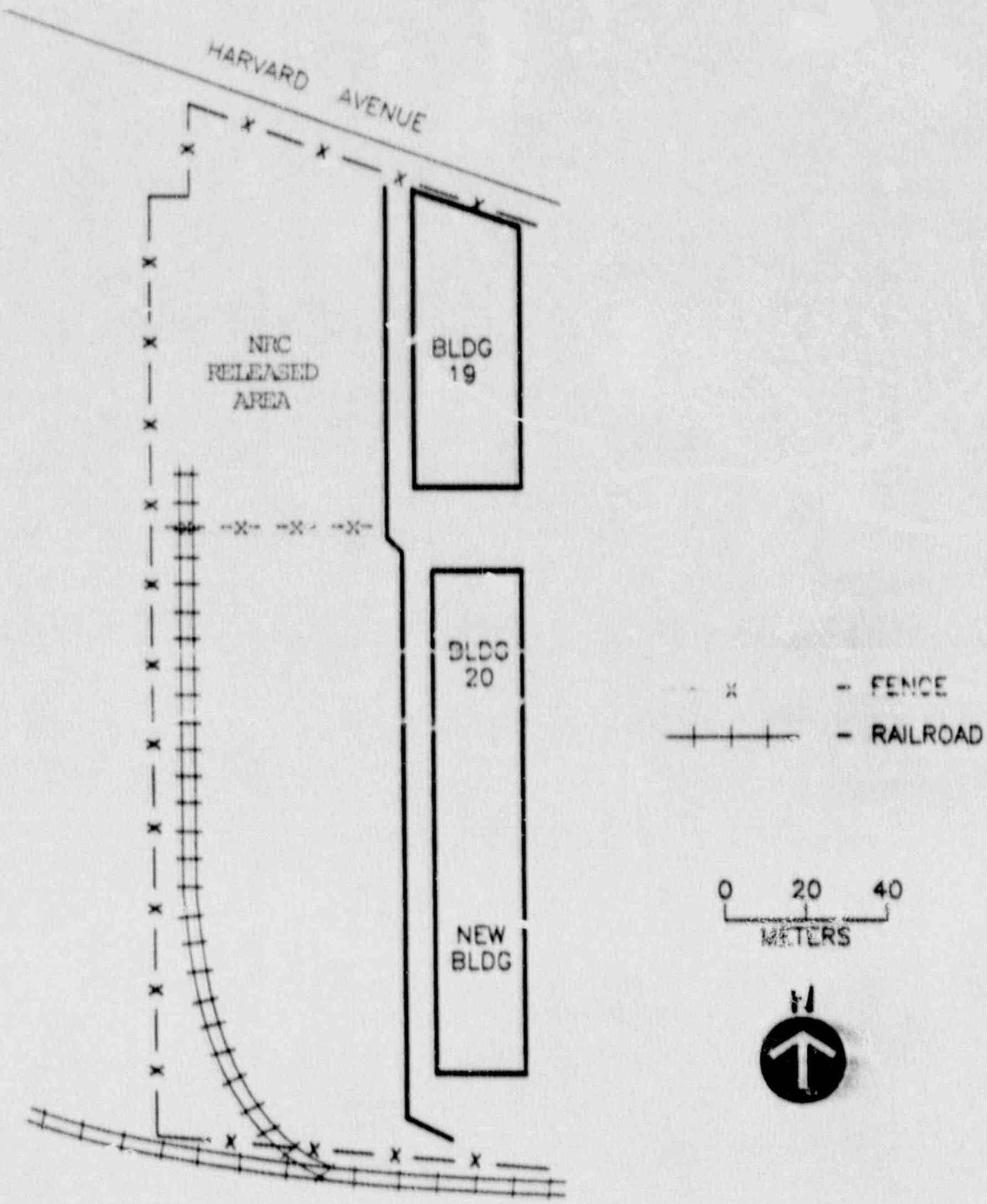
SUPPLEMENTAL SHEET
RESPONSE TO ITEM 11

The purpose of the license renewal is to permit decommissioning and release of the subject sites in accordance with remediation plans to be submitted to the NRC. Already, over 27,000 ft^3 of waste have been shipped offsite for disposal at licensed facility.

One important element of the licensee's site decomissioning effort is to characterize the existing waste piles and the remainder of the site including McGean Building 20. With such studies completed, as part of the decommissioning and disposal option evaluation, various offsite disposal options and soil processing methods will be studied. Other volume reduction techniques will also be explored. The costs and benefits of volume reduction and offsite disposal will be explored in conjunction with an evaluation of alternate site release criteria. Only after such steps have been completed will Chemetron be in a position to estimate the quantity of waste and the detailed procedures to be employed for waste disposal and the remediation plans will be submitted to the NRC.

EXHIBIT 3-1

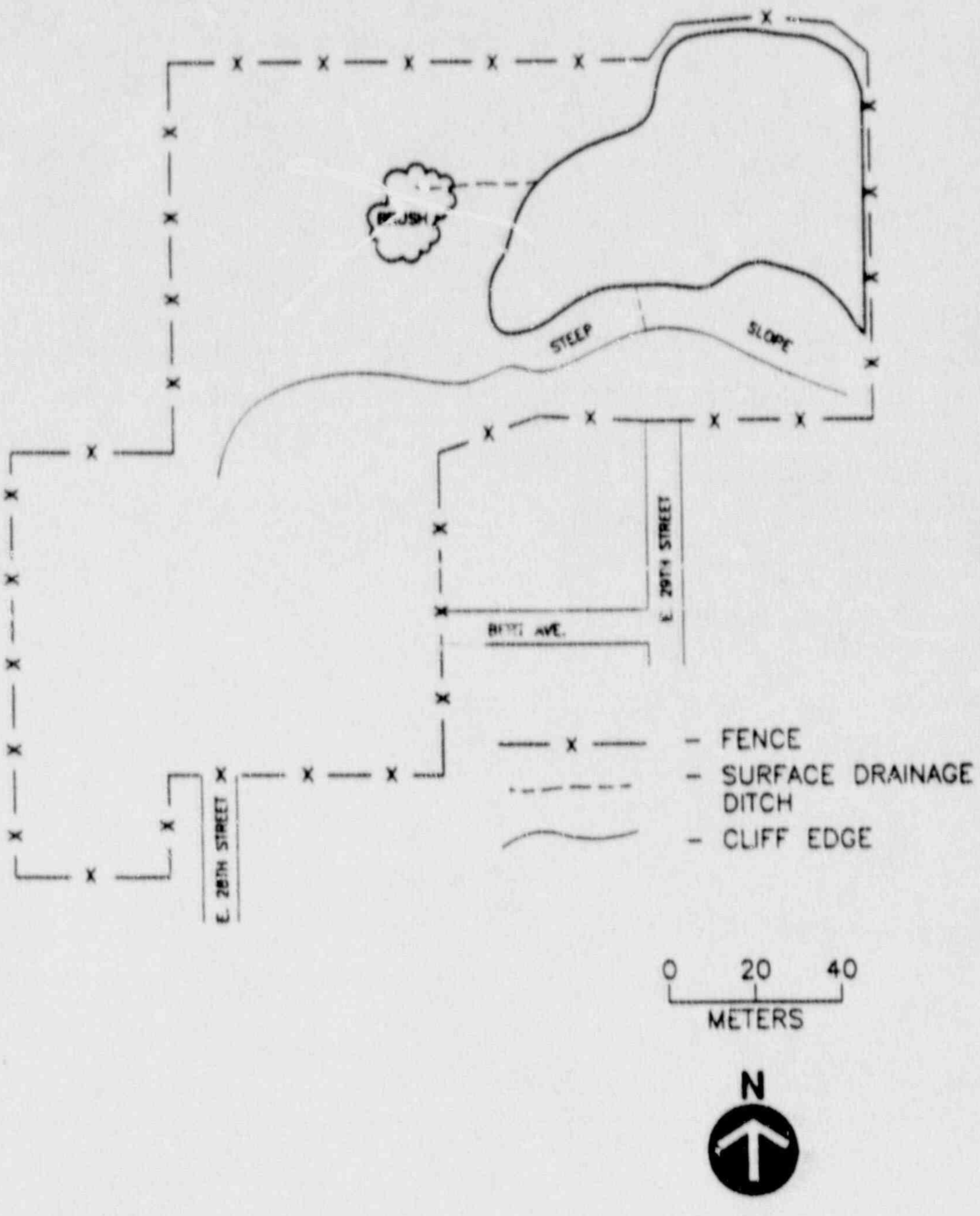
HARVARD AVENUE SITE MAP



HARVARD AVENUE SITE - Newburgh Heights, Ohio

EXHIBIT 3-2

BERT AVENUE SITE MAP



BERT AVENUE SITE - Newburgh Heights, Ohio

EXHIBIT 7-1

PRELIMINARY SCHEDULE FOR CHARACTERIZATION AND REMEDIATION

EXHIBIT 7-1

CHEMETRON CORPORATION
PRELIMINARY SCHEDULE FOR
CHARACTERIZATION AND REMEDIATION

Site Characterization Plan (Phase I) (includes Harvard Avenue and Bert Avenue sites, Building 20 and waste piles)	10/31/90
Site Characterization Report (Phase I)	3/1/91
Decommissioning Method Evaluation Plan (Building 20)	3/1/91
Updated Decommissioning Funding Plan	3/29/91
Updated Project Schedule with Milestones to include the following:	3/29/91

- o Preliminary Pathway and Dose Analysis
- o Decommissioning Method Evaluation - Selection Report (Building 20)
- o Remediation Plan Submission to NRC (Building 20) with remediation to commence upon NRC approval
- o Site Characterization Plan Supplement (Phase II)(Harvard and Bert Avenue Sites and waste piles)
- o Waste Processing Feasibility Study (Harvard and Bert Avenue sites)
- o Site Characterization Report Supplement (Phase II)

Revised Decommissioning Cost Estimates Prepared	3/29/92

Updated Project Schedule with Milestones (including Building 20) to include the following: 3/29/92*

- o Final Pathway and Dose Analysis
- o Remediation Method Selection (Harvard Avenue)
- o Remediation Plan Submitted to NRC (Harvard Avenue) with remediation to commence upon NRC approval
- o Remediation Method Selection for Bert Avenue based upon experience obtained during implementation of Harvard Avenue remediation and previously conducted studies and analysis
- o Remediation Plan submitted to NRC (Bert Avenue) with remediation to commence upon NRC approval

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* Dates of activities may be accelerated based upon the results of studies undertaken.

EXHIBIT 8-1

CURRICULUM VITAE OF JOHN P. ENGLERT

Curriculum Vitae

JOHN P. ENGLERT

TITLE: Senior Environmental Consultant

EXPERTISE: Regulatory Compliance
Hazardous, Radioactive and Mixed Waste Management

EXPERIENCE: 12 Years

As an Environmental Consultant with Dames & Moore:

- Provided project management and technical consulting services to a confidential client involved in a mixed waste clean-up project of facilities formerly used for uranium conversion, uranium, plutonium and mixed oxide fuel fabrication and radioactive materials research and development. Services included providing cost estimates for various clean-up alternatives and participating in negotiations regarding clients responsibilities for clean-up and cost allocation principles for the potentially responsible parties.

- Prepared new and revised operating procedures for environmental compliance, hazardous and radioactive waste management, effluent monitoring and control, and environmental restoration at Brookhaven National Laboratory.

- Provided technical support to Argonne National Laboratory for review of various environmental assessments and CERCLA documents (RI/FS Work Plans, Site Characterization Plans, RI and FS Reports, etc.)

- For Diamond Energy, performed a review of the New York State Environmental Quality Review Act (SEQRA) requirements associated with permitting the construction of a cogeneration plant in Lyonsdale, New York.

- Conducted environmental review of a zirconia processing facility to support planned expansion and addition of a new process line. Review included identification of environmental permit requirements and NYS SEQRA Environmental Assessment requirements.

- Performed numerous Environmental Due Diligence reviews including preliminary environmental assessments of commercial and industrial properties.

- Conducted eight hour hazardous waste operations training for Brookhaven National Laboratory.

- For Brookhaven National Laboratory, served as Task Manager for modification of a RCRA Part B/NYS Part 373 Hazardous Waste Management Permit Application. Revisions included responding to notices of incomplete application and incorporation of permitting options for mixed waste and explosive waste open burning/open detonation units.

- Developed management plan to address requirements of RCRA and CERCLA for hazardous and mixed waste generation, treatment, storage, and disposal. Designed program for efficient preparation of RCRA Part B Application and CERCLA RI/FS for the U.S. DOE West Valley Demonstration Project (WVDP).

- Managed preparation of all Emergency Planning and Community Right-to-Know (SARA Title III) submittals for the WVDP and several commercial industrial clients.

- Prepared characterization plan to identify and quantify contamination in 23 solid/mixed waste management units as part of overall site closure characterization plan for the WVDP.

- Prepared NESHAPs permit applications to construct and operate sources of hazardous and radioactive air pollutants for two DOE facilities in New York State. Maintained liaison with regulatory agencies to expedite the review and approval of permits consistent with the clients needs.

- Prepared State Pollution Discharge Elimination System (SPDES) applications and negotiated permit conditions for modification of industrial and radioactive wastewater treatment facilities for the WVDP.

- Prepared Spill Prevention Control and Countermeasures Plans for petroleum, hazardous and radioactive substance storage facilities at the WVDP.

- Prepared closure plans for a construction and demolition debris landfill unit at the WVDP. Closure plan was prepared in accordance with 6 NYCRR 360.

- Served as environmental assessment engineer on Emergency Operations Center staff at the WVDP.

- Developed sampling plans for low-level radioactive waste burial trenches and surface impoundments at the WVDP.

- Managed design and implementation of meteorological monitoring network used to develop data base for modeling atmospheric dispersion in complex terrain.

- Managed planning and implementation of several large scale geohydrological field investigations around radioactive waste disposal units.

- Prepared Safety Analysis Reports for maintenance and decontamination of a nuclear fuel reprocessing facility; bulk storage of high dose rate radioactive materials; size reduction and decontamination of low-level and transuranic wastes; and storage and supercompaction of low-level wastes.

- Performed surface water hydrology, water quality and ecology studies for the Western New York Nuclear Services Center.

- Assisted in preparation of NEPA environmental impact analyses and integration with requirements for NYS SEQRA requirements. Specific documents include programmatic EIS for the WVDP, environmental evaluation of cement stabilization of low-level waste and preparation of numerous NYS SEQRA Environmental Assessment Firms.

As an Environmental Scientist with NLO, Inc.:

- Performed environmental monitoring around low-level radioactive waste storage facilities.

- Managed geohydrological investigations at a low-level radioactive waste site, including drilling, installation of monitoring wells, sampling, compilation of geotechnical and radiological data.

- Managed health physics radiological control programs at remedial action sites.

- Evaluated radon monitoring and radon suppression techniques for uranium mill tailings.

As a Research Assistant for SUNY Buffalo:

- Performed field sampling, water chemistry and sediment analysis of several lakes in western New York.

ACADEMIC BACKGROUND:

M.S. Environmental Science, SUNY Buffalo, 1980
B.A. Biology, SUNY Buffalo, 1977

PROFESSIONAL AFFILIATIONS:

Health Physics Society
Institute of Hazardous Materials Management

COMMITTEES:

Mixed Waste Management Committee for U.S. Department of Energy, Remedial Action Programs

TRAINING AND CERTIFICATIONS:

Certified Hazardous Materials Manager
Hazardous Waste Operations (40 Hour OSHA Training)
Public Communications
Media Communications for Environmental Managers

PUBLICATIONS:

Englert, J. P., "Environmental Liabilities Associated with Property Transfer in the United States", Invited paper presented to Quebec Insurance and Risk Management Association, Montreal Canada, March 8, 1990

Englert, J. P., "Environmental Compliance Issues Associated with Decontamination and Decommissioning Projects," Invited paper presented at the ASTM Conference, Las Vegas, Nevada, January 21, 1990.

Englert, J. P., "Mixed Waste Issues at the West Valley Demonstration Project," Invited paper presented at HAZTECH International Meeting, Cincinnati, Ohio, September 12, 1989.

Englert, J. P., C. J. Roberts and E. E. Smeltzer, "Strategy for Management of Mixed Wastes at the West Valley Demonstration Project," in Environmental Aspects of Stabilization and Solidification of Hazardous and Radioactive Waste, ASTM STP 1033, pp 317-329, 1989.

Englert, J. P. and J. M. Peterson, "Estimation of Residual Radioactivity within a Shutdown Fuel Reprocessing Plant." Proceeding of Spectrum '86 ANS Topical Meeting, September 1986.

Englert, J. P., E. D. Picazo, T. G. Adams and D. P. Wilcox. 'Environmental Monitoring Program Interaction Between the West Valley Demonstration Project and New York State Agencies.' Proceedings of the 5th Annual DOE Environmental Protection Information Meeting, Albuquerque, NM, November 6-16, 1984.

Englert, J. P. and K. M. Stewart. "Natural Short-Circuiting of Inflow to Outflow through Silver Lake, New York." Water Resources Research 19:529-537, April 1983.

6/90

EXHIBIT 8-2

CURRICULUM VITAE OF JAMES G. CLINE

Curriculum Vitae

JAMES G. CLINE

TITLE Managing Partner

EXPERTISE Radioactive Waste Management
State and Federal Waste Policy Development

EXPERIENCE 27 Years

- Planning, policy, environmental, and economic analysis of facilities and systems involving nuclear waste management, energy technologies, and resource and energy recovery.
- Member of the U.S. Nuclear Regulatory Commission's advisory panel on the development of more efficient regulatory processes.
- Lead Consultant on the low-level radioactive waste disposal studies for various compact commissions and states, including the Southeast Interstate Low-Level Radioactive Waste Management Compact Commission, the Texas Low-Level Radioactive Waste management Compact Commission, and the Commonwealth of Virginia.
- Lead Consultant on Dames & Moore's ongoing safety and environmental analysis for the West Valley Demonstration Project.
- Energy Consultant to New York's Legislative Commission on Energy Systems and author of the report to the Commission entitled "An Overview of the New York State Energy Picture".
- Consultant to New York's Legislative Commission on Science and Technology and author of several published reports to the Commission including "Status of the Development of the National Nuclear Waste Policy".
- Participation in behalf of the New York legislature in the work of the Nuclear Energy Committee of the National Council of State Legislatures with particular focus on disposal of high and low-level radioactive wastes and facility siting.
- Consultant to a national consortium of 26 electric utilities on national nuclear waste management policy.
- Chairman and Chief Executive Officer, New York State Energy Research and Development Authority (1970-1975); The Authority's projects included the ownership of the Western New York Nuclear Service Center, site of the NFS reprocessing facilities and New York's low-level radioactive waste management facility; appointed by the Governor to New York's Atomic Energy Council, the executive body which coordinated state policy and agency activities responsibilities, and waste management; Directed New York's program for advanced designation of nuclear sites with special emphasis on systematic analysis of a broad range of socio-economic and environmental

JAMES G. CLINE

considerations and development of productive environmental group and community involvement; Developed programs for the maintenance of a dialogue with concerned groups and individuals; The foregoing functions included senior executive responsibility for dealing successfully with the press and public on sensitive matters of high and low-level radioactive waste management activities actually underway in the state with strong state involvement.

- Served in positions of increasing responsibility as the Authority's Principal Nuclear Engineer, Technical Director, Program Manager, and General Manager, 1962-1970.
- Project Engineer, U.S. Atomic Energy Commission, 1952-1962.

ACADEMIC BACKGROUND

B.S., Electrical Engineering, Marquette University
M.S., Nuclear Engineering, New York University
M.B.A., Business Policy, Columbia University

PROFESSIONAL AFFILIATIONS

Fellow, New York Academy of Science
Member, New York State Energy Research and Development Authority (1969-1977)
Member, Atomic Industrial Forum; participated in the work of the public understanding program (1965-1975).
Member, Rensselaer Polytechnic Institute, Advisory Council on Education in Nuclear Engineering (1962-1975).

PUBLICATIONS

Co-authored the widely distributed booklet "Nuclear Power Waste Management".

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*** END OF DOCUMENT ***

EXHIBIT 8-3

CURRICULUM VITAE OF THEODORE G. ADAMS

Curriculum Vitae

THEODORE G. ADAMS

TITLE Senior Environmental Scientist

EXPERTISE Radiation and Environmental Protection
Quality Assurance
Radioactive Waste Management
Decontamination and Decommissioning

EXPERIENCE 10 Years

- Served as liaison representative between the New York State LLW Siting Commission and one of the counties identified as candidate site for LLRW Disposal facility. Provided technical and programmatic interface between Siting Commission, County officials, technical consultants and general public. Developed and implemented Quality Assurance Program for site and method selection activities.

- Safety Manager for DOE West Valley Demonstration Project (WVDP). Provided technical and programmatic administration in the areas of environment, safety and health for operation of new facilities constructed on-site (HLW vitrification facility, LLW treatment facility, LLW storage facility) & decontamination/decommissioning of main processing plant.

- Oversight of the development and operation of the main plant and environmental laboratories at the WVDP. Established Quality Control Program for these laboratories.

- Managed the preparation of environmental review documents (environment assessments & impact statements) and coordinated the preparation and review of safety analysis reports. Managed the preparation of the EIS for site closure.

- Oversight of WVDP D&D operations of main plant and associated support facilities. Special D&D activity included removal/remediation of waste previously disposed of in burial grounds.

- Coordinated & reviewed contractor QA program (NQA-1). Assisted in development of QA requirements for High Level Waste Producers. Initiated development of QA program for DOE WVDP project office.

- Served as lead WVDP interface with various federal and state agencies (EPA, NRC, DOT, OSHA, NYSDEC, NYSDOH, NYSDOT), as well as National Laboratories, public officials and concerned private groups on ES&H/QA, Waste Management & D&D matters.

- Waste Management specialist for DOE Chicago, Argonne, Illinois. Served as the technical and programmatic specialist in the areas of D&D and hazardous and radioactive waste management. Conducted Waste Management appraisals of contractor facilities to identify potential ES&H problems associated with waste management & D&D operations and evaluate regulatory compliance.

THEODORE G. ADAMS

- Served as DOE Project Manager for D&D of New Brunswick Laboratory, New Brunswick, N.J.; BNL Glovebox facility; & Zero Gradient Synchrotron at ANL.
- Health Protection specialist for DOE Chicago. Served as technical specialist in the areas of environmental protection, industrial hygiene/occupational Health & Safety and Health Physics. Conducted ES&H appraisals of DOE contractors. Participated in development & review of Environmental Assessments and Environmental Impact Statements.

ACADEMIC BACKGROUND

B.S., Biology, University of Pittsburgh 1975 Minor: Chemistry
M.S., Health Physics, Purdue University, 1978
Ph.D., Environmental Assessment, Purdue University-completed all course work.

Various professional courses in DOE Project Management, Public Speaking/Media Training, Human Factors Operational Readiness, MORT & Risk Assessment.

PROFESSIONAL AFFILIATION

Health Physics Society
Sigma Xi

PUBLICATIONS

Several papers on trace metals in biological indicator organisms and environmental monitoring at West Valley Demonstration Project.

EXHIBIT 8-4

CURRICULUM VITAE OF FRANCISCO TREJO

nes

Francisco Trejo, Director

Special Qualifications

Thirteen years of professional experience in environmental, mechanical, electrical, radiological and nuclear engineering, including seven years of involvement in project management at different research institutions, government laboratories and nuclear reactor facilities. Six years of experience in the areas of waste management, volume reduction and disposal.

Education

Eng. Sc. D. Candidate, Nuclear Science & Engr., Columbia University, NY
M.S. Nuclear Science & Engr, Columbia University, NY
P.E., Mechanical & Electrical Engr, Veracruz University, Mexico
B.S., Mechanical & Electrical Engr, Veracruz University, Mexico

Professional Experience

1984 - Present NUCLEAR ENERGY SERVICES
Danbury, CT

Director

Responsible for the management and supervision of PS' field projects, including radwaste characterization (10CFR61), packaging and disposal activities. Cognizant individual for the use of WMS' By-Product Material (NRC) License.

To date, responsible for the following projects:

- Decon and clean-up of a source encapsulation facility.
- Technical assessment and evaluation of a vitrification based, radwaste solidification technology.
- Request/application to the NRC of a By-Production Materials License. (Obtained mid-'85.)
- Volume reduction, packaging and waste characterization of "Hot Sections" from LPRM/Vermont Yankee Power Station.
- Volume reduction, packaging, waste characterization and disposal of 14 spent fuel racks/Trojan Nuclear Power Plant.
- Radiological survey, characterization and decon of a catalyst plant.
- De-activation of two laboratories at the Knolls Atomic Power Laboratory (KAPL).
- De-activation, removal and restoration of a radioactive materials waste pit at the Knolls Atomic Power Laboratory (KAPL).

1980-1984 ANEFCO, INC.
Ridgefield, CT

Manager of Nuclear Projects

Responsible for all management activities for the following nuclear projects.

- Removal/Renovation of the OFF/Gas and Cell Ventilation System for Oak Ridge National Laboratory. Responsible for generating contract specifications for removal, decontamination and disposal of the old system and installation of the new system.
- Removal, dewatering and disposal of 10,000 gallons of liquid radwaste and sludges for the Shippingport Nuclear Station.
- Removal and disposal of control rods from Dresden Nuclear Station under subcontract with G.E.
- Removal and disposal of the SIG Reactor Pressure Vessel and Shield Tank for the Knolls Atomic Power Laboratory.

Responsibilities included technical and manpower management functions. Part of the scope of supply included the design, construction and operation of a Sodium Reaction System.

1978-1980 COLUMBIA UNIVERSITY
Chemical Engr. Dept.
New York, NY

Operations Manager, Fossil Fuel Laboratory
Responsible for the design, construction and operation of a slagging gasifier, where biomass and toxic wastes were processed. Managed the installation and operation of extensive peripheral and support systems.

1976-1978 COLUMBIA UNIVERSITY
Nuclear Engr. Dept.
New York, NY

Research Supervisor, Liquid Metals Laboratory
Responsible for the management and supervision of a variety of DOE contracts dealing with liquid metal technology R&D for the Liquid Metal Fast Breeder Reactor Program.

Francisco Trejo (Con't)

1972-1973 ATOMIC ENERGY COMMISSION OF MEXICO
Mexico City, Mexico

Staff Engineer, Foreign Technology and Licensing Dept.

Responsible for the development of liquid metals technology in Mexico, including coordination of activities between the U.S. AEC (now DOE) and the Mexican AEC.

Professional Affiliations

- Full member of the ANS

Publications

- "Modeling of Cavitation in Sodium Flow by Water Flow Tests in Prototypical LMFBR Components," Tech Memo ANL-CT-76-27 (1976).
- "An Experimental Investigation of Cavitation Inception in a flowing Sodium Environment," Partial Report for ANL-CT (1978).
- "The Simplex Coal and Biomass Gasification Process Report," Technical Report to DOE (1979).

EXHIBIT 8-5

CURRICULUM VITAE OF WILLIAM J. MANION

W. J. Manion - President, NES Inc.

nes

Special Qualifications

Technical Management and Direction; Quality Assurance; Plant Engineering; Reactor Safety Analysis; Reactor Plant Operations; Reactor Plant Testing; Facility Decommissioning; Professional Engineer.

Member of USCEA Committee on Quality Assurance. Member of ANS Power Division Program Committee and ANS Research and Test Reactor Decommissioning Committee. Member of the Board of Trustees of the Bridgeport Engineering Institute.

Education

B.M.E., Massachusetts Institute of Technology, 1952

M.S. program in Engineering Management at Rensselaer Polytechnic Institute, Newark College of Engineering and University of Connecticut.

Mr. Manion has recently authored state-of-the-art reports for the Nuclear Energy Agency of the common market nations covering decontamination technology and remote cutting techniques, and is currently editor of the decontamination and decommissioning volume for the Oak Ridge waste management series covering all fuel cycle facilities. In addition, he has coauthored a decommissioning handbook for the United States Department of Energy and functioned as Project Manager for the engineering development of the Shippingport Reactor dismantling program.*

Mr. Manion has developed conceptual decommissioning plans and associated cost estimates for numerous large light water reactor plants in support of utility licensing actions and rate cases and provided testimony to the appropriate hearing boards and has consulted to the U.S. Nuclear Regulatory Commission in the area of decommissioning.

Mr. Manion has served as Project Manager for the Atomic Industrial Forum sponsored decommissioning study of 1100 MWe boiling water, pressurized water and high temperature gas cooled reactors.** This study was the first comprehensive work that addressed the technical feasibility of large reactor decommissioning and estimated the costs for accomplishment of these programs.

In his previous capacity as General Manager, Gulf United Services Division of Gulf United Nuclear Fuels Corporation, he was Project Manager for the support service contract with the U.S. Atomic Energy Commission, through which engineering support was provided to the AEC-owned BONUS, Elk River and LaCrosse reactors. In his capacity as Project Manager, Mr. Manion participated in the technical and economic analysis that led to the decisions to decommission the BONUS and Elk River reactors. Mr. Manion was responsible for all planning and engineering for both decommissioning efforts.

* Manion, W.J. et al, "Decommissioning Handbook," DOE/EV/10128-1 (November, 1980).

** Manion, W.J. et al, "An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives," AIF/NESP-009 (November, 1976).

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W. J. Manion (Cont'd)

Mr. Manion was responsible for the preparation of the BONUS Decommissioning Plan (WRA-B-69-1, Volumes I and II), possession-only technical specifications, activity specifications, detailed procedures, final site survey, and final report (WRA-B-70-500, dated September 1, 1970). In addition, Mr. Manion was responsible for providing on-site technical supervision of all decommissioning activities from initial decontamination through the final radiation survey, and for the preparation and presentation of all licensing actions.

Mr. Manion prepared the Elk River Reactor (ERR) Decommissioning Study (UNC-SS-471), which provided the basis for selection of the decommissioning method for ERR. He was also responsible for preparation of the Dismantlement Plan (UNC-SS-836) and subsequently responsible for the development of all decommissioning activity specifications, detailed procedures, overall scheduling (by PERT), cost estimating and monitoring, and technical audit of the program as it was accomplished. Upon completion of participation in the ERR decommissioning, Mr. Manion was requested by the USAEC-RDT to prepare a decommissioning study work plan covering decommissioning alternatives for 500 MWe and 1100 MWe reactors of several types.

EXHIBIT 8-6

CURRICULUM VITAE OF LESLIE "PAUL" TERP

nes

LESLIE "PAUL" TERP - Site Supervisor

EDUCATION

1973 - Attended Lincoln High School, Manitowoc, WI

1973 - Received G.E.D. General High School Equivalency from Downey Adult High School

1984 - Present: Attended Lakeshore Technical College, Cleveland, WI Classes completed Radiation Protection Program:

Introduction to Nuclear Systems
Introduction to Nuclear Technology
Radiation Biology
Radiation Physics
Radiation Protection
Radiological Emergencies
Radioactive Materials Disposal & Management
Radiation Shielding
Chemistry
Sociology
Psychology
Communication Skills 1 (English)
Speed Reading
Principles of Management Supervision
Economics
Radiation Monitoring

EXPERIENCE

4/89 to Present — NUCLEAR ENERGY SERVICES (NES)
McGean-Rohco Chemical Plant

Site Supervisor - Responsible for all site health and safety during clean-up of all radioactive materials. In charge of training and dosimetry. Also was broker in charge of all shipments of radioactive material to Barnwell, SC. Responsible for all health physics duties.

4/89 — NUCLEAR ENERGY SERVICES (NES)
Point Beach Nuclear Plant

Lead Technician - Responsible for supervising contract health physics senior and junior technicians. Performing health physics coverage for all contractor work during U-1 outage.

2/89 to 4/89 — NUCLEAR ENERGY SERVICES (NES)
Kewaunee Nuclear Power Plant

Senior Health Physics Technician - Responsible for health physics coverage of all generator work during outage: S/G Eddy Current, tube plugging, tube sleeving, sludge lancing, nozzle dam installation and removal and all other H.P. duties.

LESLIE "PAUL" TERP - Continued

12/88

NUCLEAR ENERGY SERVICES (NES)
B.P./Sohio Chemical's U238 Catalyst Plant

Lead Technician - Supervised decontamination of components formerly contaminated with U238 (unrestricted release).

9/88 to 12/88

NUCLEAR ENERGY SERVICES (NES)
Point Beach Nuclear Plant

Lead Technician - Responsible for supervising contract health physics senior and junior technicians. Performing health physics coverage for all contractor work in containment during U-2 outage. Work performed during outage: S/G Eddy Current, tube plugging, tube sleeving, tube plug weld repair, sludge lancing, nozzle dam installation and removal, insulation removal and replacement, ISI (UT, PT, VT) and all other H.P. duties.

9/88

NUCLEAR ENERGY SERVICES (NES)
Byron Nuclear Power Plant (P.S.E.S.I.)

Senior Health Physics Technician - Duties included H.P. coverage of contractors inside containment. Mostly snubber removal and installation, all other H.P. duties.

12/87 to 7/88

DIVERSIFIED NUCLEAR INC.
B.P./Sohio Chemical's U238 Catalyst Plant

Sr. Health Physics Technician, Lead Tech., Site Coordinator - Coordinated and performed H.P. Coverage of decontamination and decommissioning activities including unrestricted release surveys and documentation of buildings and components formerly contaminated with U238. As Lead Tech. provided direction for 3 decon. Crews and also advised on methods of decontamination. Performed as Lab Tech. operating multi-channel analyzer, using Na-I crystal detector. Lab analysis on soil, sand, building materials, and waste water. As Site Coordinator was directly responsible for 40-50 personnel.

3/87 to 11/87

NUMANCO, INC.
Point Beach Nuclear Power Plant

Senior Health Physics Technician - Provided Health Physics coverage including steam generator sludge lancing, decontamination of area, equipment and personnel, count room operation, shielding installation removal and survey, routine radiation, contamination and airborne surveys, core barrel upflow conversion modification, ISI, UT, VT, PT radiography, removal and replacement of insulation, 10 year vessel ISI and Turbine Hall coverage. Coverage for all contractor work in the auxiliary building, radwaste processing, radioactive material shipment, auxiliary decontamination. Upgraded to Senior Health Physics Technician, September, 1987.

9/87 to 11/87

NUMANCO INC.
Point Beach Nuclear Power Plant

Senior Health Physics Technician – Trained and gave oral exams for job performance measure sign off's. Including the following job performance measures:

"Dose Limits"
"Dosimetry"
"Dosimetry Irregularities"
"Posting and Contamination Control Requirements"
"Portable Survey Instruments"
"Radiation Survey Methods"
"Counting Equipment"
"Radiation and Contamination Surveys"
"Air Sampling Equipment"
"Air Sampling Surveys"
"Air Sample Evaluation and Documentation"
"Respiratory Protection"
"Direct HP Coverage"
"Shielding"
"Area and Equipment Decontamination"
"Personnel Decontamination"
"Radiography"
"Alarm Response"
"Radiation Work Permits"

1/87 to 3/87

DIVERSIFIED NUCLEAR INC.
Robert E. Ginna Nuclear Power Plant

Junior Health Physics Technician – Duties included providing Health Physics coverage for steam generator sludge lancing, eddy current, tube plugging. Decontamination of area, equipment & personnel. Routine radiation, contamination and airborne surveys.

9/86 to 1/87

NUMANCO, INC.
Point Beach Nuclear Power Plant

Junior Health Physics Technician – Provided Health Physics coverage including steam generator, eddy current, tube plugging, sludge lancing, decontaminated area, equipment, personnel counting equipment operation, core barrel upflow conversion modification, insulation removal, replacement, steam generator nozzle dam installation/removal, and routine radiation, contamination, and airborne survey.

EXHIBIT 8-7

CURRICULUM VITAE OF MITCHELL CALLAHAN

nes

MITCHELL A. CALLAHAN

EDUCATION

1989: M.S., Radiological Sciences and Protection, University of Lowell, Lowell, MA

1985: B.S., Radiological Health Engineering, Texas A&M University, College Station, TX

1978: Nuclear Power Plant Operator Training, Naval Prototype Training Unit, Idaho Falls, ID

1977: Naval Nuclear Power School, Naval Training Command, Orlando, FL

EXPERIENCE SUMMARY

Qualified by over ten years of administrative and operational Health Physics experience, including extensive experience in:

Licensing

- Approved by Region III of the U.S. Nuclear Regulatory Commission to evaluate the conduct of Radiation Safety programs for compliance with regulatory licenses.
- Prepared and submitted a license application to Region I of the U.S. Environmental Protection Agency for a RCRA Permit.
- Conducted investigations and wrote responses to Emergency Adjudication Orders issued by the Ohio Department of Health.

Procedure Review and Development

- Reviewed operational Health Physics procedures for adequacy and accuracy.
- Wrote and revised operational procedures.

Radiological Surveys

- Performed and documented all types of radiological surveys.
- Evaluated radiological survey results to determine the extent of regulatory compliance.

ALARA and Exposure Control

- Implemented appropriate dosimetric techniques for personnel monitoring.
- Designed, built, and evaluated radiation shielding.
- Conducted radiation safety seminars.
- Performed and evaluated man-rem studies.

Waste Management

- Supervised the preparation and shipment of radioactive waste.
- Wrote and implemented computer programs to inventory radwaste.
- Designed a waste monitor to evaluate the curie content of aggregate waste material.
- Designed and supervised the construction of volume reduction facilities.
- Implemented volume reduction technologies.
- Served on a state legislative committee to draft radioactive waste legislation.

MITCHELL A. CALLAHAN (Continued)

EMPLOYMENT

10/89 to Present	NUCLEAR ENERGY SERVICES, Inc. Senior Radiological Controls Engineer
1/88 to 10/89	YALE UNIVERISTY Manager Radioactive Waste Program
5/87 to 1/88	BARTLETT NUCLEAR INC. Senior Health Physics Technician
12/85 to 9/86	BARTLETT NUCLEAR INC. and COMBUSTION ENGINEERING, INC. Senior Health Physics Technician
12/82 to 12/85	TEXAS A&M UNIVERSITY Health Physics Technician
8/76 to 8/82	UNITED STATES NAVY Radiochemistry and Health Physics Supervisor

PROFESSIONAL AFFILIATION

Health Physics Society

EXHIBIT 8-8

RADIATION WORKER HANDBOOK AND TRAINING MANUAL FOR CHEMETRON CORPORATION

RADIATION WORKER HANDBOOK

AND TRAINING MANUAL

FOR

CHEMETRON CORPORATION

Project Application	Copy No	Assigned To

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1. INTRODUCTION

This manual is intended to convey the minimum necessary information needed by personnel who work or intend to work with radioactive materials. This includes all NES personnel performing radiological work.

The manual presents the basic definitions, terms, and responsibilities which are inherent in radiation work. It is intended to be used both by the novice and as a refresher for veteran radiation workers.

2. REFERENCES

1. Kaplan, "Nuclear Physics"; Addison-Wesley, Mass, 1962.

2. Fitzgerald, et.al., "Mathematical Theory of Radiation Dosimetry"; Gordon & Breach, New York, 1967.

3. Miner(ed), "Ionizing Radiation and the Cell"; New York Academy of Sciences.

4. Title 10, Code of Federal Regulations, Part 19, "Notices, Instructions, and Reports to Workers; Inspections".

5. Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation".

6. Title 29, Code of Federal Regulations, Chapter XX, "Occupational Safety and Health Administration, Dept. of Labor", Part 1910.

3. A SHORT COURSE IN NUCLEAR PHYSICS

An elementary knowledge of the nature of matter and radiation will aid in the understanding of where radiation comes from and how to control it. It has often been observed that certain basic misconceptions lead to incorrect application of instruments, data, or risk assessment.

While details of atomic structure and elementary particle physics are not required here, a basic idea of the structure of the atom limited to our needs shall be presented. The atom consists of a small nucleus within a larger cloud of electrons. Electrons are negatively charged particles of small mass. The nucleus is composed of protons (positively charged) and neutrons (no charge) whose masses are close to each other, but are approximately 1800 times more massive than an electron.

Atoms can be presented by the following shorthand.

$_{92}U^{235}$ = Uranium
92 protons
235-92=143 neutrons
235 units of total weight
(electron weight is insignificant)

The same chemical element can have several isotopes, which vary only in the number of neutrons.

ex: U^{233}, U^{235}, U^{238} } **All uranium, with 92 protons, but they have 141, 143 and 146 neutrons each.**

Some isotopes are naturally unstable and become more stable (decay) by emitting radiation. Other isotopes can be made to be unstable and also decay by emission of radiation.

The types of decay radiation to be considered are:

beta	-	negatively charged, with a mass of an electron
alpha	-	positively charged, a package composed of 2 protons and 2 neutrons
gamma	-	electromagnetic radiation of no charge or appreciable mass
neutron	-	no charge, essentially an escaping particle from a nucleus which has too many to be stable

After an isotope emits radiation of these types it is more stable. It may emit any combination of the above radiations, and may do so simultaneously or in a series. The resulting atom still may be relatively unstable and perform further decay. This leads to the formation of a series of "daughters" which ultimately lead to a stable (non-radioactive) isotope.

Each isotope decays at a constant rate. The time it takes for 1/2 of the original substance to decay into another substance is called its half-life. The radiation emitted during this decay is always the same both by type and energy for a given isotope. This combination of data is used to measure and guard against the radiation emitted in this process.

If radioactive material is inhaled, swallowed, or otherwise ingested, it will have a specific biological half-life. That is, a period of time after which the body has excreted one half of the original amount. The effective biological half-life can be represented as a combination of radioactive and biological reduction in the quantity of internally deposited material as follows:

$$T\ 1/2\ \text{eff.} = \frac{(\text{BIO}\ T\ 1/2)\ (\text{RAD.}\ T\ 1/2)}{(\text{BIO}\ T\ 1/2) + (\text{RAD.}\ T\ 1/2)}$$

Where

T 1/2 eff. = effective half-life of a radioactive substance in the body
Bio T 1/2 = biological half-life of the substance
RAD T 1/2 = radioactive half-life of the substance

4. DEFINITIONS

Activity — The number of nuclear transformations (disintegrations) occurring in a given quantity of material per unit time. (See Curie)

Alpha Particle — A charged particle emitted from the nucleus of an atom having a mass and a charge equal in magnitude to a helium nucleus; i.e., two protons and two neutrons. (Symbol: α)

Analyzer, Pulse Height Multi-channel — An electronic circuit which sorts and records pulses according to height (also known as an MCA).

Atom — The smallest unit of an element that retains the chemical properties of that element.

Beta Particle — Charged particle emitted from the nucleus of an atom, with the mass and charge equal in magnitude to that of the electron. (Symbol: β)

Calibration — Determination of variation from standard, or accuracy, of a measuring instrument needed to ascertain necessary correction factors.

Chamber, Ionization — An instrument designed to measure a quantity of ionizing radiation in terms of the charge of electricity associated with ions produced within a defined volume.

Contamination, Radioactive — Deposition of radioactive material in any place where it is not desired, particularly where its presence may be harmful. This may interfere with an experiment or a procedure or be a source of biological hazard to personnel.

Controlled Area — Only applies to controlled surface contamination areas, to an area which contains one or more controlled surface contamination area(s), or an area which is established as a Special Area per Reference 8.

Count (Radiation Measurement) The external indication of a device designed to enumerate ionizing events. It may refer to a single detected event or to the total number registered in a given period of time. The term is often erroneously used to designate a disintegration, ionizing event, or voltage pulse.

Note: Spurious count - In a radiation counting device, a count caused by any agency other than radiation.

Counting Ratemeter An instrument which gives a continuous indication of the average rate of ionizing events.

Curie The special unit of activity. One curie equals 3.700×10^{10} nuclear disintegrations per second, abbreviated Ci. Several fractions of the curie are in common usage:

Microcurie: One-millionth of a curie (3.7×10^4 disintegrations per second), abbreviated uCi.

Millicurie: One thousandth of a curie (3.7×10^7 disintegrations per second), abbreviated mCi.

Nanocurie: One-billionth of a curie (37 disintegrations per second), abbreviated nCi.

Picocurie: One-millionth of a microcurie (3.7×10^{-2} disintegrations per second or 2.22 disintegrations per minute), abbreviated pCi.

Decay, Radioactive Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles and/or photons.

Detector, Radiation Any device for converting radiant energy to a form more suitable for observation. An instrument used to determine the presence and the amount of radiation.

Disintegration — A spontaneous nuclear transformation (radioactivity) characterized by the emission of energy and/or mass from the nucleus. When numbers of nuclei are involved, the process is characterized by a definite half-life. (Symbol: dis or DIS)

Dose — A general form denoting the quantity of radiation or energy absorbed. For special purposes it must be appropriately qualified. If unqualified, it refers to absorbed dose.

Absorbed Dose: The energy imparted to matter by ionizing radiation per unit of irradiated material at the place of interest. The unit of absorbed dose is the Rad. One rad equals 100 ergs per gram. (See Rad)

Cumulative Dose (radiation): The total dose resulting from repeated exposures.

Dose Equivalent — A quantity used in radiation protection. It expresses all radiations on common scale for calculating the effective absorbed dose. It is defined as the product of the absorbed dose in rads and certain modifying factors. (The unit of dose equivalent is the Rem)

Dose Rate — Absorbed dose delivered per unit time.

Efficiency (Counters) — A measure of the probability that a count will be recorded when radiation is incident on a detector. Usage varies considerably, so it is best to ascertain which factors (window transmission, sensitive volume, energy dependence, geometry, etc.) are included in a given case.

Error, Statistical — Errors in counting due to the random time-distributions of disintegrations.

Exposure — A measure of the ionization produced in air by "X" or gamma radiation. The special unit of exposure is the roentgen. (Abbreviated R) Several fractions of the roentgen are in common usage.

Microroentgen: one-millionth of a roentgen. (Abbreviated μR)

Milliroentgen: one-thousandth of a roentgen. (Abbreviated mR)

Fission — The process by which the nucleus of an atom is split into 2 or more other atoms, which releases energy.

Fusion — The process by which 2 or more light atomic nuclei combine to form another heavier nucleus.

Gamma Ray — Short wavelength electromagnetic radiation (range of energy from approximately 10 keV to 9 MeV) emitted from the nucleus. Also referred to as photons. (Symbol: γ)

Geometry Factor — The fraction of the total solid range about the source of radiation that is subtended by the face of the sensitive volume of a detector.

Quality Factor — The quality factors for various types of radiation are simply proportionality factors that relate the biological effects, as expressed in rem, to the actual radiation energy absorbed.

Half-life, Radioactive — Time required for half the amount of a radionuclide to decay into another nuclide. Each radionuclide has a unique half-life.

Ion — A positively or negatively charged atom or particle.

Isotopes — Nuclides having the same number of protons in their nuclei, and hence the same atomic number, but differing in the number of neutrons, and therefore the mass number. Almost identical chemical properties exist between isotopes of a particular element. The term s ild not be used as a synonym for nuclide.

Stable Isotope: A non-radioactive isotope of an element.

Milliroentgen (mR) A submultiple of the roentgen, equal to one-thousandth of a roentgen. (See Roentgen)

Monitoring Periodic or continuous determination of the amount of ionizing radiation or radioactive contamination present in a region.

Area Monitoring: Routine monitoring of the radiation level or contamination of a particular area, building, room or equipment.

Personnel Monitoring: Monitoring any part of an individual for exposure to external radiation or of physical deposition of radioactive materials.

Nuclide A species of atom characterized by the constitution of its nucleus. The nuclear constitution is specified by the number of protons (Z), number of neutrons (N), and energy content; or alternatively, by the atomic number (Z), mass number $A = (N + Z)$, and atomic mass.

Rad Amount of any radiation which will deposit 100 ergs of energy per gram of material.

Radiation (1) The emission and propagation of energy through space or a material medium in the form of waves. For example, energy in the form of electromagnetic waves. The term radiation or radiant energy usually refers to electromagnetic radiation and is commonly classified according to frequency, as Hertzian, infrared, visible (light), ultra-violet, x-ray and gamma ray.

(2) By extension, corpuscular emissions, such as alpha and beta radiation, or rays of unknown or mixed type, as cosmic radiation.

Background Radiation: Radiation arising from a radioactive source other than the one directly under consideration. Background radiation due to cosmic rays and natural radioactivity is always present.

External Radiation: Radiation from a source outside the body-the radiation must be capable of penetrating the skin.

Internal Radiation: Radiation from a source within the body (as a result of deposition of radionuclides in body tissues).

Ionizing Radiation: Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.

Radioactivity The property of certain nuclides to spontaneously emit particles or gamma radiation or of emitting "X" radiation following orbital electron capture or of undergoing spontaneous fission.

Artificial Radioactivity: Man-made radioactivity produced by particle bombardment or electromagnetic irradiation, as opposed to natural radioactivity.

Induced Radioactivity: Radioactivity produced in a substance after bombardment with neutrons or other particles. The resulting activity is "natural radioactivity" if formed by nuclear reactions occurring in nature, and "artificial radioactivity" if the reaction was caused by man.

Rem Amount of radiation which will cause damage to the tissue of our bodies equivalent to the damage that would be caused by absorbing 100 ergs of X-ray or gamma radiation per gram of body tissue. The rem accounts for the biological damage caused by different types of radiation.

Roentgen (R) Amount of X-ray or gamma radiation which will deposit 88 ergs of energy in one gram of dry air or 100 ergs of energy in one gram of body tissue.

Spectrum, Energy A visual display or a plot of the distribution of the intensity of radiation of a given kind as a function of its energy.

Standard, Radioactive A sample of radioactive material, usually with a long half-life, in which the number and type of radioactive atoms at a definite reference time is known. It may be used as a radiation source for calibrating radiation measurement equipment. Standards are traceable to those of the National Bureau of Standards.

Survey, Radiological Evaluation of the radiation hazards incident to the production, use or existence of radioactive materials or other sources of radiation under specific conditions. Such an evaluation customarily includes a physical survey of the disposition of materials and equipment, measurements or estimates of the levels of radiation that may be involved, and sufficient knowledge of processes using or affecting these materials to predict hazards resulting from expected or possible changes in materials or equipment.

X-ray Penetrating electromagnetic radiations whose wave lengths are shorter than those of visible light. In nuclear reactions, it is customary to refer to photons originating in the extranuclear part of the atom as x-rays.

5. RIGHTS AND RESPONSIBILITIES

Radiation workers are protected by certain standards of the Federal Government. These standards are defined in Title 10, Code of Federal Regulations, Parts 19 and 20. Conventional worker safety is controlled at the Federal level by standards published by the Occupational Safety and Health Administration (OSHA).

In accordance with 10 CFR 19, copies of both 10 CFR 19 and 10 CFR 20 must be posted in the workplace. These documents present details of the following summarized standards. These standards are Federal law.

Each employee has the right to know what his yearly exposure to radiation has been upon request. This request shall be made in writing. The worker also has the right to know his exposure at other times besides yearly (i.e., termination of a job, etc.)

In accordance with these regulations, a radiation worker has a professional obligation to notify his supervisors and/or superiors of conditions or actions which he feels are in violation of these acts and endanger the safety of company personnel and/or the general public.

In accordance with 10 CFR 20, radiation exposure to workers is limited to those as summarized below:

1. Whole body: head, trunk, active blood forming organs, lens of eyes, or gonads....1,250 mRem/calendar quarter

2. Hands and forearms, feet and ankles....18,750 mRem/calendar quarter

3. Skin of whole body....7,500 mRem/calendar quarter

Also, the total whole body dose (Rems) shall not exceed:

5 x (N-18) where N = age of worker

NRC Form #4 shall keep account of a person's lifetime dose (amount plus when and where received). In addition to exposure, 10 CFR 20 also addresses inhalation and/or ingestion of radioactive materials. Exposure to minors and the amount of permissible radiation in uncontrolled areas (i.e., to the general public) are also addressed.

Furthermore, 10 CRF 20 addresses radiation operating practices, sign postings, waste material release limits, and certain packaging limitations.

6. RISK

Radiation of various types is commonly used in medical practices (x-ray, cancer therapy) and the benefits derived are judged to exceed the risks involved. Radiation exposure to radiation workers not medically oriented is considered to entail risk increasing with dose and shall be limited by NES to doses as low as reasonably achievable (ALARA).

The risk from radiation varies with the amount, type, and energy of the radiation. It also varies with where on the body you receive it. Since your fingers and toes contain no vital organs or major blood producing areas, you can safely receive more gamma radiation there than is permitted to the trunk of the body.

Radiation damages cells. Enough radiation will damage enough cells to make you feel sick. Enough will kill you. Refer to Table 1 for a listing of effects at increasing dosage. Note that the level at which damage is first detectable is substantially larger than the amount you may be allowed to receive legally.

Radiation damage can be related by analogy to any number of common injuries. If you are hit by a baseball or by particle radiation (beta, alpha, neutron) you will be harmed. If you stay in the sun too long or receive gamma radiation, you will be harmed. The degree of harm is what matters in risk assessment. In both conventional and radiation injury, the body will repair itself to a degree. For example, if you lose a small amount of blood you will self-repair; if you receive a slight sunburn, you will self-repair. At low levels of blood loss (i.e., a cut finger) or low levels of radiation (i.e., below the legal limit) no noticeable harm is done to the person as a whole. Although there is a limit below which no detectable damage from radiation occurs, regulatory agencies have assumed conservatively that damage always occurs at any level of exposure.

The natural radiation background (sunlight, soil, food, air) exposes you to small amounts of radiation daily. It is thought this is where man has obtained his ability to repair low level radiation damage; we are subject to it all our lives. A comparison of common sources of exposure is shown in Table 2. The damage from radiation measured or anticipated in the following tables indicates that such harm is an accumulation of probabilities. While the effect of individual particles or waves of radiation on a single cell may be calculated, the cumulative effect on a specific individual can only be estimated by comparison with known results of exposures to large populations.

The damaging effects of radiation fall into two categories:

Somatic - harm to the individual
Genetic - harm to future generations

In addition, the amount of time over which a radiation dose occurs determines the degree of damage:

Acute exposure - a large amount in a short time
Chronic exposure - a small amount over a long time

The effects of radiation damage generally are referred to by one of the following terms:

latent - damage showing up after time has elapsed (i.e., cancer, genetic damage)
immediate - damage showing up after or during exposure.

TABLE 1

EFFECTS OF RADIATION

Level, Rem (Acute Exposure)	Probable Effect
0 to 50	No obvious effect, except possibly minor blood changes.
80 to 120	Vomiting and nausea for about 1 day in 5 to 10 percent of exposed personnel. Fatigue but no serious disability.
130 to 170	Vomiting and nausea for about 1 day, followed by other symptoms of radiation sickness in about 25% of personnel. No deaths anticipated.
180 to 220	Vomiting and nausea for about 1 day, followed by other symptoms of radiation sickness in about 50 percent of personnel. No deaths anticipated.
270 to 330	Vomiting and nausea in nearly all personnel on first day, followed by other symptoms of radiation sickness. About 20 percent deaths within 2 to 6 weeks after exposure; survivors convalescent for about 3 months.
400 to 500	Vomiting and nausea in all personnel on first day, followed by other symptoms of radiation sickness. About 50 percent deaths within 1 month; survivors convalescent for about 6 months.
500 to 750	Vomiting and nausea in all personnel within 4 hours from exposure, followed by other symptoms of radiation sickness. Up to 100 percent deaths; few survivors convalescent for about 6 months.
1000	Vomiting and nausea in all personnel within 1 to 2 hours. Probably no survivors from radiation sickness.
5000	Incapacitation almost immediately. All personnel will be fatalities within 1 week.

TABLE 2
SOURCES OF RADIATION
(1 rem = 1000 millirem)

	Annual Radiation Exposure (millirem/yr)
I. Natural Radiation Sources	
A. Cosmic (from outer space)	
Connecticut and Massachusetts	40
Colorado	120
B. Terrestrial (from the earth's surface)	
Connecticut	60
Massachusetts	75
Colorado	105
C. Food Consumed and the human body itself	25
Subtotal	
Connecticut	125
Massachusetts	140
Colorado	250
II. Technologically Enhanced Exposures to Natural Sources	
A. Radioactivity in Building Materials (varies from wood frame to brick to stone)	12-34
B. Air Travel (round trip cross country)	4
C. Natural Gas (randon-222)	
Cooking (lung)	15
Heating (lung)	54

TABLE 2 (continued)

SOURCES OF RADIATION

(1 rem = 1000 millirem)

		Annual Radiation Exposure (millirem/yr)
D.	Smoking (1 pack/day) - certain areas of lung	Up to 2000
	- whole body	2 to 20
III.	Man-made Sources	
A.	Medical Uses of Radiation for Diagnosis (per capita)	103
	One Chest X-ray	30 to 70
B.	Global Fallout from Nuclear Weapons Testing	2
C.	Consumer Products (TV)	0.15 x hrs/day
D.	Nuclear Power Station (within 50 miles)	0.1
	At Site Boundary	1 to 3

TABLE 3

Comparative Occupational Risks

	Observed Fatal Injuries Per Million Worker-Years(1)	Observed Deaths From Occupational Diseases Per Million Worker-Years
All Industry	100	50 to 1,000(4)
Chemical	60	N/A
Electric Utilities	160	N/A
Construction	340	N/A
Lumber	360	N/A
Mining, Underground Coal	1,160	2,000 to 6,000
Mining, Surface	260	N/A
Underground Metal Miners(2)	N/A	12,400
Shipbuilding	60	N/A
Steel	120	5,700(5)
Transit	100	N/A
Wood Products	160	N/A
Asbestos Insulation Workers(3)	N/A	3,650
Uranium Miners(2)	N/A	2,320
Smelter Workers(2)	N/A	1,930
Commercial Nuclear Power Industry (Radiation related effects only)	None	From 40 to 80 (not observed, but based on statistical calculations)

N/A = Data Not Available

1 From "Work Injury Rates" (1977), National Safety Council.

2 "The President's Report on Occupational Safety and Health", Commerce Clearing House, May 22, 1972, pages 11 and 128.

3 Irving J. Selikoff and William J. Nicholson, "Deaths Among 17,800 Asbestos Insulation Workers in the United States and Canada, January 1, 1967 through January 1, 1977," National Institutes of Health, 1978.

4 From U.S. HEW and U.S. NRC Staff Analysis of NRDC Petition PRM-2-6 to lower occupational radiation limits, July 1978. The most probable numbers are from 50 to 110.

5 Dr. Carol Redmond, University of Pittsburgh.

TABLE 4

Risks Which Increase Chance of Death By 1 in 1,000,000

Smoking 1.4 cigarettes	Lung cancer, heart disease
Drinking 1/2 liter of wine	Cirrhosis of the liver
Spending 1 hour in a coal mine	Black lung disease
Living 2 days in New York or Boston	Air pollution
Traveling 6 minutes by canoe	Accident
Traveling 10 minutes by bicycle	Accident
Traveling 300 miles by car	Accident
Flying 1,000 miles by jet	Accident
Flying 6,000 miles by jet	Cancer caused by Cosmic radiation
Living 2 months with cigarette smoker	Lung cancer, heart disease
Eating 40 tablespoons of peanut butter	Liver cancer caused by aflatoxin B
Drinking 30 12 oz. cans of diet soda	Cancer caused by saccharin
Eating 100 charcoal broiled steaks	Cancer from benzopyrene
Radiation exposure of 10 millirem (0.01 rem)	Cancer caused by radiation

TABLE 5

Average Risk of Fatality By Various Causes

Type of Event	Total Number Per Year (1)	Individual Chance Per Year (2)
Death (All Causes)	1,898,000	1 in 110
All Accidents	100,761	1 in 2,100
Motor Vehicle	47,038	1 in 4,600
Falls	14,136	1 in 15,000
Burns	6,338	1 in 34,000
Firearms	2,059	1 in 105,000
Electrocution	1,148	1 in 188,000
Lightening	160	1 in 1,400,000
Radiation effect 0.8 rem	None observed	1 in 12,500
Radiation effect 2.5 rem	None observed	1 in 4,000
Radiation effect 4 rem	None observed	1 in 2,500
Nuclear Power Plant		
Routine Release Health Effect Site Boundary Resident (50 yrs at 2 mrem/yr.)	None observed	1 in 5,000,000 (potential calculated)
Resident within 10 miles (50 years at 0.2 rRem/yr)	None observed	1 in 50,000,000 (potential calculated)

(1) Data from non-radiation effects is from 1979 World Almanac and is based on a U.S. population of 216,000,000.

(2) Chances for radiation effect fatalities are calculated. Chances for non-radiation fatalities are based on observed data.

TABLE 6

Chronic Individual Lifetime Chance of Fatality

Event Duration	20 Years	40 Years
Motor Vehicle	1 in 230	1 in 115
Falls	1 in 750	1 in 375
Radiation dose of 0.8 rem/yr	1 in 625	1 in 313
Radiation dose of 1.5 rem/yr	1 in 333	1 in 167(1)
Radiation dose of 2 rem/yr	1 in 250	1 in 125
Radiation dose of 2.5 rem/yr	1 in 200	1 in 100
Radiation dose of 3 rem/yr	1 in 167(1)	1 in 84
Radiation dose of 4 rem/yr	1 in 125	1 in 63

(1) The total dose of 3 rem/yr for 20 years is 60 rem. Any lifetime dose of 60 rem (i.e., 4 rem/yr for 15 years or 1.5 rem/yr for 40 years) causes the same lifetime risk.

TABLE 7

Sources of Information on Risk of Cancer from Radiation

Type of Cancer	Cause of Exposure or X-ray Treatments	Exposure Date	Years After Exposure Considered	Number of Subjects	Average Dose (rem)
Leukemia	A-bombs, Japan	1945	5-25	23,979	130
	Spondylitis	1935-54	0-25	14,554	372
Bone	Ra^{226} intake	1915-35	11-56	775	17,000
	Ra^{226} treatments	1944-64	4-25	925	4,410
	Spondylitis	1935-54	6-27	14,654	372
Breast	A-bombs, Japan	1945	16-25	12,000	125
	Fluoroscopy	1940-49	10-30	243	121
Lung	Uranium mines	1920-63	6-50	4,146	4,680
	Fluorspar mines	1935-63	11-33	800	2.770
	metal mines		16-37	1,759	1,720
	Spondylitis	1935-54	6-27	14,554	400
	A-bombs, Japan	1945	16-25	19,472	133
Gastro-intestinal	A-bombs, Japan	1945	25	23,979	130
	Spondylitis	1935-54	11	14,554	375
Leukemia age 0-9	A-bombs, Japan	1945	6-24	4,507	112
	Thymus X-rays	1926-57	0-35	1,451	65
	Tinia capitis	1940-49	0-22	2,043	30

Reference: National Academy of Sciences, 1972, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," (NAS 72).

7. RADIATION MEASUREMENT AND CONTROL

7.1 RADIATION MEASUREMENT

The device issued to radiation workers for the purpose of measuring radiation is the thermoluminescent dosimeter (TLD). A TLD consists of: a holder, filters, and a teflon card that has the thermoluminescent material in it. The filters allow us to tell the difference between beta and gamma radiations. The teflon card contains material that is thermoluminescent; that is, the material gives off a small amount of light when it is heated, after having been exposed to ionizing radiation. The amount of light is proportional to the amount of exposure to radiation for the TLD.

In conjunction with the TLD we use a direct (self-reading) pocket dosimeter (SRPD). This device enables us to determine at a glance how much exposure we have accumulated. The SRPD is worn next to the TLD on the upper front portion of the body. By holding the SRPD up to your eye, such that the end with the lens is toward your eye, and the end with the recessed pin is toward a light source, you can observe a scale. The scale is crossed at some point by a movable hairline. As the SRPD is exposed to radiation, the hairline moves up the scale.

Remember to wear these devices whenever handling radioactive material and each and every time you enter a radiologically controlled area. Unless told otherwise by Radiological Control personnel, wear them on the upper front trunk portion of the body. Other dosimetry devices will be issued by Radiological Control personnel when needed.

To determine your dose with a SRPD, you subtract the initial reading from the final reading. That is, if a SRPD reads 10 mrem when you enter an area and reads 30 mrem when you exit, then your dose is 20 mrem.

The three most important methods to minimize your exposure in fulfillment of ALARA objectives are the proper use of time, distance, and shielding. Each of these items is discussed in detail below.

7.2 TIME

The less time you spend in radiation areas, the less exposure to radiation you will receive. To fully utilize the time that is spent in radiation areas, all jobs should be pre-planned. Such pre-planning should include:

1. Making sure you have all the tools and equipment required for the job prior to entering the area.

2. Being familiar with the equipment either through job mock-up training or referring to a repair manual or plans prior to entering the area.

3. Knowing the radiation levels as well as component location prior to entering the area, and having stand-by personnel wait in low dose rate areas until needed.

4. Determining the Stay Time value.

7.2.1 Calculation of Stay Time

To determine your anticipated exposure prior to entering a radiation area, multiply the area radiation level by the amount of time to be spent in the area. Your exposure can thus be controlled by limiting the time you spend in the area:

Exposure = exposure rate x time

Stay Time is defined as the maximum amount of time a worker is allowed to stay in a specific radiation area. The Stay Time depends on ALARA considerations and the individual's present accumulated exposure. For example, John Smith

Quarterly exposure limit = 1250 mR

Present Quarterly Exposure = 1000 mR

Remaining Quarterly Exposure = 250 mR

Worker Area Radiation Level = 100 mR/hr

Safety Factor = 50 mR/hr

$$\text{Stay Time} = \frac{250 - 50}{100} = 2.0 \text{ hours maximum}$$

7.3 DISTANCE

By keeping as much distance between yourself and sources of radiation as possible, you can reduce the amount of exposure to radiation you will receive. Here are some suggestions:

1. Work at arm's length from hot spots whenever possible.

2. Use long-handled tools if possible.

3. Remove item to be worked on to an area lower in dose rate.

7.3.1 Radiation Exposure Reduction

Uniformly distributed radiation from a point source decreases approximately as the square of the distance. For example:

Assume a dose rate from a point source at 1 ft = 1 rem/hr

Then, at 2 ft the dose rate = 250 mR/hr
at 4 ft the dose rate = 63 mR/hr

Radiation from a line source, like a long pipe, decreases approximately linearly with distance. For example:

Assume a dose rate from a line source at 10 ft = 500 mR/hr

Then, at 20 ft the dose rate = 250 mR/hr

at 40 ft the dose rate = 125 mR/hr

Summary:

a. Point (infinite)

$$\text{Dose Rate}_2 = \frac{\text{Dose Rate}_1 \times (\text{Dist}_1)^2}{(\text{Dist}_2)^2}$$

b. Line (within 1/2 length)

$$\text{Dose Rate}_2 = \frac{\text{Dose Rate}_1 \times \text{Dist}_1}{\text{Dist}_2}$$

c. Plane (within 0.7 radius)

$$\text{Dose Rate}_1 = \text{Dose Rate}_2$$

7.4 SHIELDING

The third method of controlling/minimizing radiation exposure is by means of shielding. Generally, this is the preferred method because it results in intrinsically safe working conditions, whereas reliance on distance and/or time of exposure may involve continuous administrative control over workers.

The amount of shielding required depends on the type of radiation, the activity of the source and on the dose rate which is acceptable outside the shielding material.

The installation of the shielding material could be of the permanent type or of the temporary type.

Examples:

- Construction walls - permanent shielding
- Pre-design pipe wall thickness - permanent shielding
- Concrete blocks - temporary shielding
- Lead sheets/blankets - temporary shielding
- Lead shot - temporary shielding

If the shielding installation is of the temporary type, radiation workers shall be cautioned never to move the temporary shield without the approval of the Radiological Controls Supervisor.

7.4.1 Effectiveness of Shielding

The following paragraphs provide shielding effectiveness for α, β and γ radiation particles.

Alpha (α) particles are easily absorbed. A thin sheet of paper is usually sufficient to stop alpha particles and so they never present a shielding problem.

Beta (β) radiation is more penetrating than alpha radiation. In the energy range which is normally encountered (1-10 MeV) beta radiation requires shielding of up to 0.4 inches of aluminum for complete absorption.

One important problem encountered when shielding against beta radiation concerns the emission of secondary X-rays, which result from the rapid slowing down of the beta particle. This X-radiation is known as bremsstrahlung. In order to reduce the amount of bremsstrahlung, beta shield should be constructed of materials of low mass number (e.g., aluminum).

Gamma (γ) radiation is attenuated exponentially when it passes through any material. The dose rate to γ-radiation emerging from a shield can be written as:

$$D_t = D_o \exp(-\mu t)$$

Where

D_t = dose rate after passing through a shield of thickness t

D_o = dose rate without shielding

μ = linear absorption coefficient of the shielding material

t = thickness of shielding material

Half-Value Layer (HVL): The half thickness or half-value layer for a particular shielding material is the thickness required to reduce the intensity to one half its incident value. Writing the HVL as t 1/2, the previous equation becomes:

$$\frac{Dt}{D_o} = 0.5 = \exp(-\mu t\ 1/2)$$

$$t\ 1/2 = \frac{0.693}{\mu}$$

Tenth Value Layer (TVL): The tenth thickness or tenth-value layer is simply the thickness required to reduce the intensity of a beam of gamma radiation to one-tenth its incident value. By a calculation similar to that carried out above it can be shown that:

$$t\ 1/10 = \frac{2.303}{\mu}$$

Some typical values of t 1/2 and t 1/10 for lead, iron and water are given in Table 6.3.1.

TABLE 6.3.1

APPROXIMATE VALUES OF t 1/2 AND t 1/10

γ - radiation	inches of lead		inches of iron		inches of water	
energy (MeV)	t 1/2	t 1/10	t 1/2	t 1/10	t 1/2	t 1/10
0.66 (Cs-137)	0.4	1.0	1.4	2.75	7.5	25.0
1.25 (Co-60)	0.78	1.8	1.9	3.7	15.0	27.0

7.5 AREA DESIGNATIONS

All controlled areas at work sites are divided into area categories as defined in 10 CFR 20. Categorization of areas allows workers to know what kind of environment they are entering and provides written warning of radiological hazards at entrances to the specific areas.

- Radiation Area 1-100 mR/hr general field
- High Radiation Area > 100 mR/hr general field
- Airborne Radioactivity Area > 2×10^{-11} uCi/ml alpha (based on insoluable U^{238})
- Radioactive Materials 0.10 µ Ci Am^{241}
  0.10 µ Ci U^{238}
  1.0 µ Ci Th (natural)
  100 µ Ci Tc^{99}

8. CONTAMINATION MEASUREMENT AND CONTROL

8.1 CONTAMINATION

Contamination (Radioactive) - is the deposition of radioactive material in any place where it s not desired, and particularly in any place where its presence may be harmful. Contamination may destroy the validity of an experiment or a procedure, make equipment unusable, or actually be a source of harm to personnel.

Contamination (Fixed) - is that radioactive contamination that remains on tools and equipment and is not reduced by normal decontamination techniques.

Contamination (Loose Surface) - is that radioactive contamination that is removable from tools and equipment by normal decontamination techniques.

8.2 DETECTING CONTAMINATION

When a sensitive radiation detection instrument is used to locate contamination, that is called frisking (the instrument is referred to as a frisker).

After each exit from a contaminated area, you are required to pass a sensitive probe slowly over your body - frisk. Normally, you will not find contamination on your body. If you do find contamination, stay where you are, and notify a Radiological Control Technician. If necessary, they shall wash the contamination off, using soap and lukewarm water. After cleaning you will again be frisked to check for contamination. For example, if only a hand is contaminated, then washing only the hands would be required. If simple cleaning does not work, more abrasive methods are employed.

If you place a contaminated tool next to the frisker you will see a response on the meter. The tool can be washed to remove the contamination (just like removing any dirt or grease).

A swipe is a piece of dry filter paper which is wiped over a surface and then measured for radioactivity. This method detects removable or loose surface contamination. The limits for loose surface contamination, requiring the use of protective clothing are:

1. 1,000 dpm/100 cm^2 (beta-gamma) removable
2. 20 dpm/100 cm^2 (alpha) removable

NOTE: The limits are applied and tested for independently for alpha and for beta-gamma.

Even though an item has been swiped, and no contamination detected, the item still needs to be frisked. Certain porous items can have contamination fixed to them.

In a situation where airborne contamination is present, or an individual has possibly ingested contamination (as in cases of facial contamination), a whole body count will be required for the contaminated individual. This will tell just how much, if any, radioactive material is in the body, and from that, a calculation of the worker's dose can be made.

Airborne materials may occur as dust, fumes, smoke, vapor, or gas. The most common measurements are taken of particulate matter by suction onto filter paper. This air sampling may be divided into 'spot' or 'continuous' sampling, depending upon the collection time spent. Due to naturally occurring radioactive gases in the atmosphere, radon for example, and their particulate daughters, a correction in the counted activity is made based on the short half-life of the naturally occurring gases involved.

The estimated long-life activity count rate is determined by the following formula:

$$C_{LL} = \frac{C_2 - 0.271\, C_1}{0.729}$$

when C_{LL} = long lived count rate
C1 = counter after 4 hours of decay
C2 = counts after 24 hours of decay

8.3 GUIDELINES FOR WORK IN CONTAMINATED AREAS

1. Do not eat, smoke, chew, or drink in controlled areas.
2. Do not enter an area that is contaminated without Radiological Control's approval.
3. Always wear protective clothing for work in contaminated areas.
4. Avoid contact on your face with any contaminated items (do not scratch your nose while in protective clothing).
5. Always be aware of actions that could cause airborne contamination (even if they are not your actions).
6. Contain contamination to as small an area as possible by:
   - observing contamination postings.
   - using proper protective clothing removal procedures.

- placing all contaminated tools and equipment in their proper places.
- keeping the areas as clean as possible by practicing good housekeeping.

7. Persons with open sores, wounds, or bleeding of any degree will not be allowed in contaminated areas.
8. Always wear respirators when required by posted signs or by Radiological Control instructions.

8.4 RESPIRATORS

In most cases, when respiratory protection is required, a full face air purifying respirator will be used. However, steps are taken to eliminate the need for respiratory protection by minimizing airborne contaminants. Some of these steps include:

- The use of physical boundaries such as doors and tents to localize airborne contaminants.
- The use of filtered ventilation to remove contaminants from the air.
- The decontamination of grossly contaminated areas to prevent airborne contamination being caused by work in the area.

Here is a list of some specific cautions that are applicable to respirator use:

1. Contact lenses cannot be worn with respirators.
2. If dentures are worn while qualifying for respirators, they must be worn while working in a respirator.
3. Remember also that full face, air purifying respirators do not supply oxygen. Do not wear them into atmospheres that are immediately dangerous to your health, or into any area that may be deficient in oxygen.
4. Do not use air purifying respirators to fight fires.
5. Beards are not permitted if a respirator is to be worn. (This includes wearing a respirator in the respirator test booth.)
6. If you are in an area, and for any reason your respirator fails to supply you air - remove the respirator and quickly exit the area.
7. Always wear the type of respirator prescribed by Radiological Control.

8. Perform a negative pressure test each time a respirator is put on, prior to entering the work area. Radiological Control personnel shall assist you in assuring a good fit.

The following shall be the procedure for donning and removal of the full face, air purifying respirator:

Prior to use, the mask should be visually inspected for defects, e.g., straps, viewing shield and exhaust port. Next - remove the filter canister and inspect that portion of the filter element visible through the filter connector pipe. If there is any evidence of deformity - replace with a new filter (after inspecting new filter). Now - connect filter canister to mask - ensuring that connector is tight (canister is not free to move). Next - adjust straps so mask may be donned. Place mask on head, tighten straps snugly (do not pull straps too tight).

Clear mask by exhaling, and then - holding hands tightly against filter intake ports - inhale and hold for 5-10 seconds. The mask should collapse tightly around face. This indicates a snug fit and that mask is ready for use. If mask does not collapse readjust straps and test again. Around the ear eye glasses will not be worn with the mask as a tight seal of the mask around the head and face is not possible when around the ear glasses are worn. Prescription lense inserts are the responsibility of the individual rad worker. When removing the mask - simply lean forward (bend at the waist), grasp mask around the area of the mask and filter connection - disengaging the chin from the chin recess in the mask and sliding the mask forward and off the head. This method will minimize the possibility of becoming contaminated by "loose" contamination falling off the mask outer surfaces and on to the wearer.

8.5 MINIMIZING WASTE VOLUME

1. Radwaste receptacles are for contaminated trash only. Do not throw clean trash into these containers.

2. All tools and equipment removed from Contaminated Areas must be surveyed by Radiological Control personnel prior to removal to determine

if they are contaminated. Contaminated tools and equipment should be stored for future use, and contaminated trash should be disposed of as radwaste. Tools, equipment, and trash that are frisked "clean" may be stored or discarded as everyday non-radioactive material.

3. Whenever possible, use tools and equipment that are already contaminated. Re-use of contaminated tools and equipment will reduce the amount of radioactive material generated. If you do not know where to get tools that are to be used in contaminated areas - ASK your supervisor.

9. EMERGENCY ACTIONS

9.1 ACCIDENTAL SPILLAGE OF RADIOACTIVE MATERIALS

Should radioactive or contaminated materials be accidentally released from their container the following actions shall be taken. NES personnel are to follow the instructions below which have been developed using the SWIMS acronym:

"S" = Stop the spill
"W" = Warn other personnel
"I" = Isolate the spill area
"M" = Minimize personnel exposure
"S" = Secure the appropriate equipment

Stop The Spill-

If the spill has occurred from a source which may or is continuing to add material to the spill, take such measures as necessary to stop the spill, such as closing a valve or blocking the path of the fluid with absorbent material. A balance of risk to the individual must be weighed for potential personnel risk in these actions versus the potential safety and economic cost if limited actions are taken. If mechanical action is needed, such as closing a valve or disabling a pump, knowledge of the effect on the total system or machinery involved is required prior to such actions.

Warn Other Personnel-

Others in the immediate area and those entering the area must be told of the event to enable all personnel to take the appropriate response actions. Health physics personnel must be notified as soon as possible.

Isolate The Spill Area-

Non-vital personnel shall be kept out of the immediate vicinity, if necessary by having someone posted at the entrance to the area. Personnel who have been contaminated shall remain in the immediate vicinity to prevent the spread of contaminants until health physics personnel release them. An exception to this is when the ambient radiation levels are high or of a traumatic injury requiring leaving the are has occurred.

Minimize Personnel Exposure-

The event may include both a radiological and a chemical hazard. Personnel shall remain in the immediate vicinity until health physics personnel arrive both to assist in spill control and to be available for surveying of exposed individuals. The nature of the spill, both chemical and radiological, and the need to monitor the spill shall dictate how close personnel should remain.

Secure The Appropriate Equipment -

Ventillation or other operating equipment may be selected for shutdown due to the nature of the spill and to prevent further occurrence. Knowledge of the systems and equipment involved is necessary prior to taking such action.

9.2 FIRE IN A CONTROLLED AREA

Areas shall be evacuated by all non-emergency personnel when a fire, heavy smoke, or similar fumes occur in a controlled area. Health physics, operational and/or fire response personnel shall be immediately notified. This is true for all fire events, including those where personnel in the immediate vicinity have extinguished a minor event, such as a wastebasket fire.

1. When possible the fire shall be extinguished by personnel in the immediate vicinity rather than allowing it to grow into larger proportions while designated personnel are on their way.

2. If a fire cannot be rapidly extinguished, the local fire department shall be summoned for fire detail:

   - fire detail shall wear self-contained respiratory equipment, protective clothing, and any other items deemed necessary by the lead health physics individual
   - the primary function of the fire detail shall be to evacuate personnel from the fire area
   - the secondary function of the fire detail shall be to save equipment and property without endangering their own or other lives
   - the tertiary function of the fire detail is to minimize the spread of contamination outside the controlled area

3. Fire extinguishing agents such as CO_2, foam, or dry chemicals are preferred as this minimizes the volume of potentially contaminated liquids.

4. All firefighting personnel shall be surveyed prior to exiting the event area except for those in need of immediate medical assistance outside the controlled area. Minimization of the spread of contamination will be kept in mind at all times.

9.3 CONTAMINATED INJURED MAN

1. Minor Wounds

Several steps should be taken when open wounds could be contaminated.

- o Wash minor wounds immediately under running water, spreading the edges of the gash. If at all practical, collect and retain cotton sponges, fluids, etc., for analyses.

- o Report all radiation accidents involving personne: wounds, ingestion or inhalation to the RCS as soon as possible.

- o Call, at once, a physician qualified to treat radiation injuries and to collect additional bioassay samples.

- o Permit no person involved in a radiation injury to return to work without the approval of the attending physician and the RCS.

- o Prepare a complete history of the accident and subsequent activity related thereto for the RCS.

2. Serious Injury

In emergency situations where an individual is seriously injured in a contaminated area, the first priority is to treat t.. injury.

Other actions include:

- o Contact the RCS
- o Call or have someone call an ambulance
- o Notify the nearest hospital qualified to treat contaminated injuries that a potentially contaminated injured person would soon arrive.

A Health Physics Technician equipped with appropriate survey instruments shall accompany the contaminated, injured individual to the hospital.

Once at the hospital, the Technician shall survey the emergency transport vehicle and paramedic crew. The Technician shall support the medical staff treating the patient regarding survey results, accident history, etc.

No contaminated injured individual may return to work without written approval of the attending physician and the RCS.

9.4 HIGH AIRBORNE RADIOACTIVITY

Particulate Radioactivity above 2×10^{-11} uCi/ml alpha (based on insoluable U-238) in occupied radiological areas:

NOTE: High airborne contamination is not expected in ground moving tasks. However, cutting, grinding or burning of other material may be performed in containment thus warranting these precautions.

A. Immediate Action: Notify Radiological Controls Supervisor.

(1) Evacuate personnel from affected areas. Don respiratory equipment in accordance with the Airborne Radioactivity Program (No. 83A5497) for personnel who must return to the affected area.

(2) Verify that the high airborne results (i.e., from air sampling or elevated instrument readings) are correct.

(3) Stop operations which might be causing high airborne radioactivity until adequate control of airborne radioactivity is established.

(4) Secure air moving equipment (e.g., fans window air conditioners, and unit heaters) in the affected spaces.

(5) Determine the extent of the airborne radioactivity by sampling the affected area and adjacent areas which might be affected using portable air samplers.

B. Supplementary Action:

(1) Attempt to identify the radionuclide causing the airborne radioactivity. For example, by promptly measuring the sample for alpha radioactivity and determining the half-life.

(2) Measure and control surface contamination in areas affected by high airborne radioactivity.

(3) Perform alpha and beta/gamma surveys of ventilation filters and ducts and measure surface contamination in the vicinity of the ventilation exhaust discharge point.

(4) When resuming operations, take a portable air sample to verify that the cause of high airborne radioactivity is corrected.

(5) Check personnel exposed to high particulate radioactivity for internal radioactivity.

C. Followup Action:

A report of any incident involving high airborne radioactivity, other than fallout or natural background, in areas occupied by personnel not wearing or wearing inappropriate respiratory equipment, shall be sent to Remcor. The report shall include results of internal monitoring and be submitted within ten working days.

9.5 LOSS OF RADIOACTIVE MATERIAL

If radioactive material is lost, the following procedures shall be followed:

A. NES will immediately conduct a search. The primary reason for this is to ascertain that no persons will receive inadvertent internal or external exposure from the material.

B. If the material cannot be located before the end of the work day, NES will prepare an incident report in accordance with 10 CFR 20.402 and notify the NRC as appropriate.

EXHIBIT 9-1

RADIOLOGICAL CONTROL PLAN
FOR CHEMETRON CORPORATION

RADIOLOGICAL CONTROL PLAN

FOR

CHEMETRON CORPORATION

Project Application	Copy No Reviewed by	Assigned To Approved

APPROVALS

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1. INTRODUCTION

1.1 SCOPE AND PURPOSE

This manual presents the radiation protection standards and controls to be in effect for the decontamination of the Chemetron/McGean - ROHCO property. All management personnel responsible for operations in a radiation environment involving handling or processing of radioactive materials must be knowledgeable of the contents of this manual and must ensure that each employee has a good understanding of the sections which apply to his/her job assignment. Any deviation from this manual requires the written approval of the NES Project Manager.

These radiological safety requirements have been developed based on the recommendations and requirements of the National Council on Radiation Protection and Measurements, the U.S. Department of Energy, the International Commission on Radiological Protection, and on standards which have been reviewed and accepted by the Public Health Service, the U. S. Nuclear Regulatory Commission, the Department of Labor and the Environmental Protection Agency.

It is necessary that all personnel associated with the handling of radioactive material or who are in radiation areas understand that a knowledge of standard radiation protection rules and practices is a part of their job. It is not independent of, or in addition to their routine duties, but an integral part of their duties and responsibilities.

Each person should understand that it is his/her responsibility to minimize his/her own exposure to radiation. Also, each person associated with the handling of radioactive material shall receive periodic instruction in the general and specific radiological aspects which he/she may encounter, and shall also be made aware of his/her responsibility to the company, the public, and co-workers for safe handling of radioactive materials.

The major purpose of this manual is to establish the basic practices to be implemented throughout the entire cleanup project by NES to ensure satisfactory control of radioactive materials and radiation exposures to personnel. The basic philosophy is to maintain radiation exposures as low as reasonably achievable (ALARA) and to keep radioactive material contained at all times in the smallest practical volume. The implementation of this operating philosophy will be the responsibility of the NES Site Supervisor and Project Manager.

1.2 RESPONSIBILITIES

The SS (Site Supervisor), the RCS (Radiological Control Supervisor) and the RCT (Radiological Control Technicians) have the authority to cease operations in the event that operating conditions are not in compliance with operational safety controls or approved operating procedures. NES' SS, RCS and RCT further have the authority to remove from the list of employees authorized to receive occupational radiation exposure, those individuals who approach the established administrative radiation exposure limits or who have not demonstrated their continuing understanding of, or the need for compliance with radiological safety-related operating procedures.

Radiological Control Technicians are the on-the-job representatives of NES, and as such, are responsible for identifying safety hazards, and assuring that the job is not allowed to proceed without abatement or control of these hazards. To implement this responsibility, Radiological Control Techs have the authority to stop work which violates the applicable work procedures or which in their opinion presents an imminent danger of:

A. Excessive radiation exposure to personnel.

B. Contamination of personnel or the environment.

C. Personnel injury or equipment damage from an identified industrial safety hazard.

When it becomes necessary to stop a job due to a safety hazard, conditions should be stabilized immediately so that stopping the job does not in itself present an additional hazard. Unless precluded by the urgency of the situation, cessation of operations will be implemented through the Project Manager who is responsible for the overall conduct of the job.

1.3 OPERATIONAL PROCEDURES AND REVIEW REQUIREMENTS

Detailed procedures incorporating radiological and other safety considerations are required for operations involving the handling of radioactive materials. Preparation of such procedures by operating organizations minimizes the problems encountered by requiring explicit planning in advance of actually performing the work. The written procedure becomes a step-by-step guide for the personnel performing the operation. Prior to being issued for use, the procedure must be reviewed and approved by NES.

2. CONTROL OF PERSONNEL EXPOSURE

2.1 RADIATION EXPOSURE LIMITS

2.1.1 Occupational Radiation Exposure Limits

Radiation exposure limits are used for controlling personnel exposure to radiation (excluding medical and dental exposures) to levels which are believed to cause no ill-effects even if the employee was exposed to these levels throughout his/her entire working life. These limits are based on those promulgated by Title 10, Code of Federal Regulation, Part 20, "Standards for Protection Against Radiation". Personnel should endeavor to maintain their own exposures as low as reasonably achievable and below these limits. The occupational exposure limits are contained in Table 2-1. It shall be the goal of NES to maintain individual radiation exposure to less than two rem a year.

Table 2.1 lists administrative limits for occupational radiation exposure. These limits are less than or equal to those specified in 10 CFR 20. The administrative limits shall be the operating limitations for exposure to all personnel. No employee shall exceed these limits without receipt of a formal written extension of allowable exposure by the Radiological Controls Supervisor (RCS) and the Site Supervisor (SS). This extension shall be limited to one calendar quarter in duration, after which another formal written extension may be issued. In no event shall these extensions exceed the limitations imposed by 10 CFR 20 for individual exposure.

Also, no employee shall be exposed to further radiation of any kind whatsoever which may produce a lifetime exposure to the individual greater than the following limiting dose (Rems), as specified in 10 CFR 20:

5 times (N-18) where "N" = worker age in calendar years

2.1.2 Occupational Radiation Exposure Controls

To maintain personnel radiation exposures as low as reasonably achievable (ALARA), NES may choose to have more restrictive radiation exposure limits.

The three most important methods to minimize your exposure in fulfillment of ALARA objectives are the proper use of time, distance, and shielding. Each of these items is discussed below.

A. TIME

The less time you spend in radiation areas, the less exposure to radiation you will receive. To fully utilize the time that is spent in radiation areas, all jobs should be pre-planned. Such pre-planning should include:

1. Making sure you have all the tools and equipment required for the job prior to entering the area.

TABLE 2.1
Radiation Worker Occupational Exposure Limits and Controls

Type Of Exposure	10 CFR 20 Limits, Rem		Administrative Controls, Rem		
	Annual	Quarter	Annual	Quarter	Daily
Whole Body, Head and Trunk, Gonads, Lens of Eye, Red Bone Marrow, Active Blood Forming Organs	5	3	3	1.25 (1)	
Unlimited Areas of the Skin (Except hands, feet, ankles, and forearms)	30	7.5	15	3.75(1)	
Forearms	75	18.75	15	3.75(2)	
Extremities	75	18.75	15	3.75(2)	
Minors (less than 18 years)	10% of above levels		No Exposure Allowed		

(1) As measured by the "open window" of TLD card
(2) As measured by appropriate supplemental dosimetry

2. Being familiar wi h the equipment and plans prior to entering the area.

3. Knowing the radiation levels as well as component location prior to entering the area.

B. DISTANCE

Your exposure to radiation can be significantly reduced by keeping as much distance between yourself and source as possible.

C. SHIELDING

The third method of controlling/minimizing radiation exposure is by means of shielding. NES shall utilize shielding as necessary to limit exposure to personnel.

2.1.3 Exposure to Minors

Individuals under the age of 18 are not permitted to enter controlled, restricted or radiation areas at the Chemetron/McGean - ROHCO property.

2.1.4 Exposure to Unborn Child

The National Council on Radiation Protection and Measurements (NCRP) recommends:

> "During the entire gestation period, the maximum permissible dose equivalent to the fetus from occupation exposure of the expectant mother should not exceed 0.5 rem."

Prior to being issued dosimetry equipment, all personnel authorized to receive radiation exposure shall be given specific instruction about prenatal exposure risks to the developing embryo and fetus. This instruction shall include both orally and in writing, the applicable information in the appendix to U.S. Nuclear Regulatory Commission Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure."

Instruction concerning prenatal exposure to the unborn child shall be given during initial and reverification training.

All personnel receiving instruction in accordance with this paragraph shall sign the following statement prior to being issued dosimetry:

> "The recommendation of the National Council on Radiation Protection and Measurements to limit radiation exposure to the unborn child to the very lowest practical level, not to exceed 0.5 rem during the entire period of pregnancy, has been explained to me."
>
> Signature ______________________
> Typed or printed name ______________________
> Date ______________________
>
> The signed statements shall be kept with the training records.

2.1.5 Exposure to Visitors

NES shall control the exposure of visitors to its worksites to levels as low as is reasonably achievable. For exposure control purposes a "visitor" is defined as any person not qualified as a radiation worker and who requires access to controlled areas.

If the visitor will not enter any controlled areas, he will be instructed such that he can recognize how these areas are marked and further instructed to not to enter any area so marked. Visitors will normally require an escort and will be issued temporary dosimetry.

Entry by a visitor to a controlled area shall require the following:

1. Assignment of a temporary self-reading pocket dosimeter (SRPD);

2. Escort by a qualified radiation worker at all times while in the controlled area.

Visitors are not allowed access to any area where there is a significant risk of internal deposition of radioactive material.

If repeated entries to controlled areas are required by a visitor, over periods exceeding two weeks, a temporary TLD can be issued if the visitor meets appropriate requirements as a radiation worker.

2.1.6 Non-Occupational Exposure Limits

NES shall control the radioactive material in its possession so that exposure to members of the general public is limited to the lowest practical levels not to exceed the following: .125 rem per quarter or .5 rem per calendar year.

3. PERSONNEL MONITORING

3.1 PERSONAL DOSIMETRY

3.1.1 Thermoluminescent Device (TLD)

NES shall use TLD badges to measure personnel radiation exposure for permanent record purposes. This TLD measures ionizing radiation by emitting a measurable amount of visible light which is directly proportional to the amount of incident radiation. This TLD measures both beta and gamma exposure. The results of the TLD badge measurements are the basis of the legal record of an employee's exposure. Therefore, any deliberate action by an employee which invalidates the TLD measurements is cause for disciplinary action.

Those personnel who have qualified as radiation workers and who have a need to enter a controlled area shall be issued a permanent TLD.

An individual's permanent TLD normally shall be worn on the front of the body between the waist and neck, facing away from the body.

3.1.2 Self-Reading Pocket Dosimeters

Self-reading pocket dosimeters (SRPD) may be issued to individuals who enter controlled areas. These dosimeters, if used, shall be utilized as required and shall be returned to the Radiological Control Technician (RCT) for processing. If the SRPD is worn with a TLD, the SRPD shall be worn next to the permanent TLD.

All personnel who are likely to receive a dose in excess of 125 mrem in a quarter year shall be monitored by dosimeters. The following personnel may be monitored with dosimeters:

1. Personnel entering an area posted as a radiation area or high radiation area.
2. Personnel who routinely remain in spaces immediately adjacent to radiation areas. Even though the general area radiation levels in the space are less than one mrem per hour, personnel shall be monitored if they are likely to receive a dose in excess of 125 mrem in a quarter year.
3. Personnel who directly handle or touch radioactive material, or personnel in a controlled surface contamination area, even though they do not enter a radiation area. However, it is permissible for personnel to handle radiation survey instruments containing check sources without being monitored with dosimeters.

Pocket dosimeters, whether low or high range types, shall be read by the wearer prior to entering radiation or high radiation areas and periodically thereafter to control his own radiation exposure while in these areas. To prevent off-scale reading, low range dosimeters shall be recharged whenever the reading exceeds 150 mrem.

Extremity TLD's will be made available by NES if the need arises. Extremity TLD's will be TLD finger rings or TLD's oriented toward the source of radiation as much as practical without causing damage to the devices during use.

3.2 LOSS OR DAMAGE OF TLD'S

Each instance of a lost or damaged personnel TLD shall be reported promptly to radiological control personnel.

Individuals who lose or damage their TLD while in a controlled area shall immediately exit the area and report the condition to the RCT. The individual shall be restricted from entering controlled areas until an exposure estimate has been completed and a new TLD issued.

3.3 ESTIMATION OF DOSE

All exposures indicated by the TLD shall be considered to have been received by the individual unless it can be clearly demonstrated to be erroneous.

If an exposure measurement result from a TLD is lost or proven erroneous, an estimate of the dose received by the individual during the period in question shall be established by the RCS and documented as a part of the employee's Exposure Record. An example of a Dose Evaluation Report is provided as Figure 3.

Estimates of dose received shall consider at least the following:

1. Dose rates in the individual's work area

2. Actions taken by the individual during the time for which dose information is desired. This review should include consideration of work position, time in controlled areas, etc.

3. Doses received by other personnel doing similar work in the area

3.4 WEARING TLD'S

The wearing of TLD's will be strictly enforced.

3.5 TRACKING RADIATION EXPOSURE

Prior to personnel performing work at the Chemetron/McGean - ROHCO property, NRC Form-4, "Occupational External Radiation E[illegible] History", will be completed to determine personnel lifetime exposure. [illegible] "Current Occupational External Radiation Exposure", will be com[illegible]ted to determine personnel exposure for the current year and quarter.

4. INTERNAL RADIOLOGICAL MONITORING

4.1 BIOASSAY

4.1.1 In-vitro Bioassay

In-vitro sampling (urinalysis) will be performed at least twice during the course of work at the Chemetron/McGean - ROHCO property. The first sample will be collected prior to the actual start of work. The second sample will be collected upon work completion or personnel termination. Bioassay samples will also be collected in emergency situations.

4.1.2 In-vivo Bioassy

In-vivo (lung) counting will be performed by an approved vendor, i.e., local hospital if urinalysis is not possible or sufficient.

4.2 SPECIAL INTERNAL DOSIMETRY EVALUATION

Personnel who are involved in radiological work will have internal dosimetry evaluations when internal contamination is confirmed or suspected, in accordance with the following criteria:

A. A urinalysis or chest count will be required in the following circumstances:

1. Whenever personnel are exposed to high airborne radioactivity above limits in 10 CFR 20, Appendix B.

2. Whenever personnel are exposed to high airborne concentrations exceeding protection provided by respiratory equipment being worn.

3. Whenever nasal swabs or personnel frisking indicates detectable counts of alpha or beta-gamma activity above limits of Section 1.4 of the NES, Surface Contamination Program.

4. Whenever Radiological Controls Supervisor feels that internal monitoring is needed.

When in-vivo examinations are required as a result of internal contamination, the involved personnel shall be transported directly to the whole body counter facility as soon as practicable after the incident. Additionally, in-vitro fecal sampling may be required, if the urinalysis or in-vivo examination indicates internal contamination.

4.3 DOSE COMMITMENT

When an internal deposition is detected, the employee's dose commitment(s) shall be estimated by methods consistent with reports 26 and 30 of the International Commission on Radiological Protection (ICRP). The dose commitment shall be reported to the employee and shall become a part of his exposure history file. The dose commitment is defined as the dose equivalent (rem) received by specific organs during a period of one calendar year, that was the result of uptakes (single or multiple) of radionuclides.

4.4 WORK RESTRICTION

An employee may have his radiation work activities altered or limited as a result of:

1. Approaching the control levels of Section 2.1 herein
2. Unknown exposure status
3. Increased potential for internal deposition such as an open skin break
4. Repeated violations of safety requirements

The RCS is responsible for implementing work restrictions when necessary. The employee's supervisor shall be notified in writing that a work restriction has been imposed within hours of determining the need for a restriction. Copies of work restrictions will be maintained in the employee's dosimetry record.

No person shall exceed the administrative control levels of Section 2.1 without prior, written approval of the RCS and the SS.

An employee whose exposure status is unknown (e.g., lost dosimeter) shall not enter a controlled area until his current exposure status is determined by the RCS.

When an employee has an internal deposition of a radioisotope induced for medical diagnostic purposes, he shall be restricted from wearing a TLD until the medical isotope is eliminated from the body. This is done to avoid including exposure from the medical isotope to that exposure received from this contact with radioactive material.

Employees who work with radioactive materials shall report any skin breaks which they may have to their immediate supervisor and radiological controls personnel. Skin breaks include unhealed wounds, open cracks from chapping, injuries such as lacerations, abrasions, punctures, and blisters or burns. A clearly open wound shall be sufficient reason to prohibit entry to a controlled area, irrespective of protective clothing or medical dressings.

Safeguards shall be maintained by supervision to minimize the likelihood of accidental introduction of radioactive materials beneath the skin. If the skin is broken while working with radioactive materials, the employee shall immediately report to his immediate supervisor who will have the skin break surveyed by an RCT. The RCS will determine if additional follow-up action is required.

Contaminated personnel shall be decontaminated in accordance with approved procedures.

5. PERSONNEL RECORDS & REPORTS

5.1 EXPOSURE RECORDS

The RCS shall assure that records are maintained to permit a ready accounting of an employee's accumulated radiation exposure. This occupational exposure record shall include:

A. Any known prior employment occupational exposure history. (See Figure 1)

B. External and internal exposure received occupationally, including that received at other installations. (See Figure 2)

C. Special dose evaluations and work restrictions. (See Figure 3)

D. Reports of unusual exposure such as overexposure or incidents with potential for internal deposition. The incident forms will be supplied by NES.

Each employee shall be informed of the results of all record dosimetry evaluations. Non-record exposure control information shall be preserved for two years to enable exposure re-evaluation, if it should become necessary. Employee exposure records shall be retained by NES indefinitely.

6. IDENTIFICATION AND MONITORING OF CONTROLLED AREAS

6.1 CONTROLLED AREAS

A radiological controlled area applies to areas which contain radioactive materials or are considered as radiation areas.

There are five (5) area posting classifications as defined below:

A. Radiation Area

A Radiation Area is an accessible area where a major portion of the body could receive a dose from 1 mRem to 100 mRem in one hour.

Entrance to radiation areas shall be conspicuously posted with "DOSIMETRY REQUIRED" signs.

B. Airborne Radioactivity

Areas accessible to personnel will be posted as "AIRBORNE RADIOACTIVITY AREAS" if airborne radioactivity exists or is likely to exist in concentrations exceeding 25 percent of those specified in 10 CFR 20, Appendix B, Table I, Column I.

Each Airborne Radioactivity Area must be posted with signs meeting applicable standards, including the radiation symbol, and the words "CAUTION - AIRBORNE RADIOACTIVITY AREA".

C. High Radiation Area

A high radiation area is an accessible area where a major portion of the body could receive a dose in excess of 100 mrem in one hour. Such areas shall be posted as "High Radiation Areas" and locked or guarded. Positive controls shall be established for each entry into the area in such a way that no individual is prevented from leaving a high radiation area. Prior to locking the area, a search will be performed to ensure all personnel have exited. Signs shall be posted containing the conventional magenta three-bladed symbol on yellow background and the words "CAUTION - HIGH RADIATION AREA".

D. Radioactive Materials

A Radioactive Materials Area is an area that contains radioactive material in quantities exceeding ten times the 10CFR20 Appendix C quantity. Each Radioactive Materials Area must be posted with signs meeting applicable standards, including radiation symbol, and the words "CAUTION - RADIOACTIVE MATERIALS".

6.2 IDENTIFYING CONTROLLED AREAS

The boundaries of controlled areas, if not a permanent wall or fence, shall be clearly indicated by rope, or chain. Radiation warning signs printed in the standard yellow and magenta colors shall be posted to identify to personnel the actual or potential presence of radiation or contamination and to notify personnel of radiological conditions.

The radiation symbol used on radiological signs and tags shall conform with American National Standards Institute Standard N2.1-1969. The radiation symbol in the standard colors (magenta and yellow) shall not be used for any purpose other than radiological controls.

All radiological posting shall be done by or at the direction of radiological control personnel. Movement or removal of posted radiation warning signs, tags, or boundary markers by personnel other than radiological control personnel or without their approval may be cause for disciplinary action.

Controlled areas shall be posted with the appropriate signs such that posting is readily identifiable from all ordinary avenues of approach.

7. RADIOLOGICAL SURVEYS

Radiation surveys are performed as necessary to ensure that personnel do not exceed limits of Section 2.1 and do not receive unnecessary exposure to radiation. The primary concern is to minimize personnel exposure as low as reasonably achievable (ALARA) by providing information to radiation workers on the radiation levels in the work area so work will be completed efficiently. An example of a radiological survey form is provided as Figure 6.

7.1 SURVEY FREQUENCIES

Radiation surveys are performed as necessary to ensure personnel do not exceed radiation exposure limits and to meet requirements for posting radiation areas. These surveys are performed to determine whether abnormal radiation levels exist and to determine the extent and magnitude of radiation levels. The following surveys shall be the minimum performed.

1. <u>Facilities Containing Radioactive Material</u>

    a. Radiation surveys shall be performed to control radiation exposure whenever operations are performed that might be expected to change existing radiation levels. Examples of such operations include accumulation of waste and relocation of highly radioactive materials.

    b. Temporary boundaries (e.g., rope boundaries) of radiation areas shall be surveyed weekly to ensure controlled areas do not extend beyond posted boundaries.

    c. Gamma surveys shall be performed at least weekly in occupied posted radiation areas and high radiation areas, in all occupied areas of radiological facilities and in radioactive material short-term storage areas. Long-term storage areas shall be surveyed at least monthly.

    d. Other surveys shall be performed as necessary to control personnel exposure to gamma, beta and alpha radiation.

2. During Casualties

a. Radiation surveys shall be performed as necessary to assess the extent and magnitude of a radiation condition in the event of an accident which might cause abnormal radiation levels.

3. Records

a. Records of radiation surveys shall be retained until the end of the job and submitted to Chemetron Corporation. The survey information shall be recorded on a standard form, if specified, or on locally prepared forms which contain at least the following information:

- Date and time of survey
- Reason for survey and type of radiation measured (e.g., weekly gamma)
- Type and identifying number of instruments used
- Instrument calibration due dates
- Location (shall be shown on a survey map or listed in a table)
- Radiation level measured
- Remarks
- Signature of surveyor
- Signature of persons reviewing results (e.g., Radiological Controls Supervisor)

7.2 SAFETY PRECAUTIONS

The following safety precautions shall be observed by personnel using portable radiation monitoring equipment.

1 Only personnel trained in the use of portable radiation monitoring equipment shall be allowed to use this equipment. As a minimum, training shall consist of a lecture on the use of the instrument, and the meaning of its measurements, a demonstration of its proper handling, and a period of supervised use.

2. Damage to or loss of radioactive source can result in spreading, inhaling, or ingesting contamination. Therefore, radioactive sources require careful handling and accountability control. If a source is lost, immediate steps shall be taken to recover the source and minimize radiation exposure to or contamination of personnel as a result of the lost source.
3. Except for sources which are permanently attached to monitoring instruments, check sources which are not in use shall be kept in a locked cabinet. The number of keys shall be kept at a minimum. Combination locks are permitted and, when used, the number of personnel having the combination shall be kept to a minimum.

7.3 CALIBRATION AND MAINTENANCE OF SURVEY INSTRUMENTS

Radiological control supervisory personnel shall ensure that the appropriate survey instruments are available, functional, and calibrated using accepted standards for performing radiation surveys.

The types and uses of specific radiation monitoring devices recommended for use are listed in Table 7-1.

TABLE 7-1

RADIATION MONITORING DEVICES

APPLICATION	RECOMMENDED INSTRUMENTS
Personnel dosimetry, record	Landauer TLD/equipment
Personnel dosimetry, self-read	Atomic Products #019-100,200
Personnel survey/frisking, monitor	Eberline Model PCM-1A Personnel Contamination Monitor Technical Manual
Area radiation monitoring alpha	PRS-1,2 survey meter with AC3-7 probe
Area radiation monitoring beta/gamma	ESP-1 survey meter with HP-270, HP-290 probes
Contamination monitoring beta/gamma	ESP-1 survey meter with HP-210, HP-210AL probes
High level gamma radiation	Eberline Teletector G112A
Area exit surveys	Eberline Radiation monitor RM-20
Portable air sampling device	Radeco H-809V
Isotopic analysis	Canberra Model 85 MCA with intrinsic germanium crystal
General field geiger counter	ESP-1 with gamma/beta probe
Continuous air sampling device alpha	Eberline ALPHA-5A
Continuous air sampling device beta/gamma	Eberline AMS-3

8. EMERGENCY ACTIONS

8.1 ACCIDENTAL SPILLAGE OF RADIOACTIVE MATERIALS

Should radioactive or contaminated materials be accidentally released from their container the following actions shall be taken. NES personnel are to follow the instructions below which have been developed using the SWIMS acronym:

"S" = Stop the spill
"W" = Warn other personnel
"I" = Isolate the spill area
"M" = Minimize personnel exposure
"S" = Secure the appropriate equipment

Stop The Spill-

If the spill has occurred from a source which may or is continuing to add material to the spill, take such measures as necessary to stop the spill, such as closing a valve or blocking the path of the fluid with absorbent material. A balance of risk to the individual must be weighed for potential personnel risk in these actions versus the potential safety and economic cost if limited actions are taken. If mechanical action is needed, such as closing a valve or disabling a pump, knowledge of the effect on the total system or machinery involved is required prior to such actions.

Warn Other Personnel-

Others in the immediate area and those entering the area must be told of the event to enable all personnel to take the appropriate response actions. Health physics personnel must be notified as soon as possible.

Isolate The Spill Area-

Non-vital personnel shall be kept out of the immediate vicinity, if necessary by having someone posted at the entrance to the area. Personnel who have been contaminated shall remain in the immediate vicinity to prevent the spread of contaminants until health physics personnel release them. An exception to this is when the ambient radiation levels are high or of a traumatic injury requiring leaving the are has occurred.

Minimize Personnel Exposure-

The event may include both a radiological and a chemical hazard. Personnel shall remain in the immediate vicinity until health physics personnel arrive both to assist in spill control and to be available for surveying of exposed individuals. The nature of the spill, both chemical and radiological, and the need to monitor the spill shall dictate how close personnel should remain.

Secure The Appropriate Equipment -

Ventillation or other operating equipment may be selected for shutdown due to the nature of the spill and to prevent further occurrence. Knowledge of the systems and equipment involved is necessary prior to taking such action.

8.2 FIRE IN A CONTROLLED AREA

Areas shall be evacuated by all non-emergency personnel when a fire, heavy smoke, or similar fumes occur in a controlled area. Health physics, operational and/or fire response personnel shall be immediately notified. This is true for all fire events, including those where personnel in the immediate vicinity have extinguished a minor event, such as a wastebasket fire.

1. When possible the fire shall be extinguished by personnel in the immediate vicinity rather than allowing it to grow into larger proportions while designated personnel are on their way.

2. If a fire cannot be rapidly extinguished, the local fire department shall be summoned for fire detail:

   - fire detail shall wear self-contained respiratory equipment, protective clothing, and any other items deemed necessary by the lead health physics individual
   - the primary function of the fire detail shall be to evacuate personnel from the fire area
   - the secondary function of the fire detail shall be to save equipment and property without endangering their own or other lives
   - the tertiary function of the fire detail is to minimize the spread of contamination outside the controlled area

3. Fire extinguishing agents such as CO_2, foam, or dry chemicals are preferred as this minimizes the volume of potentially contaminated liquids.

4. All firefighting personnel shall be surveyed prior to exiting the event area except for those in need of immediate medical assistance outside the controlled area. Minimization of the spread of contamination will be kept in mind at all times.

8.3 CONTAMINATED INJURED MAN

1. Minor Wounds

Several steps should be taken when open wounds could be contaminated.

- o Wash minor wounds immediately under running water, spreading the edges of the gash. If at all practical, collect and retain cotton sponges, fluids, etc., for analyses.
- o Report all radiation accidents involving personnel wounds, ingestion or inhalation to the RCS as soon as possible.
- o Call, at once, a physician qualified to treat radiation injuries and to collect additional bioassay samples.
- o Permit no person involved in a radiation injury to return to work without the approval of the attending physician and the RCS.
- o Prepare a complete history of the accident and subsequent activity related thereto for the RCS.

2. Serious Injury

In emergency situations where an individual is seriously injured in a contaminated area, the first priority is to treat the injury.

Other actions include:

- o Contact the RCS
- o Call or have someone call an ambulance
- o Notify the nearest hospital qualified to treat contaminated injuries that a potentially contaminated injured person would soon arrive.

A Health Physics Technician equipped with appropriate survey instruments shall accompany the contaminated, injured individual to the hospital.

Once at the hospital, the Technician shall survey the emergency transport vehicle and paramedic crew. The Technician shall support the medical staff treating the patient regarding survey results, accident history, etc.

No contaminated injured individual may return to work without written approval of the attending physician and the RCS.

8.4 HIGH AIRBORNE RADIOACTIVITY

Particulate Radioactivity above 2 x 10^{-11} uCi/ml alpha (based on insoluable U-238) in occupied radiological areas:

NOTE: High airborne contamination is not expected in ground moving tasks. However, cutting, grinding or burning of other material may be performed in containment thus warranting these precautions.

A. Immediate Action: Notify Radiological Controls Supervisor.

(1) Evacuate personnel from affected areas. Don respiratory equipment in accordance with the Airborne Radioactivity Program (No. 83A5497) for personnel who must return to the affected area.

(2) Verify that the high airborne results (i.e., from air sampling or elevated instrument readings) are correct.

(3) Stop operations which might be causing high airborne radioactivity until adequate control of airborne radioactivity is established.

(4) Secure air moving equipment (e.g., fans, window air conditioners, and unit heaters) in the affected spaces.

(5) Determine the extent of the airborne radioactivity by sampling the affected area and adjacent areas which might be affected using portable air samplers.

B. Supplementary Action:

(1) Attempt to identify the radionuclide causing the airborne radioactivity. For example, by promptly measuring the sample for alpha radioactivity and determining the half-life.

(2) Measure and control surface contamination in areas affected by high airborne radioactivity.

(3) Perform alpha and beta/gamma surveys of ventilation filters and ducts and measure surface contamination in the vicinity of the ventilation exhaust discharge point.

(4) When resuming operations, take a portable air sample to verify that the cause of high airborne radioactivity is corrected.

(5) Check personnel exposed to high particulate radioactivity for internal radioactivity.

C. Followup Action:

A report of any incident involving high airborne radioactivity, other than fallout or natural background, in areas occupied by personnel not wearing or wearing inappropriate respiratory equipment, shall be sent to Remcor. The report shall include results of internal monitoring and be submitted within ten working days.

8.5 LOSS OF RADIOACTIVE MATERIAL

If radioactive material is lost, the following procedures shall be followed:

A. NES will immediately conduct a search. The primary reason for this is to ascertain that no persons will receive inadvertent internal or external exposure from the material.

B. If the material cannot be located before the end of the work day, NES will prepare an incident report in accordance with 10 CFR 20.402 and notify the NRC as appropriate.

NRC Form 4
(12-81)
10 CFR 20

Approved by OMB
3150-0005

U S NUCLEAR REGULATORY COMMISSION

OCCUPATIONAL EXTERNAL RADIATION EXPOSURE HISTORY

See instructions on the Back

IDENTIFICATION

1. NAME (PRINT – LAST, FIRST, AND MIDDLE)	2. SOCIAL SECURITY NO.
3. DATE OF BIRTH (MONTH, DAY, YEAR)	4. AGE IN FULL YEARS (N)

OCCUPATIONAL EXPOSURE – PREVIOUS HISTORY

5. PREVIOUS EMPLOYMENTS INVOLVING RADIATION EXPOSURE – LIST NAME AND ADDRESS OF EMPLOYER	6. DATES OF EMPLOYMENT (FROM – TO)	7. PERIODS OF EXPOSURE	8. WHOLE BODY (REM)	9. RECORD OR CALCULATED (INSERT ONE)
10. REMARKS	11. ACCUMULATED OCCUPATIONAL DOSE – TOTAL			

13. CALCULATIONS – PERMISSIBLE DOSE WHOLE BODY

(A) PERMISSIBLE ACCUMULATED DOSE = 5(N – 18) . ______ ______ REM

(B) TOTAL EXPOSURE TO DATE (FROM ITEM 11) . ______ ______ REM

(C) UNUSED PART OF PERMISSIBLE ACCUMULATED DOSE (A – B) . ______ ______ REM

12. CERTIFICATION: I CERTIFY THAT THE EXPOSURE HISTORY LISTED IN COLUMNS 5, 6, AND 7 IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

EMPLOYEE'S SIGNATURE DATE

14. NAME OF LICENSEE

FIGURE 1

NRC Form 5
(10-81)
10 CFR 20

Approved by OMB
3150-0006

U. S. NUCLEAR REGULATORY COMMISSION

CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

See instructions on Back

IDENTIFICATION

1. NAME (PRINT – Last, first, and middle)	2. SOCIAL SECURITY NO.
3. DATE OF BIRTH (Month, day, year)	4. NAME OF LICENSEE

5. DOSE RECORDED FOR (Specify: Whole body, skin of whole body, or hands and forearms, feet and ankles.)	6. WHOLE BODY DOSE STATUS (rem)	7. METHOD OF MONITORING (e.g., Film Badge – FB, Pocket Chamber – PC, Calculations – Calc.) X OR GAMMA ______ BETA ______ NEUTRONS ______

8. PERIOD OF EXPOSURE (From – To)	DOSE FOR THE PERIOD (rem)				13. RUNNING TOTAL FOR CALENDAR QUARTER (rem)
	9. X OR GAMMA	10. BETA	11. NEUTRON	12. TOTAL	

LIFETIME ACCUMULATED DOSE

14. PREVIOUS TOTAL (rem)	15. TOTAL QUARTERLY DOSE date rem	16. TOTAL ACCUMULATED DOSE (rem)	17. PERM. ACC. DOSE 5(N-18) (rem)	18. UNUSED PART OF PERMISSIBLE ACCUMULATED DOSE (rem)

FIGURE 2

Sheet ___ of ___

Rev. ___

Date ___

DOSE EVALUATION REPORT

NAME ______________ SOCIAL SECURITY NO. ______________

DATE OF BIRTH ______________ COMPANY OR CRAFT ______________

LOST TLD ☐ No. ______________ NEUTRON DOSE EVALUATION ☐

LOST FILM BADGE ☐ No. ______________ Lost Dosimeter ☐ No ______________

DAMAGED ☐ (Describe) ______________

DESCRIPTION OF OCCURRENCE

(Use additional Sheets if necessary and check here if used ☐)

Summary of Available Records of Exposure (Give Survey Numbers, RWP Numbers, Dosimeter Readings, etc.)

(Use additional Sheets if necessary and check here if used ☐)

Estimated Exposure (Evaluate above Data and Estimate Occupational External Radiation Exposure. Describe Evaluation below and Attach Additional Sheets if necessary. Check Here ☐ if used)

______ Rem ______ Rem ______ Rem

Whole Body Skin Extremities

______________ ______________ ______________

Employee Supervisor Investigator

ACTION

Personnel Monitoring Records Adjusted

Date ______________

By ______________

File This Report with Applicable Dosimetry Records For Period

FIGURE 3

FIELD SURVEY MAP LOCATION ____ /AREA

DATE ________ TIME ________ REASON ________________

INSTRUMENT USED ____________ SERIAL NO. ____________

REMARKS ______________________________

SURVEYED BY: ______________ REVIEWED BY: ______________

FIGURE 4

DAMES & MOORE
HEALTH AND SAFETY PLAN

Project Name:	Allegheny International, Harvard/Bert Ave. Sites
Project Number:	17653-003-023
Project Site Location:	Newburgh Heights, Ohio
Project Manager:	Theodore Adams
Site Safety Officer:	Larry Keefe
Plan Preparer:	Kathryn A. Sova
Preparation Date:	September 1990

APPROVED:

Regional Health & Safety Manager

______________________________ (Date)

Office Safety Coordinator

______________________________ (Date)

Managing Principal-in-Charge

______________________________ (Date)

Project Manager

______________________________ (Date)

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ATTACHMENT B - Standard Safe Work Practices
ATTACHMENT C - Contacts and Procedures
ATTACHMENT D - Responsibilities
ATTACHMENT E - Heat Stress/Cold Stress
ATTACHMENT F - Forms

1.0 PURPOSE

The purpose of this Plan is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise while conducting sampling and other on-site activities at the Allegheny International (Harvard/Bert Avenue) sites in Newburgh Heights, Ohio.

2.0 APPLICABILITY

The provisions of the Plan are mandatory for all on-site Dames & Moore employees and Dames & Moore subcontractors engaged in on-site operations who will be exposed or have the potential to be exposed to on-site hazardous substances.

Dames & Moore policy states that Dames & Moore subcontractors shall provide a health and safety plan for their employees covering any exposure to hazardous materials and shall complete all work in accordance with that plan. The subcontractor may choose to use Dames & Moore's Health and Safety Plan as a guide in developing its own plan or may choose to adopt in full the Dames & Moore plan. In either case, the subcontractor shall hold Dames & Moore harmless from, and indemnify it against, all liability in the case of any injury. Dames & Moore reserves the right to review and approve the subcontractor's plan at any time. All subcontractors will, at a minimum, follow all provisions of the Dames & Moore Health and Safety Plan.

Inadequate health and safety precautions on the part of the subcontractor, or the belief that the subcontractor's personnel are or may be exposed to an immediate health hazard, can be the cause for Dames & Moore to suspend the subcontractor's site work and ask the subcontractor's personnel to evacuate the hazard area.

Dames & Moore's subcontractor will be responsible for operating in accordance with the Occupational Safety and Health Administration (OSHA) regulations 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response. These regulations include the following provisions for employees exposed to hazardous substances, health hazards, or safety hazards: training as described in 120(e); medical surveillance as described in 120(f); and personal protective equipment described in 120(g).

3.0 SITE DESCRIPTION

3.1 GENERAL INFORMATION

Site: Allegheny International, Harvard/Bert Avenue Sites
Job No.: 17653-003-023
Objectives: To conduct an environmental investigation.
Proposed Date of Investigation: September 1990 - Unknown
Background Review of the Site: Complete ___ Preliminary _X_
Documentation/Summary: Overall Hazard: Serious ___ Moderate _X_
Low ___ Unknown _X_

3.2 SITE HISTORY

Bert Avenue Site

Prior to 1975, the Chemetron Corporation disposed of industrial wastes and rubble at a nearby dump site at Bert Avenue. These wastes included general plant trash, process residues, and building debris. Some of the material discarded was contaminated with low levels of depleted uranium (U_3O_8). This contaminant resulted from the dismantling and decommissioning of the company's former depleted uranium conversion and catalyst product facility, which was operated at the Harvard Avenue site. Other wastes discarded at this dump were: antimony slag, containing nuclide of the natural uranium and thorium decay series in disequilibrium; fly ash, containing the natural uranium and thorium decay series; and fire brick and crucibles, also containing the uranium and thorium decay series radionuclides.

Currently, the southern portion of the property is on the same level as the adjacent land; there is a steep slope to a swampy, surface-water drainage area in the northeast portion of the site. Discarded equipment and miscellaneous trash and rubble are located around the edges of the slope. The site is fenced with access controlled by a locked gate.

Harvard Avenue Site

In 1959, the Chemetron Corporation purchased a foundry warehouse at the company's present location in Newburgh Heights, Ohio. Portions of this building were used from 1965 to 1972 to convert depleted UF_6 to U_3O_8 for use in producing a chemical catalyst. Processing operations subsequently contaminated the south end of the building.

The site consists of a parcel of vacant land adjacent to the current McGean/Rohco facility. The site is at grade level, fences on three sides, and bounded on the fourth side by the warehouse wall.

3.2.1 Dames & Moore Activities

Dames & Moore will:

- Collect surficial soil samples;
- Perform radiological surveys;
- Perform air monitoring surveys for chemical hazards; and

- Monitor a subcontractor drilling soil borings, and collect soil samples from the borings.

3.3 FACILITY DESCRIPTION

Waste Types: Liquid _X_ Solid _X_ Sludge ___ Gas ___
Characteristics: Corrosive ___ Ignitable ___ Radioactive _X_
Volatile ___ Toxic _X_ Reactive ___ Unknown _X_
Unusual Site Features (dike integrity, power lines, terrain, etc.):
(Steep, deep slope - Bert Avenue site)
Status: (active, inactive, unknown) _Inactive_

3.4 HAZARD EVALUATION

Radiological

Hazardous exposures associated with uranium are of two types: chemical and radiological; of the two, radiation is the more hazardous. Prior radiological surveys and soil sampling at both sites have identified residual surface and subsurface radioactive contamination. There are three principal types of natural radioactive emissions from radionuclides.

Alpha particles have very low penetrating power and can be stopped by paper or the upper layers of skin, but are hazardous if inhaled or ingested.

Beta particles have fairly low penetrating power, but can cause localized skin reactions, such as burns, when external to the body. Beta particles are also hazardous if inhaled or ingested.

Gamma rays have high penetrating power when external to the body, and if gamma-emitting sources exist within the body, it poses an internal hazard as well.

Protective equipment is required to prevent inhalation and ingestion of gamma-emitting materials.

As activities on-site include drilling and sampling, close attention will be paid to site monitoring for radioactive contamination. Therefore, an NES Health Physics Technician will follow screening/sampling procedures as outlined in the NES Radiological Control Plan (Attachment A).

<u>Safety</u>

The Bert Avenue site has an excavation which is deeply sloped and littered with debris, e.g., glass, metal, etc. A registered professional engineer will assess the stability of the slope prior to on-site activities and determine if protective system(s) are needed.

The Harvard Avenue site has several excavations which, after periods of rain, accumulate water in the bottom of the excavation. Dames & Moore personnel will not enter any excavations unless a registered professional engineer has evaluated safety conditions in terms of OSHA regulations 29 CFR Part 1926 Subpart P - Excavation Standard.

Standard Safe Work Practices employed by Dames & Moore are listed in Attachment B and must be adhered to at all times.

<u>Chemical</u>

Recent sampling indicates the presence of metals in soils and sediment. The exposure limits, recognition qualities, acute and chronic effects and first-aid treatment for these contaminants are presented in Tables 1 and 2.

Routes of exposure associated with contaminated dusts are via inhalation and eye and/or skin contact if dry or dusty conditions exist. Volatile organic compounds, if present in environmental media, may be hazardous if inhaled or absorbed through the skin.

Therefore, a minimum of Level D+ protection is recommended to perform work on site with the potential to upgrade to Level C if organic vapors exceed action levels and/or if dry or dusty conditions exist. Tables 3 and 4 provide hazard monitoring methods, action levels and protective equipment required for on-site activities.

4.0 EMERGENCY INFORMATION

If an emergency develops on-site, the procedures as listed in Attachment C should be utilized. Should the situation require outside support services, the client will be notified along with the appropriate contact from the list which follows.

4.1 EMERGENCY CONTACTS

Contact	Person or Agency	Telephone
Police (Bert Ave. Site)	Newburgh Heights	911
Police (Harvard Ave. Site)	Coyahoga Heights	(216) 883-6800
Fire (Bert Ave. Site)	Newburgh Heights	911
Fire (Harvard Ave. Site)	Coyahoga Heights	(216) 641-1923
Ambulance	Newburgh Heights	911
Hospital	Saint Vincent Charity	(216) 363-2746
Client Contact	John Ellwood (AI)	(412) 562-4180
D&M Project Manager	Theodore Adams	(716) 662-8016 (216) 341-6818 (Bert Ave. Site)
D&M M[illegible]IC/Group Leader	Robert Blickwedehl	(716) 662-8016
D&M Regional H&S Manager	Kathryn A. Sova	(201) 272-8300
D&M Cert. Health Physicist	Dr. Carlyle Roberts	(716) 942-3235

4.2 LOCATION OF SITE RESOURCES (for emergency use)

Water Supply: Available on site.
Telephone: Available on site.

The location of site resources for emergency use will be identified by the Site Safety Officer prior to initiation of on-site activities.

4.3 ADDITIONAL ARTICLES TO BE TAKEN INTO FIELD

1. First Aid Kit
2. Disposal Eye Wash (1 liter or more)

5.0 SITE SAFETY WORK PLAN

5.1 MONITORING

5.1.1 Monitoring Requirements

The Site Safety Officer (SSO) will conduct air monitoring for the hazards present in Table 1. Equipment necessary for air monitoring at this site consists of an OVA/PID, a particulate meter and an explosimeter. The type of monitoring instruments specified by the hazard and the action levels to upgrade personal protection are shown in Table 3. All monitoring equipment shall be maintained following procedures outlined in the owner's manual for the specified monitoring equipment.

5.1.2 Monitoring Schedule

5.1.2.1 Instrument Calibration

All applicable instruments shall be calibrated daily. Readings shall be recorded on the Instrument Calibration Check-Out Sheet provided in Attachment F.

5.1.2.2 Background Readings

Before any field activities commence, the background levels of the site will be read and noted on the Air Monitoring Forms in Attachment F. Daily background readings shall take place away from areas of potential contamination to obtain accurate results.

Generally, background levels for organic vapors in ambient air read zero. If background readings indicate higher levels of organic vapors than anticipated, the Site Safety Officer will determine the source of the readings prior to initiation of on-site activities. This Plan will be amended, as appropriate, to reflect any adjustments necessary as the result of higher than expected background levels.

5.1.2.3 Air Monitoring Frequency

All site readings may be noted on the Air Monitoring Form provided in Attachment F along with the date, time, weather conditions, wind direction and speed, if possible, and location where the background level was recorded.

The following schedule should be followed for air monitoring activities as specified for each activity.

Activity: All Activities

Air Monitoring Equipment	Monitoring Frequency
CGI	Monitor every 15 min/every sample retrieved
HNu/OVA	Monitor every 15 min/every sample retrieved
Particulate Meter	Monitor continuously

5.2 LEVELS OF PROTECTION

A minimum of Level D+ protection is needed to perform work on site. Level C protection may be required, as described in Table 4, and will be available on-site.

5.3 RESPIRATORY PROTECTION

5.3.1 Types of Cartridges/Limits of Cartridges

If air purifying respirators are required, organic vapor/acid gas cartridge(s) with high efficiency dust and mist filters will be used.

Sampling activities will be initiated in Level D+. If organic vapors as measured in the breathing zone by the OVA/PID exceed 1 ppm, don respirators. However, if organic vapors exceed 5 ppm, evacuate the area and notify the Project Manager. A re-assessment of personal protective equipment (PPE), including respiratory protection, will be made.

All ambient air measurements which are taken to evaluate personnel exposure will be taken within the individual's breathing zone and shall be fairly frequent or constant for a duration of at least 30 seconds.

If dust levels, as measured by the particulate monitor, exceed 1 mg/m^3, implement dust suppression measures or Level C. If dusty conditions continue following dust suppression, don respirator.

5.4 WORK LIMITATIONS

In general, field work will be conducted during daylight hours only. At least two personnel will be in the field at all times. The Dames & Moore Project Manager (PM) or Regional Health and Safety Manager (RHSM) must grant special permission for any field activities conducted beyond daylight hours. All Dames & Moore personnel working in the field have completed the Dames & Moore Hazardous Material Sites Training Course (or its equivalent). Additionally, all Dames & Moore field personnel have been declared medically fit for duty and, where respiratory protection is necessary, have been properly trained, fit tested and declared fit for respiratory use. No drilling shall take place without first confirming the absence of subsurface utility lines or other buried metal objects.

5.5 FIELD PERSONNEL

The responsibilities of the Project Manager, the On-Site Safety Officer and project personnel are listed in Attachment E and must be adhered to at all times.

A work party consisting of the following persons will perform the tasks:
Project Manager: Theodore Adams
Site Safety Officer: Larry Keefe

5.6 HEAT STRESS/COLD STRESS

If on-site activities are conducted during extreme weather conditions, instructions for minimizing heat stress/cold stress are in Attachment E.

6.0 DECONTAMINATION PROCEDURES

6.1 GENERAL

Radiological

A single radiological entry/exit (control) point will be established for each site such that, prior to entry, all Dames & Moore and Dames & Moore subcontractor work personnel are checked by an NES Health Physics Technician for proper protective clothing. Upon exiting, contaminated or suspected contaminated clothing is removed, and placed in proper waste receptacles, and all exiting personnel will perform a self-frisk to determine any presence of contamination.

Persons found to be contaminated will be deconned in accordance with the NES Radiological Control Plan (Attachment A), and the levels and extent of the contamination documented. The results of any and all decontamination efforts will also be documented.

Chemical

Personnel should follow the decontamination procedures outlined below.

1. Locate a decontamination area.

2. Establish a personnel decontamination station consisting of a basin with soapy water, a rinse basin with plain water and a can with a plastic bag.

3. Wash and rinse boots.

4. Remove outside gloves and discard in plastic bag.

5. Remove disposable suit and discard in plastic bag.

6. Upon leaving the contamination area, all personnel will proceed through the appropriate Contamination Reduction Sequence as described above.

7. All protection gear should be left on-site during lunch break following decontamination procedures.

The maximum decontamination layout for Level C protection is shown on the attached diagram, and a description is given below.

Maximum Measures for Level C Decontamination

Station			
1:	Segregated Equipment Drop	1.	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths or indifferent containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
2:	Boot Cover & Glove Wash	2.	Scrub outer boot covers and gloves with decon solution or detergent and water.
3:	Boot Cover & Glove Rinse	3.	Rinse off decon solution from Station 2 using copious amounts of water.
4:	Tape Removal	4.	Remove tape around boots and gloves and deposit in container with plastic liner.

5:	Boot Cover Removal	5. Remove boot covers and deposit in container with plastic liner.
6:	Outer Glove Removal	6. Remove outer gloves and deposit in container with plastic liner.
7:	Suit and Boot Wash	7. Wash splash suit, gloves, and safety boots. Scrub with long-handled scrub brush and decon solution.
8:	Suit, Boot & Glove Rinse	8. Rinse off decon solution using water. Repeat as many times as necessary.
9:	Cartridge or Mask Change	9. If worker leaves exclusion zone to change cartridges (or mask), this is the last step in the decontamination procedures. Worker's cartridges are exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.
10:	Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
11:	Splash Suit Removal	11. With assistance of helper, remove splash suit. Deposit in container with plastic liner.
12:	Inner Glove Wash	12. Wash inner gloves with decon solution.
13:	Inner Glove Rinse	13. Rinse inner gloves with water.

14:	Face Piece Removal	14.	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
15:	Inner Glove Removal	15.	Remove inner gloves and deposit in lined container.
16:	Inner Clothing Removal	16.	Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the disposable coveralls.
17:	Field Wash	17.	Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
18:	Redress	18.	Put on clean clothes.

Minimal Decontamination

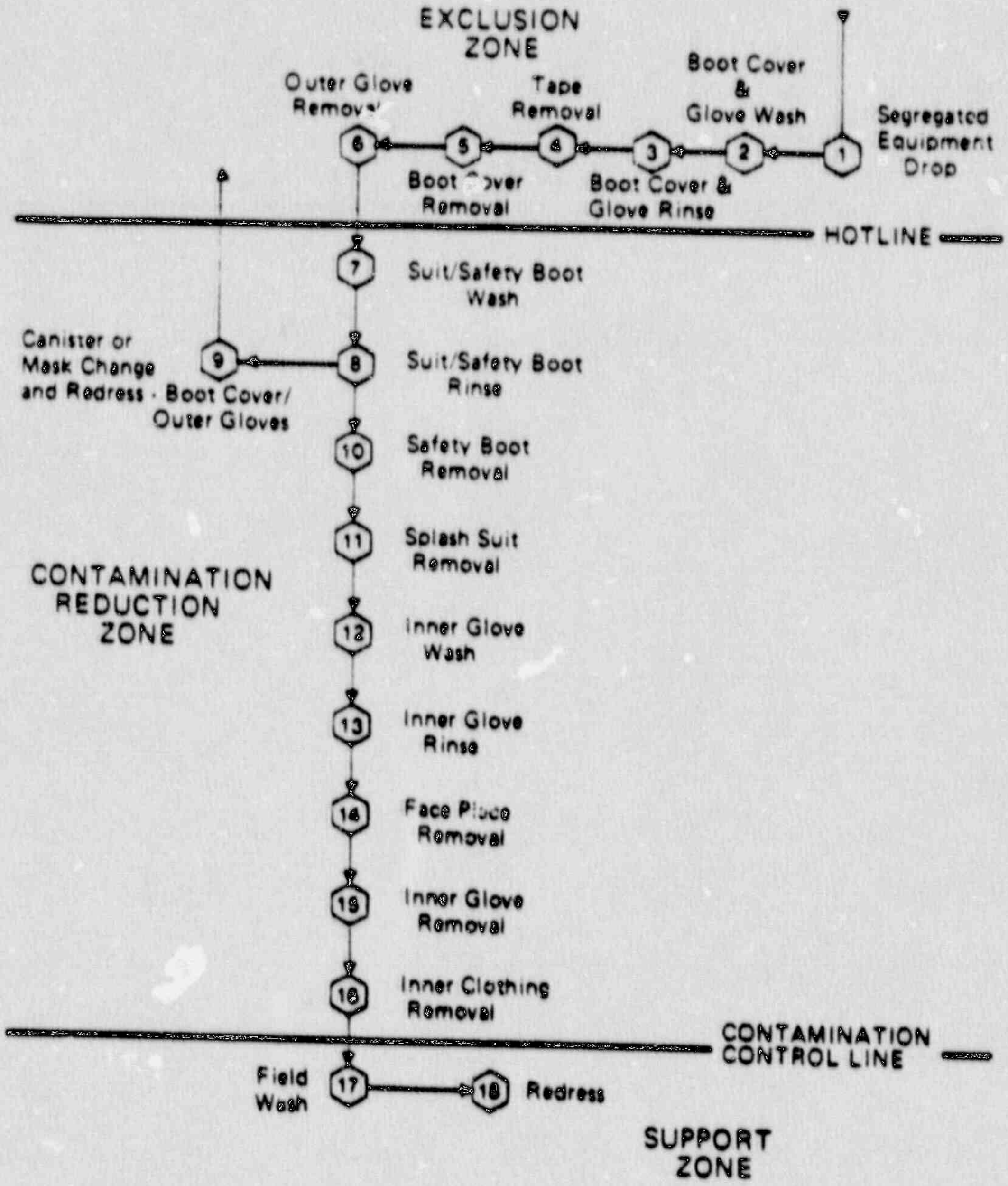
Less extensive procedures for decontamination can be subsequently or initially established when the type and degree of contamination becomes known or potential for transfer is judged to be minimal. These procedures generally involve one or two washdowns only. The layout for a minimal decontamination operation is shown in the attached diagram.

Closure of the Personnel Decontamination Station

All disposable clothing and plastic sheeting used during the operation should be double-bagged and removed to an approved off-site disposal facility. Decon and rinse solution will be contained on site. Re-usable rubber clothing should be dried and prepared for future use. (If gross contamination has occurred, additional decontamination of these items may be required.) Cloth items should be bagged and removed from the site for final cleaning. All wash tubs, pail containers, etc. should be thoroughly washed, rinsed, and dried prior to removal from the site.

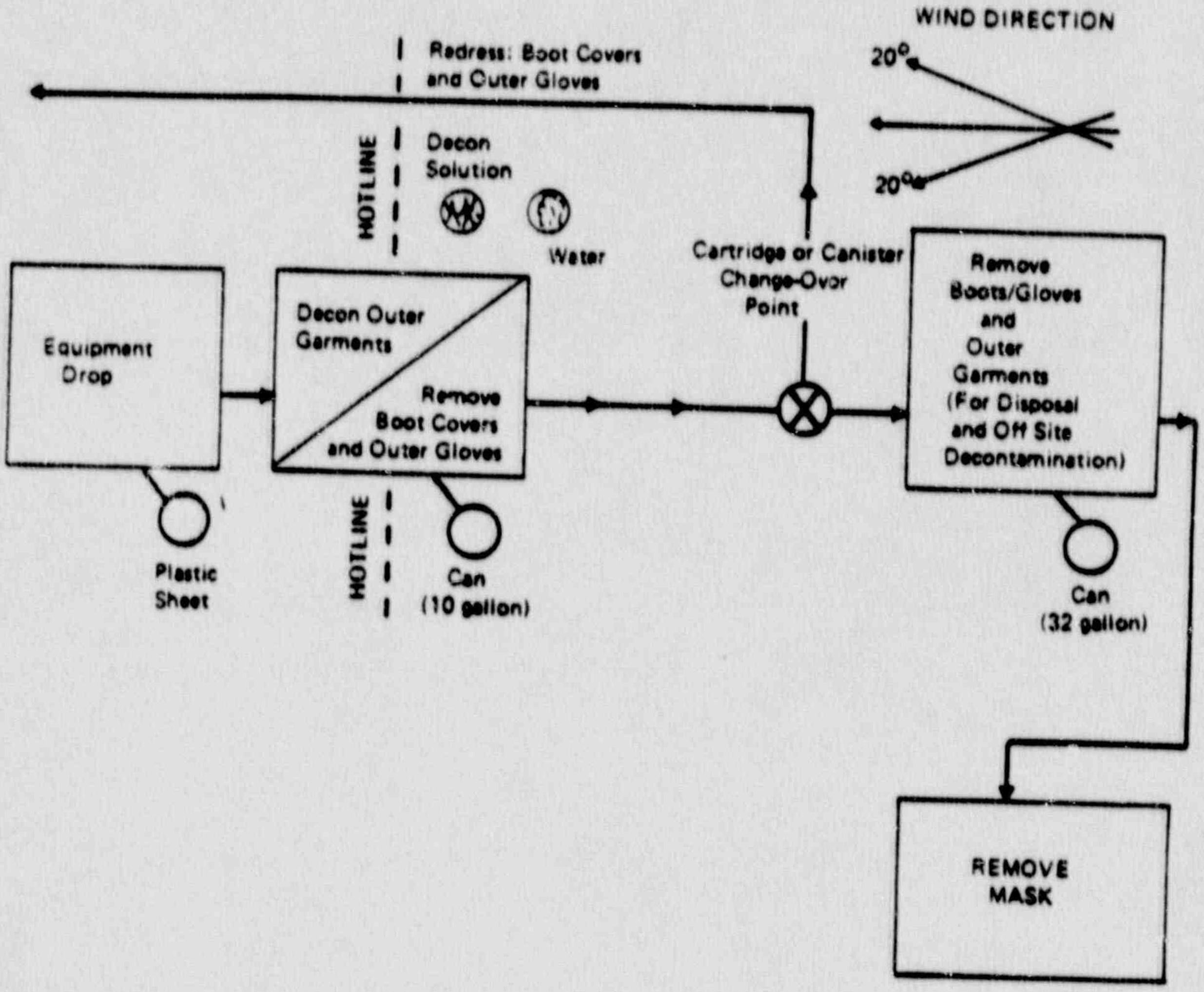
MAXIMUM DECONTAMINATION LAYOUT

L[illegible] PROTECTION



MINIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION



7.0 FORMS

The following forms are located in Attachment E:

Site Safety Briefing Form
Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form (to be completed by PM only)
Calibration Check Sheet
Air Monitoring Form

The Site Safety Briefing Form will be completed prior to initiation of on-site activities. The Plan Acceptance Form should be filled out by all employees working on the site. The Plan Feedback Form should be filled out by the On-Site Safety Officer and any other on-site employee who wishes to fill one out. The Accident Report Form should be filled out by the Project Manager in the event that an accident occurs.

ALL COMPLETED FORMS SHOULD BE RETURNED TO THE BUFFALO HEALTH AND SAFETY OFFICER

TABLE 1

EXPOSURE LIMITS AND RECOGNITION QUALITIES

COMPOUND	EXPOSURE[a] LIMITS (PPM UNLESS OTHERWISE INDICATED)	IDLH[b] LEVEL (PPM UNLESS OTHERWISE INDICATED)	ODOR	WARNING CONCENTRATION (PPM)	LEL[c] %	UEL[d] %	IONIZATION POTENTIAL (EV)
Uranium	0.2 mg/m^3(2)	20 mg/m^3	Variable	--	Variable	Variable	--
Chromium	1 mg/m^3(1) 0.5 mg/m^3(2)	None	Variable	--	Variable	Variable	--
Antimony	0.5 mg/m^3(1)(2)	80 mg/m^3	--	--	--	--	--
Arsenic	0.2 mg/m^3(2)	Ca	Variable	Variable	--	--	--
Zinc	Varies with Compound	None	--	--	--	--	--
Lead	0.15 mg/m^3(2)	None	Variable	--	Variable	Variable	--
Copper	1 mg/m^3(1)(2)	None Specified	Odorless	--	--	--	--
Nickel	1 mg/m^3(1)(2)	Ca	Variable	--	--	--	--

NOTES:

(a) * OSHA Permissible Exposure Limit or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value.
(b) Immediately Dangerous to Life or Health Level.
(c) Lower Explosive Limit
(d) Upper Explosive Limit

(1) OSHA Time Weighted Average
(2) ACGIH Time Weighted Average

Ca = Potential human carcinogen

The odor warning concentrations given are generally odor thresholds with irritation thresholds given in parenthesis.

TABLE 2

ACUTE AND CHRONIC EFFECTS AND FIRST-AID TREATMENT

COMPOUND	ROUTES OF ENTRY	EYE IRRITANT	ACUTE EFFECTS	CHRONIC EFFECTS
Uranium	Inhalation Ingestion	Yes	Dermatitis, skin burns, chest rales, cough, nausea, vomiting	Skin, bone marrow, lymphoatics, blood liver, kidneys
Chromium	Inhalation Ingestion Skin and/or Eye Contact	--	Histologic fibrosis of lungs	Respiratory system, Chromium VI carcinogen
Antimony	Inhalation Skin and/or Eye Contact	--	Irritates nose, throat, mouth; cough, dizziness, headache, nausea, vomiting, diarrhea, unable to smell	Respiratory system, CVS, skin, eyes
Arsenic	Inhalation Ingestion Skin Absorption Skin and/or Eye Contact	--	Ulceration of nasal septum, dermatitis, GI disturbances, hyperpigmentation of skin	Liver, kidneys, skin, lungs, lymphatic system
Zinc	Inhalation	--	Sweet metal taste, dry throat, cough, chills, fever, tight chest, blurred vision, back pain	Respiratory system
Lead	Inhalation Ingestion Skin and/or Eye Contact	--	Lassitude, insomnia, eye grounds, abdominal pain, gingival lead line	GI tract, CNS, kidneys, blood, gingival tissue
Copper	Inhalation Ingestion Skin and/or Eye Contact	Yes	Irritates mucous membranes, metal taste, dermatitis	Respiratory system, skin, liver, increased risk with Wilson's disease, kidneys
Nickel	Inhalation Ingestion Skin and/or Eye Contact	--	Nasal cavities, sensitive dermatitis, allergic asthma, pneumonitis	Nasal cavities, lungs, skin

<u>General First-Aid Treatment</u> (A first-aid kit will be kept in the site vehicle)

Eye - Irrigate Immediately (A portable eye-wash unit will be kept in the site vehicle.)
Skin - Soap Wash Promptly
Inhalation - Move to Fresh Air
Ingestion - Get Medical Attention

TABLE 3

HAZARD MONITORING METHOD, ACTION LEVELS, AND PR TECTIVE MEASURES

HAZARD	MONITORING METHOD	ACTION LEVEL	PROTECTIVE MEASURES	MONITORING SCHEDULE
Toxic Vapors	OVA/PID (10.2 EV lamp)	(1) Measurable Above Background Based on Judgement of SSO up to 1 ppm	Level D+ (see Table 4)	o Continue working o Continue monitoring every 15 minutes/ every sample retrieved
	OVA/PID (10.2 EV lamp)	(1) Measurable Above Background Based on Judgement of SSO 1-5 ppm	Level C (see Table 4)	o Continue working o Continuous monitoring
	OVA/PID (10.2 EV lamp)	(1) Measurable Above Background Based on Judgement of SSO >5 ppm	STOP WORK EVACUATE AREA NOTIFY PROJECT MANAGER	
Toxic Dust	Particulate Monitor	< 1 mg/m^3 above background	Level D+ (see Table 4)	o Continuous monitoring
		> 1 mg/m^3 above background	*Implement dust suppression measures. Level C (See Table 4)	o Continuous monitoring
Explosive Atmosphere	Explosimeter	0-10% LEL		o Continue monitoring every 15 minutes/ every sample retrieved
		10-25% LEL		o Continuous monitoring
		>25% LEL	EVACUATE AREA EXPLOSION HAZARD NOTIFY PROJECT MANAGER	

NOTES:

(1) The above action levels are not solely based on the criteria for selecting levels of protection by the 1984 EPA Standard Operating Procedures, but also on the professional judgement and experience of the Site Safety Officer (SSO).

* Super windy or dusty conditions exist. The area should be hosed down to try to minimize the potential for the inhalation of contaminated dust.

TABLE 4

PROTECTIVE EQUIPMENT FOR ON-SITE ACTIVITIES

Activity	Level	Protective Equipment
All Activities	D+	o Hard hat
		o Safety goggles
		o Tyvek coveralls[1]
		o Heavy duty anti-C rubber gloves and inner latex gloves
		o Outer chemical-resistant (neoprene) steel-toe/steel-shank boots or rubber boots over steel-toe work boots
		o Dosimetry Badge (TLD)
		o Hearing protection (foam ear plugs or ear muffs)[2]
All Activities	C	o Same as above plus
		o Full-face respirator with organic vapor/acid gas cartridges with high-efficiency dust and mist filters[3]

(1) Cotton coveralls can be used in place of Tyvek coveralls (except during drilling) when direct reading instrumentation and visual observation indicate that no contamination is present.

(2) Required during noise intensive activities.

(3) If the OVA/PID reading is measurable above background or dusty conditions exist.

ATTACHMENT A

SEE NES RADIOLOGICAL CONTROL PLAN

ATTACHMENT B

STANDARD SAFE WORK PRACTICES

I. GENERAL

1. Eating, drinking, chewing gum or tobacco and smoking are prohibited in the contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists. Employees who handle contaminated or potentially contaminated materials or articles must wash with soap or mild detergent and water before eating.

2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surface (i.e., ground, etc.).

3. Prevent, to the extent possible, spillage. In the event that a spillage occurs, contain liquid, if possible.

4. Prevent splashing of contaminated materials.

5. All field crew members shall make use of their senses (***all senses***) to alert them to potentially dangerous situations in which they should not become involved (i.e., presence of strong, irritating or nauseating odors).

6. Field crew members shall be familiar with the physical characteristics of investigations, including:

   - Wind direction in relation to ground zero area;,
   - Accessibility to associates, equipment, vehicles;
   - Communications;
   - Hot zone (areas of known or suspected contamination);

- Site access;
- Nearest water sources.

7. The number of personnel and equipment in the contaminated area should be minimized, but only to the extent consistent with work force requirements of safe site operations.

8. All wastes generated during Dames & Moore and/or subcontractor activities at the site will be disposed of as directed by the Project Manager.

II. DRILLING AND SAMPLING PROCEDURES

For all drilling and sampling activities, the following standard safety procedures shall be employed.

1. All drilling and sampling equipment shall be cleaned before proceeding to the site.

2. At the drilling or sampling site, sampling equipment shall be cleaned after each use.

3. Work in "cleaner" areas should be conducted first where practical.

4. The minimum number of personnel necessary to achieve the objectives shall be within 25 feet of the drilling or sampling activity.

5. If emergency and back-up subcontracted personnel are at the site, they should remain 25 feet from the drilling or sampling activity, where practical.

6. Exclusion zones will be established within designated hot lines. Delineation of a hot line will reflect the interface between areas at or below a predetermined threshold contaminant concentration, based on available data including the results of monitoring and chemical analyses, information from site personnel regarding historical site activities, and general observations. This determination will be made by the Project Manager in conjunction with the On-Site Safety Officer and site personnel.

ATTACHMENT C

CONTACTS AND PROCEDURES

I. CONTACTS

Should any situation of unplanned occurrence require outside support service, the appropriate contacts should be made. The list of appropriate contacts is found in Section 4 of the Health and Safety Plan.

II. PROCEDURES

In the event that an emergency develops on-site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on-site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

A. Personnel on-site should use the "buddy system" (pairs). Buddies should pre-arrange hand signals or other means of emergency signals for communication in case of lack of radios or radio breakdown (see the following item).

  - Hand gripping throat: out of air, cannot breathe.

- Grip partner's wrist or place both hands around waste: leave the area immediately, no debate.

- Hands on top of head: need assistance.

- Thumbs up: Okay, I'm all right, I understand.

- Thumbs down: No, negative.

B. Site work area entrance and exit routes should be planned, and emergency escape routes delineated by the On-Site Safety Officer.

C. Visual contact should be maintained between "pairs" on-site with the team remaining in close proximity in order to assist each other in case of emergencies.

D. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety Officer.

E. Wind indicators visible to all on-site personnel should be provided by the Project Manager to indicate possible routes for upwind escape.

F. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team and re-evaluation of the hazard and the level of protection required.

G. In the event that an accident occurs, the Project Manager is to complete an Accident Report Form for submittal to the Office

Safety Coordinator (OSC), who will forward a copy to the Regional Health and Safety Manager (RHSM). The OSC should assure that the follow-up action is taken to correct the situation that caused the accident.

H. In the event that an accident occurs, the Project Manager is to complete an Accident Report Form for submittal to the MPIC of the office, with a copy to the regional health and safety program office. The MPIC should assure that follow-up action is taken to correct the situation that caused the accident.

ATTACHMENT D

RESPONSIBILITIES

I. PROJECT MANAGER

The Project Manager (PM) shall direct on-site investigations and operational efforts. The PM, assisted by the Site Safety Officer (SSO), has primary responsibility for:

1. Making certain that appropriate personnel protective equipment and monitoring equipment are available and properly utilized by all on-site personnel.

2. Making certain that personnel receive this plan and are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies.

3. Making certain all field personnel have had the Dames & Moore Core Health and Safety Training Course or its equivalent.

4. Making certain that personnel are aware of the potential hazards associated with the site operations.

5. Monitoring the safety performance of all personnel to ensure that the required work practices are employed.

6. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.

7. Preparing any accident/incident reports (see attached Accident Report Form) and routine job exposure records.

8. Assuring the completion of Plan Acceptance and Feedback Forms attached hereto.

II. SITE SAFETY OFFICER

The Site Safety Officer (SSO) shall:

1. Implement project Health and Safety Plans and report to the Site Safety Coordinator and the PM for action if there are any deviations from the anticipated conditions described in the plan; the SSO has the authorization to stop work at any time.

2. Calibrate all monitoring equipment (except radiation detection equipment) on a daily basis and record results on the attached sheets (see Section 7.0 - Daily Instrument Calibration Check Sheet and Daily Radiation instrument Operability Check Sheet).

3. Making certain that all monitoring equipment is operating correctly according to manufacturer's instructions and provide maintenance if it is not.

4. Confirm that personnel working on-site have the proper medical surveillance program and Health and Safety training which qualifies them to work at a hazardous waste site. Also be responsible for identifying all site personnel with special medical problems or restrictions.

III PROJECT PERSONNEL

Project personnel involved in on-site investigations and operations are responsible for:

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.

2. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SSO.

3. Notifying the PM and SSO of any special medical problems and making certain that all on-site personnel are aware of any such problems.

ATTACHMENT E

HEAT STRESS/COLD STRESS

HEAT STRESS

If site work is to be conducted during the summer or in other hot environments, heat stress is a concern in the health and safety of personnel. For workers wearing permeable clothing, follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Heat Stress. For workers wearing semi-permeable or impermeable clothing, the ACGIH standard cannot be used. For those situations, workers should be monitored when the temperature in the work are is above 70°F (21°C).

To monitor the worker, measure:

- *Heart rate*. Count the radial pulse during a 30-second period as early as possible in the rest period.

  If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

- *Oral temperature*. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

  If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.

2. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SSO.

3. Notifying the PM and SSO of any special medical problems and making certain that all on-site personnel are aware of any such problems.

If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

- *Body water loss*, if possible. Measure weight on a scale accurate to ± 0.25 pound at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see following Table). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATIZED WORKERS

Adjusted Temperature[1]	Normal Work Ensemble	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 min of work	After each 15 min of work
87.5°F - 90°F) (32.8°C - 32.2°C)	After each 60 min of work	After each 30 min of work
82.5°F - 87.5°F) (28.1°C - 30.8°C)	After each 90 min of work	After each 60 min of work
77.5°F - 82.5°F) (25.3°C - 28.1°C)	After each 120 min of work	After each 90 min of work
72.5°F - 77.5°F) (22.5°C - 25.3°C)	After each 150 min of work	After each 120 min of work

(1) Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine - no cloud cover and a sharp, distinct shadow; 0 percent sunshine - no shadows.)

If workers are not monitored for heat stress, work activities in hot environments can result in dehydration, heat exhaustion, heat stress or even heat stroke.

Signs and Symptoms of Heat Stress

- ***Heat rash*** may result from continuous exposure to heat or humid air.

- ***Heat cramps*** are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:
  - muscle spasms
  - pain in the hands, feet and abdomen.

- ***Heat exhaustion*** occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:
  - pale, cool, moist skin
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- ***Heat stroke*** is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:
  - red, hot, usually dry skin
  - lack of or reduced perspiration
  - nausea
  - dizziness and confusion
  - strong, rapid pulse
  - coma

COLD STRESS

Frost Bite

Frostbite is an injury resulting from exposure to cold. The extremities of the body (fingers, toes) are most often affected. The signs of frostbite are:

- Skin turns white or grayish-yellow.
- Pain is sometimes felt early, but subsides later. Often there is no pain.
- The affect part feels intensely cold and numb.

Hypothermia

If site work is to be conducted during the winter, cold stress is a concern in the health and safety of the personnel. Additional insulated clothing will be provided to field personnel. Of special note for cold stress on this site is the wearing of Tyvek suits. Disposable clothing does not breath; therefore, perspiration is not provided with a means of evaporation. During strenuous physical activity, an employee's clothes can become wet. Wet clothes combined with cold temperatures can lead to hypothermia. If the air temperature is less than 40°F and an employee becomes wet, the employee must change to dry clothes. The on-site heated trailer facility or a personnel vehicle may be utilized as a change area.

Hypothermia is characterized by shivering, numbness, drowsiness, muscular weakness and a low internal body temperature when the body feels warm externally. This can lead to unconsciousness and death.

In either case (frostbite or hypothermia), seek immediate medical attention.

To prevent these effects from occurring, persons working in cold environments should war adequate clothing and reduce the time spent in the cold area.

ATTACHMENT F

SITE SAFETY BRIEFING FORM

ON-SITE SAFETY MEETING

Project ______________________________

Date ______________ Time ______________ Job No. ______________

Address ______________________________

Specific Location ______________________________

Type of Work ______________________________

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ______________________________

Chemical Hazards ______________________________

Emergency Procedures ______________________________

Hospital/Clinic ______________________________ Phone ______________

Hospital Address ______________________________

Special Equipment ______________________________

Other ______________________________

ATTENDEES

Name Printed	Signature

Meeting Conducted by: ______________________ (Name Printed) ______________________ (Signature)

Site Safety Officer ______________________ Team Leader ______________________

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person to work on the subject project work site and returned to the Office Safety Coordinator.

Job No. ______________________________

Client/
Project ____

Date ______________________________

I represent that I have read and understand the contents of the above Plan and agree to perform my work in accordance with it.

____
Signature

____
Print Name

____
Company/Office

____
Date

PLAN FEEDBACK FORM

Job Number ______________________________

Job Name ________________________________

Date ____________________________________

Problems with plan requirements:

____
____
____
____
____

Unexpected situations encountered:

____
____
____
____
____

Recommendations for future revisions:

____
____
____
____
____

AIR MONITORING

GENERAL INFORMATION

Name(s) ______________________ Background Level ______________________
Date ______________________ Weather Condition ______________________
Time ______________________ ______________________
Project ____
Job No. ______________________
Estimated Wind Direction ______________________
Estimated Wind Speed (i.e., calm, moderate, strong, etc) ______________________
Estimated Air Temperature and % Relative Humidity ______________________
Location where Background Level was Obtained ______________________

EQUIPMENT SETTINGS

HNu

Range ______________________
Span Pot ______________________
Calibration Gas ______________________

EXPLOSIMETER

Alarm Trigger-%LEL ______________________
Alarm Trigger-%02 ______________________
Calibration Gas ______________________

FIELD ACTIVITIES

Field Activities Conducted ____
____
____

TIME	HNU	EXPLOSIMETER %LEL %02	DRAGER TUBE	RADIATION METER
	Equivalent		ppm-consistent	

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT			DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS
TO	FROM TELEPHONE (include area code)		
NAME OF INJURED OR ILL EMPLOYEE			
DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT	
NARRATIVE DESCRIPTION OF ACCIDENT			
NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED			LOST TIME YES ☐ NO ☐
PROBABLE DISABILITY (Check One) FATAL ☐ LOST WORK DAY WITH DAYS AWAY FROM WORK — ☐ LOST WORK DAY WITH DAYS OF RESTRICTED ACTIVITY — ☐ NO LOST WORK DAY ☐ FIRST AID ONLY ☐			
CORRECTIVE ACTION TAKEN BY REPORTING UNIT			
CORRECTIVE ACTION WHICH REMAINS TO BE TAKEN (by whom and by when)			
NAME OF SUPERVISOR		TITLE	
SIGNATURE		DATE	

PROJECT EXPOSURE HISTORY FORM

(To Be Completed by Project Manager)

Job Name ______________________________

Job Number ______________________________

Dates from/to ______________________________

D&M PERSONNEL ON-SITE

1. ____________	5. ____________
2. ____________	6. ____________
3. ____________	7. ____________
4. ____________	8. ____________

Suspected Contaminants	Verified Contaminants and Airborne Concentrations Thereof

Attachment 1

DECOMMISSIONING FUNDING PLAN

FOR CHEMETRON CORPORATION

Harvard and Bert Avenue Sites

Newburgh Heights, Ohio

License No. SUB-1357

Docket No. 40-8724

October 1, 1990

ATTACHMENT 1

DECOMMISSIONING FUNDING PLAN
FOR CHEMETRON CORPORATION

DECOMMISSIONING FUNDING PLAN
FOR
CHEMETRON CORPORATION

Harvard and Bert Avenue Sites
Newburgh Heights, Ohio

1.0 Introduction

In accordance with the requirements of 10 CFR 40.36(d) and as requested in the NRC's letter of September 11, 1990 consenting to transfer of control, Chemetron Corporation is submitting this Decommissioning Funding Plan with its application for renewal of License No. SUB-1357. This plan includes a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning, including means of adjusting the cost estimate and funding level periodically. Additionally, an updated characterization and remediation schedule is being submitted as part of the application for license renewal. The decommissioning cost estimate was based upon and is consistent with that updated schedule.

2.0 Cost Estimate for Decommissioning

At the outset, it should be recognized that it is extremely difficult to generate a specific single reliable estimate of the total decommissioning costs for the Harvard and Bert Avenue sites, including Building 20. The licensee must remediate depleted uranium contamination in largely undetermined concentrations and must still characterize significant portions of the site to determine the surface and subsurface locations and concentrations of contamination. It has only recently constituted a new management and technical team to characterize the site and direct the remediation effort.

Previous attempts to remediate the site by other contractors have been unsuccessful, in large part because they sought to pursue physical remediation without having first performed adequate characterization. Previous efforts have resulted in some limited reduction in the volume of contaminated material; however, these prior efforts did not produce a comprehensive data base of the type necessary for creation of a reliable remediation plan. Without such a plan and considering the unknowns, a definitive decommissioning cost estimate is not possible. The NRC apparently recognized that the estimate to be provided with the renewal application cannot be as reliable or definitive as desirable inasmuch as it requested that an updated decommissioning funding plan be submitted by March 29, 1991.

Given these circumstances, the licensee has endeavored to develop an estimate meeting the requirements of 10 C.F.R. § 40.36(d). The major current unknown variables in development of a remediation plan, and therefore a cost estimate, include the location, volume and concentration of contaminants, limits for site release, extent of contamination in Building 20, weather, treatment and processing options, and disposal, excavation and transportation costs. Nonetheless, the licensee is required by 10 C.F.R. § 40.36(d) to submit a decommissioning funding plan and cost estimate at the license renewal application stage. Therefore, given the number and range of variables and the inability of the licensee to control certain of these variables in order to develop the required cost estimate, the licensee must make certain assumptions and decisions, which of necessity at this stage can only be arbitrary.

In making its estimate, the licensee has chosen certain parameters and made certain assumptions and estimates which it believes to be reasonable, but which may be modified or replaced during the development of a detailed remediation plan. Changes in decisions and assumptions could result in significant modification in the decommissioning cost.

In accordance with 10 CFR §40.36(d), the licensee's cost estimate for decommissioning is $7,465,000. Enclosure 1, entitled Initial Cost Estimate Tabulation (Harvard and Bert Avenue Sites), sets forth the fundamental elements of this estimate. Included in the estimate are study costs, physical remediation costs, disposal costs, and post-remediation testing, including a final radiation site survey.

3.0 Financial Assurance for Decommissioning

3.1 Decommissioning Funding

Chemetron will provide financial assurance for decommissioning in the form of a parent company guarantee, pursuant to 10 CFR 40.36(e), in the amount of $7,465,000. The original of the parent company guarantee of Sunbeam/Oster Company, Inc. and supporting documents are attached as Attachment 2. As called for by the NRC's September 11, 1990 letter, Chemetron will provide to the NRC actual financial statements for Sunbeam/Oster Company, Inc. by December __, 1990.

3.2 Periodic Adjustments

Chemetron will adjust the decommissioning cost estimate and associated funding level in an updated decommissioning funding plan to be submitted to the NRC by March 29, 1991 and thereafter as required by NRC regulations. Thereafter, Chemetron will update its decommissioning cost estimate annually. Chemetron will give timely notification to the NRC of the occurrence of any material changes, revisions and adjustments to the underlying cost estimates, including inflation, and to the financial assurance mechanisms, including any change from one mechanism to another.

ENCLOSURE 1

INITIAL COST ESTIMATE TABULATION
HARVARD AND BERT AVENUE SITES

1. Release criteria based upon pathway and dose analysis

2. Excavated contamination volume - 110,000 cubic feet[1]

3. Reduction (as a result of waste pile characterization, and/or processing and/or sorting) by 99,000 cubic feet

4. Excavation of high level contaminant (post site characterization, processing, and/or sorting) - 13,000 cubic feet

5. Net volume to remediate by offsite disposal - 24,000 cubic feet

6. Disposal, transportation, processing and/or sorting, and exavation cost (aggregate) - $100.00/cubic foot

7.	Cost to dispose of contaminant	$ 2,400,000
8.	Cost of fill and regrading	$ 500,000
9.	Cost to decontaminate Building 20	$ 1,000,000
10.	Cost of site security, environmental monitoring and site management (5 years)	$ 1,500,000
11.	Cost of engineering analysis, study, and testing (first 2 years)	$ 1,865,000
12.	Estimated cost for post closure testing	$ 200,000
	Total:	$ 7,465,000[2]

---

1 Revised estimate based upon recently received engineering estimate.

2 This estimate contemplates the implementation of various management techniques to control cost components such as site staffing, transport, and excavation and assumes that excavation will be commenced only after completion of site characterization, pathway and dose analysis, and related work.

ATTACHMENT 2

PARENT COMPANY GUARANTEE OF SUNBEAM/OSTER COMPANY, INC. AND SUPPORTING DOCUMENT

Re: NRC License No. SUB-1357

PARENT COMPANY GUARANTEE

Guarantee made this October 1, 1990 by Sunbeam/Oster Company, Inc., a corporation organized under the laws of the State of Delaware, herein referred to as "guarantor," to the U.S. Nuclear Regulatory Commission ("NRC" or "the beneficiary"), obligee, on behalf of our subsidiary, Chemetron Corporation, of Two Oliver Plaza, Pittsburgh, Pennsylvania 15222.

Recitals

1. The guarantor has full authority and capacity to enter into this guarantee under its bylaws, articles of incorporation, and the laws of the State of Delaware, its State of incorporation. Guarantor has approval from its Board of Directors to enter into this guarantee.

2. This guarantee is being issued to comply with regulations issued by the NRC, an agency of the U.S. Government, pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974. NRC has promulgated regulations in Title 10, Chapter I of the Code of Federal Regulations, Part 40 which require that a holder of, or an applicant for, a materials license issued pursuant to 10 CFR Part 40 provide assurance that funds will be available when needed for required decommissioning activities.

3. The guarantee is issued to provide financial assurance for decommissioning activities for the Harvard and Bert Avenue sites in Newburgh Heights, Ohio as required by 10 CFR Part 40, the current decommissioning cost estimate for which is as follows: $7,465,000.

4. The guarantor meets or exceeds the following financial test criteria -- ¶II.A.1 of Appendix A to 10 CFR Part 30, test (b) below -- and agrees to comply with all notification requirements as specified in 10 CFR Part 40.

The guarantor shall meet one of the following two financial tests:

(a) (i) A current rating of its most recent bond issuance of AAA, AA, A or BBB as issued by Standard and Poor's, or Aaa, Aa, A or Baa as rated by Moody's; and

(ii) Tangible net worth is at least $10 million and at least six times the current decommissioning cost estimate (or prescribed amount if a certification is used); and

(iii) Assets located in the United States amounting to at least 90 percent of its total assets or at least six times the current decommissioning cost (or prescribed amount if certification is used).

or

(b) (i) Net working capital and tangible net worth each at least six times the current decommissioning cost estimates (or prescribed amount if certification is used); and

(ii) Assets located in the United States amounting to at least 90 percent of its total assets or at least six times the amount of current decommissioning cost estimates (or prescribed amount if certification is used); and

(iii) Meets two of the following three ratios: a ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities that is greater than 0.1; and a ratio of current assets to current liabilities that is greater than 1.5; and

(iv) Tangible net worth of at least $10 million.

5. The guarantor has majority control of the voting stock of the 100% parent company of the following licensee covered by this guarantee: Chemetron Corporation, Two Oliver Plaza, Pittsburgh, Pennsylvania 15222, which is responsible to the Commission for the Harvard and Bert Avenue sites in Newburgh Heights, Ohio under NRC License No. SUB-1357.

6. Decommissioning activities as used below refers to the activities required by 10 CFR Part 40 for decommissioning of the facility identified above.

7. For value received from Chemetron Corporation, and pursuant to the authority conferred upon the guarantor by the unanimous resolution of its directors, a certified copy of which is attached, the guarantor guarantees to the NRC that if the licensee fails to perform the required decommissioning activities, as required by License No. SUB-1357, the guarantor shall

   (a) carry out the required activities, or

   (b) set up a trust fund in favor of the above identified beneficiary in the amount of these current cost estimates for these activities.

8. The guarantor agrees to submit revised financial statements, financial test data, and a special auditor's report and reconciling schedule annually within 90 days of the close of the parent guarantor's fiscal year.

9. The guarantor agrees that if, at the end of any fiscal year before termination of this guarantee, it fails to meet the financial test criteria, the licensee shall send within 90 days of the end of the fiscal year, by certified mail, notice to the NRC that the licensee intends to provide alternative financial assurance as specified in 10 CFR Part 40. Within 120 days after the end of the fiscal year, the guarantor shall establish such financial assurance if Chemetron Corporation has not done so.

10. The guarantor also agrees to notify the beneficiary promptly if the ownership of the licensee or the parent firm is transferred and to maintain this guarantee until the new parent firm or the licensee provides alternative financial assurance acceptable to the beneficiary.

11. The guarantor agrees that within 30 days after it determines that it no longer meets the financial test criteria or it is disallowed from continuing as a guarantor for the facility under License No. SUB-1357, it shall establish an alternative financial assurance as specified in 10 CFR Part 30, 40, 70, or 72, as applicable, in the name of Chemetron Corporation unless Chemetron Corporation has done so.

12. The guarantor as well as its successors and assigns agree to remain bound jointly and severally under this guarantee notwithstanding any or all of the following: amendment or modification of license or NRC-approved decommissioning funding plan for that facility, the extension or reduction of the time of performance of required activities, or any other modification or alteration of an obligation of the licensee pursuant to 10 CFR Part 40.

13. The guarantor agrees that all bound parties shall be jointly and severally liable for all litigation costs incurred by the beneficiary, NRC, in any successful effort to enforce this parent company guarantee against the guarantor.

14. The guarantor agrees to remain bound under this guarantee for as long as Chemetron Corporation must comply with the applicable financial assurance requirements of 10 CFR Part 40, for the previously listed facility, except that the guarantor may cancel this guarantee by sending notice by certified mail to the NRC and to Chemetron Corporation, such cancellation to become effective no earlier than 120 days after receipt of such notice by both the NRC and Chemetron Corporation as evidenced by the return receipts.

15. The guarantor agrees that if Chemetron Corporation fails to provide alternative financial assurance as specified in 10 CFR Part 40, as applicable, and obtain written approval of such assurance from the NRC within 90 days after a notice of cancellation by the guarantor is received by both the NRC and Chemetron Corporation from the guarantor, the guarantor shall provide such alternative financial assurance in the name of Chemetron Corporation or make full payment under the guarantee.

16. The guarantor expressly waives notice of acceptance of this guarantee by the NRC or by Chemetron Corporation. The guarantor also expressly waives notice of amendments or modification of the decommissioning requirements and of amendments or modifications of the license.

17. If the guarantor files financial reports with the U.S. Securities and Exchange Commission, then it shall

promptly submit them to the NRC during each year in which this guarantee is in effect.

18. This guarantee shall, upon its effective date as shown below, be deemed a complete substitute for and in lieu of, rather than in addition to, the parent company guarantee, dated September 28, 1990, in the amount of $750,000, provided by the guarantor to the NRC in respect of NRC License No. SUB-1357, held by Chemetron Corporation, which previous guarantee shall thereafter be null and void.

I hereby certify that this guarantee is true and correct to the best of my knowledge.

Effective date: November 1, 1990

Sunbeam/Oster Company, Incorporated

Michael Lederman

Michael G. Lederman
Vice President

Signature of witness or notary: Janice Bilik

JANICE BILIK
NOTARY PUBLIC, State of New York
No. 01BI4888896
Qualified in Putnam County
Commission Expires March 16, 19 91

CHEMETRON CORPORATION
c/o Sunbean/Oster Company, Inc.
Two Oliver Plaza
Pittsburgh, Pennsylvania 15222

October 1, 1990

Mr. Robert M. Bernero
Director
Office of Nuclear Material
Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: License No. SUB-1357; Financial Assurance for Decommissioning

Dear Mr. Bernero:

I am the chief executive officer of Chemetron Corporation, Two Oliver Plaza, Pittsburgh, Pennsylvania 15222, a Delaware corporation. This letter is in support of this firm's use of the financial test to demonstrate financial assurance, as specified in 10 CFR Part 40.

I hereby certify that Chemetron Corporation is currently a going concern, in that it is expected to continue operating in the same general manner and scope as it operated in 1988 and 1989 at least long enough for current expectations and plans to be carried out.

This firm is required to file a Form 10-K with the U.S. Securities and Exchange Commission for the latest fiscal year. This fiscal year of this firm ends on October 1.

I hereby certify that the content of this letter is true and correct to the best of my knowledge.

Michael Lederman

Michael G. Lederman
Chairman of the Board & President

2998k

SUNBEAM/OSTER COMPANY, INC.
Two Oliver Plaza
Pittsburgh, Pennsylvania 15222

October 1, 1990

Mr. Robert M. Bernero
Director
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: License No. SUB-1357; Financial Assurance for Decommissioning

Dear Mr. Bernero:

I am the Treasurer of Sunbeam/Oster Company, Inc., Two Oliver Plaza, Pittsburgh, Pennsylvania 15222, a Delaware corporation. This letter is in support of this firm's use of the financial test to demonstrate financial assurance, as specified in 10 CFR Part 40.

This firm guarantees, through the parent company guarantee submitted to demonstrate compliance under 10 CFR Part 40, the decommissioning of the following facility for which a subsidiary of this firm is obligated to the Commission. The current cost estimates or certified amounts for decommissioning, so guaranteed, are shown for each facility:

Name of Facility	Location of Facility	Current Cost Estimate
Harvard & Bert Avenue Sites	Newburgh Heights Ohio	$7,465,000

This firm is required to file a Form 10-K with the U.S. Securities and Exchange Commission for the latest fiscal year.

This fiscal year of this firm ends on October 1. The figures for the following items marked with an asterisk are derived from this firm's consolidated projected pro forma financial statements for the latest completed fiscal quarter ended July 1, 1990, as if the Modified Joint Stock Plan of Reorganization for Allegheny International, Inc. and certain of its subsidiaries had become effective as of that date. The reasonableness of the assumptions and conclusion embodied in those financial statements is discussed in the procedures letter from the accounting firm of Arthur Andersen & Co., a copy of which is attached hereto. Also attached are copies of the opinions as to the solvency of this firm and its subsidiary, NMGM, Inc. (the direct parent company of Chemetron Corporation) recently given to certain lenders by the financial advisory and consulting firm, Murray, Devine & Co., selected by those lenders. No material changes have occurred since July 1, 1990 which would lead us to conclude that the attached financial statements are not substantially accurately descriptive of this firm's financial condition as of this date. We expect to have our first audited year-end financial statements available late in December 1990.

Financial Test: Alternative I

1.	Decommissioning cost estimates or certified amounts for facility (total of all cost estimates or certified amounts shown in paragraphs above)	$7,465,000
*2.	Total liabilities (if any portion of the cost estimates for decommissioning is included in total liabilities on your firm's financial statement, deduct the amount of that portion from this line and add that amount to lines 3 and 4)	$395,238,000
*3.	Tangible net worth**	$211,702,000
*4.	Net worth	$242,300,000
*5.	Current assets	$319,675,000
*6.	Current liabilities	$154,671,000
*7.	Net working capital (line 5 minus line 6)	$165,004,000
8.	The sum of net income plus depreciation, depletion, and amortization***	$ 65,000,000
*9.	Total assets in United States (required only if less than 90 percent of firm's assets are located in the United States)	$573,141,000

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* Denotes figures derived from financial statements.

** Tangible net worth is defined as net worth minus goodwill, patents, trademarks, and copyrights.

*** Estimated based on projections.

		Yes	No
10.	Is line 3 at least $10 million	X	__
11.	Is line 3 at least 6 times line 1?	X	__
12.	Is line 7 at least 6 times line 1?	X	__
13.	Are at least 90 percent of firm's assets located in the United States? If not, complete line 14.	X	__
14.	Is line 9 at least 6 times line 1?	X	__
	(Guarantor must meet two of the following three ratios)		
15.	Is line 2 divided by line 4 less than 2.0?	X	__
16.	Is line 8 divided by line 2 greater than 0.1?	X	__
17.	Is line 5 divided by line 6 greater than 1.5?	X	__

I hereby certify that the content of this letter is true and correct to the best of my knowledge.

____

[Name]
Treasurer
October 1, 1990

2999k

SUNBEAM/OSTER COMPANY, INC.

Sunbeam/Oster Company, Inc. and Consolidated Subsidiaries
Projected Pro Forma Balance Sheet (Unaudited)
July 1, 1990

(Dollars in Thousands)

Assets	
Receivables, Net	$164,846
Inventory	$145,288
Other Current Assets	$9,541
Total Current Assets (a)	$319,675
Property, Plant & Equipment	$159,049
Other Assets and Non-Core Assets	$128,216
Goodwill	$30,598
Total Assets	$637,538
Liabilities & Net Worth	
Short Term Debt	$2,448
Accounts Payable	$69,372
Other Current Liabilities	$82,851
Current Liabilities	$154,671
Senior Term Loan	$114,600
Tax Notes	$13,600
Capital Leases & IRB's	$8,500
Sunbeam 5 1/2's of 92	$11,400
Total Debt	$148,100
Other Long term Liabilities, Reserves and NOE's	$92,467
Total Liabilities	$395,238
Common Equity	$242,300
Total Liabilities & Net Worth	$637,538

(a) $10.0 to $20.0 million in cash contained in Swingline Facility.

SUNBEAM/OSTER COMPANY, INC.

July 1, 1990 Comparative Summary Balance Sheet Analysis

(Dollars in Thousands)

	Allegheny International Actual	Sunbeam/Oster Company, Inc. Pro Forma
Assets		
Current Assets	$639,938	$319,675
Non-Current Assets	$252,175	$317,863
Total Assets	$892,113	$637,538
Liabilities & Net Worth		
Current Liabilities	$200,141	$154,671
Long Term Liabilities	$837,253	$240,567
Total Liabilities	$1,037,394	$395,238
Shareholder's Equity	($145,281)	$242,300
Total Liabilities & Net Worth	$892,113	$637,538

ARTHUR ANDERSEN & CO.

2100 One PPG Place
Pittsburgh, Pennsylvania 15222
(412) 232-0600

August 27, 1990

Japonica Partners
505 Park Avenue
New York, New York 10022

One Hospital Trust Plaza, Suite 19[illegible]
Providence, Rhode Island 02903

Gentlemen:

We have applied the procedures enumerated below to the projected pro forma unaudited condensed balance sheet of Sunbeam/Oster Company, Inc. and Consolidated Subsidiaries (Sunbeam/Oster) as of July 1, 1990.

The objective of this pro forma unaudited condensed financial information is to show the significant effects on the historical financial information assuming the reorganization of Allegheny International, Inc. and Subsidiaries (AI) by Japonica Partners (Japonica) had occurred on July 1, 1990. However, the pro forma unaudited condensed financial statements are not necessarily indicative of the effects on the financial position of AI that would have occurred had the above-mentioned reorganization actually occurred on July 1, 1990.

The following procedures, which were agreed to by Japonica, were performed solely to assist you in your consideration of the reorganization of AI by Japonica. The scope of our work was limited to the following agreed-upon procedures specified by Japonica who determined the appropriateness of such agreed-upon procedures:

Sunbeam/Oster Company, Inc. and Consolidated Subsidiaries
Projected Pro Forma Balance Sheet (Unaudited)
July 1, 1990

The basis of the projected pro forma unaudited condensed balance sheet of Sunbeam/Oster at July 1, 1990 was the historical financial statements of AI at July 1, 1990. We traced the historical amounts per Japonica's supporting worksheets for the unaudited condensed AI balance sheet at July 1, 1990 to the AI Form 10-Q for the quarterly period ended July 1, 1990 filed with the Securities and Exchange Commission noting agreement.

We reviewed the pro forma adjustments made to the historical AI balance sheet at July 1, 1990 by Japonica noting them to be based upon assumptions which include an equity investment of $242.3 million in Sunbeam/Oster and the fair market value of AI property, plant, equipment and intangible assets as determined by an independent appraisal report dated August 31, 1989. The pro forma condensed balance sheet of Oster/Sunbeam was prepared in accordance with Accounting Principles Board Opinion No. 16, "Business Combinations," and No. 17, "Intangible Assets," which provide for allocation of the purchase price based upon the relative fair market value of the assets purchased. It should be noted, however, that these pro forma adjustments do not reflect certain adjustments that may have been required had an audit been performed at July 1, 1990 and that it will be necessary to update the final pro forma balance sheet for Sunbeam/Oster for any changes in the fair market value of the assets and liabilities acquired in the reorganization.

These procedures are substantially less in scope than an examination of projected pro forma financial information, the objective of which is an opinion on Japonica's assumptions, the pro forma adjustments and the application of those adjustments to the AI historical financial information. Accordingly, we do not express such an opinion.

Based on the results of the procedures referred to above, nothing came to our attention that caused us to believe that Japonica's assumptions do not provide a reasonable basis for presenting the significant effects directly attributable to the above-mentioned reorganization, that the related pro forma adjustments do not give appropriate effect to those assumptions, or that the pro forma unaudited condensed balance sheet does not reflect the proper application of those adjustments to the AI historical financial statement amounts at July 1, 1990. However, had we performed additional procedures or had we made an audit of the pro forma condensed financial information, other matters might have come to our attention that would have been reported to you.

This report is intended solely for the information of Japonica Partners and the Nuclear Regulatory Commission to be used in the consideration of the reorganization referred to above and should not be used for any other purpose.

Very truly yours,

Arthur Andersen & Co.

The Murray, Devine & Co. solvency opinions letter contains proprietary material and is not attached. See October 1, 1990 letter from J. R. Kraemer of Fried, Frank, Harris, Shriver & Jacobson to Charles Haughney, Branch Chief, Fuel Cycle Safety Branch, U.S. Nuclear Regulatory Commission.

SECRETARY'S CERTIFICATE

I, Michael G. Lederman, am the Secretary of Sunbeam/Oster Company, Inc., a Delaware corporation (the "Corporation"), and hereby certify that:

1. Set forth below is a true and complete copy of the resolutions adopted by the Board of Directors of the Corporation as of the date hereof authorizing and directing the execution and delivery of the NRC Guarantee (as defined in the resolutions) and the NRC Amendment (as defined in the resolutions), which resolutions are in full force and effect as of the date hereof and has not been amended, rescinded, or modified. As used in the following resolutions the term "Sale" means the purchase of the assets and the assumption of the undischarged liabilities of Allegheny International, Inc., a Pennsylvania corporation and of its subsidiaries by the Corporation:

RESOLVED, that Michael G. Lederman, the Vice President, General Counsel and Secretary of the Corporation be, and he hereby is, authorized and directed to execute and deliver that certain guarantee, dated on or about the date hereof (the "NRC Guarantee"), to the U.S. Nuclear Regulatory Commission (the "NRC"), as obligee on behalf of Chemetron Corporation, a Delaware corporation which, pursuant to the Sale, is an indirect wholly-owned subsidiary of the Corporation ("Chemetron"), such NRC Guarantee to be issued to comply with regulations issued by the NRC and to provide, on behalf of Chemetron, financial assurance for decommissioning activities for the Harvard and Bert Avenue sites in Newburgh Heights, Ohio as required by 10 CRF 40, and to be in a certification in an initial amount of $750,000, and to execute and deliver such modifications thereto as such officer shall, in his sole discretion, determine to be necessary, appropriate or desirable (provided that such modifications are acceptable to the NRC), any such determination to be conclusively evidenced by the execution and delivery of the NRC Guarantee;

RESOLVED, that the proper officers of the Corporation be, and each of them hereby is, authorized and directed in the name of the Corporation and on its behalf, to execute and deliver a successor guarantee to the NRC Guarantee (the "NRC Amendment"), such NRC Amendment to be dated as of October 1, 1990 and to provide that the amount of the NRC Guarantee shall be increased to $7,465,000, and to be in such form as such officers shall determine to be necessary, appropriate or desirable, any such determination to be conclusively evidenced by the execution and delivery of the NRC Amendment;

RESOLVED, that the officers of the Corporation be, and each of them hereby is, authorized and directed to execute such other documents and take such other action as he or they shall deem necessary, appropriate or desirable in order to carry out the intent and purposes of the foregoing resolutions and any actions taken by such officer or officers in furtherance of these objectives are hereby ratified and approved.

IN WITNESS WHEREOF, the undersigned has executed this certificate this 28 day of September, 1990.

Michael Lederman

Michael G. Lederman

AMENDMENT TO STANDBY TRUST AGREEMENT

This Amendment, entered into as of September 27, 1990 by and between Chemetron Corporation, a Delaware corporation, herein referred to as the "Grantor," and The Chase Manhattan Bank, N.A., One Chase Plaza, New York, New York 10081, herein referred to as the "Trustee."

WHEREAS, on September 27, 1990, the Grantor and the Trustee entered into a Standby Trust Agreement (the "Trust Agreement") establishing a standby trust fund for the benefit of the U.S. Nuclear Regulatory Commission (the "NRC"); and

WHEREAS, on the date of the Trust Agreement, the Grantor provided to the NRC a parent company guarantee from Sunbeam/Oster Company, Inc. ("SOC"), in the amount of $750,000, which amount is reflected in Schedule A to the Trust Agreement; and

WHEREAS, as of October 1, 1990, the Grantor will provide to the NRC a parent company guarantee from SOC in the amount of $7,465,000 in substitution for the parent company guarantee described in the next preceding recital; and

WHEREAS, the parent company guarantee of October 1, 1990 will become effective on November 1, 1990;

NOW, THEREFORE, the Grantor and the Trustee agree as follows:

Schedule A to the Trust Agreement is hereby amended to appear as follows:

SCHEDULE A

This Agreement demonstrates financial assurance for the following cost estimates for the following licensed activities:

U.S. NUCLEAR REGULATORY COMMISSION LICENSE NUMBER	NAME AND ADDRESS OF LICENSE	ADDRESS OF LICENSED ACTIVITY	COST ESTIMATE FOR REGULATORY ASSURANCE DEMONSTRATED BY THIS AGREEMENT
SUB-1357	Chemetron Corporation, c/o Sunbeam/ Oster Company Inc., Two Oliver Plaza, Pittsburgh, PA 15222	Harvard & Bert Ave. sites, Newburgh Heights, Ohio	$7,465,000

The foregoing amendment shall become effective on November 1, 1990.

CHEMETRON CORPORATION (Grantor)

By: [signature]
Name: Michael G. Lederman
Title: Chairman of the Board and President

THE CHASE MANHATTAN BANK, N.A. (Trustee)

By: [signature]
Name: GENE GEMELLI
Title: SECOND VICE PRESIDENT

3024k

TOTAL P.03