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NNFD RESEARCH LABORATORY
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September 29, 1989

U.S. Nuclear Regulatory Commission
Attn: Leland C. Rouse, Chief
Fuel Cycle Safety Branch
Division of Industrial & Medical
Nuclear Safety
Washington, D.C. 20555

Reference: 1) Ltr. from C.C. Boyd to L.C. Rouse, dated May 19, 1989
2) Ltr. from L.C. Rouse to C.C. Boyd, dated August 8, 1989

Gentlemen:

The Babcock & Wilcox Company, Naval Nuclear Fuel Division Research Laboratory (NNFD-RL), is providing for your information changes to the demonstration section of our license, SNM-778, to reflect the recently approved changes to our organization.

An explanation of the changes is attached along with the actual page changes to our license. Revisions are indicated by a vertical line in the right hand margin of the page. The specification section of our license, which also reflects these changes, was submitted as Reference 1 and latter approved by Reference 2. NNFD-RL believes these changes to be an improvement to our current organization and administrative in nature.

If you should have any further questions, please feel free to contact me at (804) 522-5753.

Sincerely,

Charlie C. Boyd, Jr.

Charlie C. Boyd, Jr.
Licensing & Compliance Officer

Attachments
cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Stewart Ebneter, Regional Administrator
101 Marietta ST, N.W.
Atlanta, GA 30323

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PDR ADOCK 07000824
C PDC

addt info 25974

DOCKET NO. 70-824

CONTROL NO. 25974

DATE OF DOC. September 29, 1989

DATE RCVD. October 5, 1989

FCUF ✓ PDR ✓

FCAF ______ LPDR ______

I & E REF. ✓

SAFEGUARDS ✓

FCTC ______ OTHER ______

DATE 10/5/89 INITIAL SAC

Attachment

SNM-778 ORGANIZATIONAL CHANGES

- The Manager, Regulatory Relations (Manager, RR) is now called the Manager, Safety & Safeguards (Manager, SS).

- The Supervisor, Health & Safety is now called the Supervisor, Health Physics.

- The Industrial Safety Officer now reports to the NNFD Health & Safety Manager. His responsibilities at and for the NNFD-RL remain the same. However, the Manager, Safety and Licensing and the Supervisor, Health Physics are no longer directly responsible for this function.

- The Facility Supervisor and License Administrator positions are now combined into one position (with the same functions, responsibilities, and requirements) called the Licensing & Compliance Officer.

- National Bureau of Standards (NBS) has been changed to National Institute of Standards and Technology (NIST).

- The titles and responsibilities of Senior Health Physics Engineer and the Health Physics Engineers are now consolidated into one title, that of Health Physicist. There are no changes to the duties, responsibilities, and requirements.

- The Industrial Safety Officer is now a formal part of the Area Operating Procedure and Radiation Work Permit review process.

- The position of Supervisor, Health Physics is held by S. W. Schilthelm.

- The position of Licensing & Compliance Officer is held by C. C. Boyd, Jr.

- The position of Industrial Safety Officer is held by A. J. Ambrose.

- The resumes of the Health Physicists (T. Grochowski, D. L. Spangler, and C. R. Yates) are provided in lieu of the resume of the Senior Health Physics Engineer.

REVISIONS BY PAGE AND PARAGRAPH

Page 9-10

Facility Supervisor changed to Licensing & Compliance Officer.

Page 10-6

Paragraph 10.4.2.5

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Paragraph 10.4.2.6

Health and Safety Group changed to Health Physics Group.

Page 10-9

Paragraph 10.5.3

Health and Safety changed to Industrial Safety for Housekeeping and for Emergency Equipment.

Page 11-1

Paragraph 11.1.2

Manager, Regulatory Relations (Manager, RR) changed to Manager, Safety & Safeguards (Manager, SS).

The Manager, Facilities no longer reports to the Manager, SS.

Paragraph 11.1.3 (was old paragraph no. 11.1.5)

Manager, RR changed to Manager, SS.

Health and Safety Group changed to Health Physics Group.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

License Administrator changed to Licensing & Compliance Officer.

Paragraph 11.1.4 (was old paragraph 11.1.3)

Facility Supervisor changed to Licensing & Compliance Officer.

Manager, RR changed to Manager, SS.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

The Licensing & Compliance Officer now reports to the Manager, Safety and Licensing vice the Manager, SS.

The responsibilities of the License Administrator from the old paragraph 11.1.10 and the Facility Supervisor from old paragraph 11.1.12 have been added as the third and fourth (page 11-2) paragraphs.

Page 11-2

Paragraph 11.1.5 (was old paragraph 11.1.4)

Facility Supervisor changed to Licensing & Compliance Officer.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Paragraph 11.1.6

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Manager, RR changed to Manager, SS.

Health and Safety Group changed to Health Physics Group.

Senior Health Physics Engineer changed to Health Physicists.

The Health Physics Supervisor is no longer responsible for industrial safety programs. The Industrial Safety Officer now reports to the Manager, Health and Safety at NNFD.

Paragraph 11.1.7

Senior Health Physics Engineer changed to Health Physicists.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Health Physics staff changed to Health Physics Group.

Page 11-3

Paragraph 11.1.7

Facility Supervisor changed to Licensing & Compliance Officer.

Paragraph 11.1.8

Supervisor, Health and Safety changed to NNFD Manager, Health and Safety.

Facility Supervisor changed to Licensing & Compliance Officer.

Page 11-4

Paragraph 11.1.8

Signature authority added on the Area Operating Procedures and Radiation Work Permits for the Industrial Safety Officer.

Old paragraph 11.1.10 combined with new paragraph 11.1.4.

Paragraph 11.1.10

The Nuclear Criticality Safety Officer is now appointed by the Manager, SS.

Page 11-5

Paragraph 11.1.10

Manager, RR changed to Manager, SS.

License Administrator changed to Licensing & Compliance Officer.

Since the License Administrator and the Facility Supervisor are combined into the Licensing & Compliance Officer, the requirement to discuss the report prior to submission has been deleted.

Old paragraph 11.1.12 combined with new paragraph 11.1.4.

Paragraph 11.1.11

Manager, RR changed to Manager, SS.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Page 11-6

Paragraph 11.1.11

Manager, RR changed to Manager, SS.

License Administrator changed to Licensing & Compliance Officer.

Paragraph 11.2

Within this paragraph the positions previously discussed in paragraph numbers 11.2.3, 11.2.4, 11.2.5, 11.2.6, 11.2.7, are now discussed in paragraph numbers 11.2.7, 11.2.3, 11.2.4, 11.2.5, 11.2.6 respectively.

Paragraph 11.2.1

Under experience, the reference to section 11.2.1 has been changed to 11.1.3.

Page 11-7

Paragraph 11.2.2

Gary S. Hoovler has been replaced by S. W. Schilthelm as Supervisor, Health and Safety (now called Supervisor, Health Physics).

Page 11-8 and 11-9

Paragraph 11.2.3

Reginald R. Spradlin has been replaced by A. J. Ambrose as the Industrial Safety Officer.

Page 11-11

A. F. Olsen has been replaced by Charlie C. Boyd as the License Administrator and Facility Supervisor (now called the Licensing & Compliance Officer).

Page 11-12

This Nuclear Criticality Safety (NCS) Officer is now the Manager of the NCS group vice the supervisor.

The NCS group is now called a unit.

Lynchburg Research Center has been changed to the NNFD-RL.

Page 11-13 through 11-16

Paragraphs 11.2.7.1, 11.2.7.2, and 11.2.7.3

The resumes of the three Health Physicists have been added.

Page 11-16

Paragraph 11.3.1

Facility Supervisor changed to Licensing & Compliance Officer.

Page 11-17

Paragraph 11.3.1

Facility Supervisor changed to Licensing & Compliance Officer.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

The Health Physics Supervisor is no longer responsible for industrial safety programs, therefore, the Industrial Safety Officer has been added to the review process.

Page 11-18

Paragraph 11.3.2

Health and Safety Group changed to Health Physics Group.

Senior Health Physics Engineer changed to Health Physicists.

Paragraph 11.4.1

Supervisor, Health and Safety changed to Supervisor, Health Physics.

The words, "or his designated alternate" have been added.

<u>Page 11-21</u>

Paragraph 11.5

Figure 11-2 is referenced vice Figure 9-4.

Facility Supervisor changed to Licensing & Compliance Officer.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

<u>Page 11-22</u>

New organization diagram.

<u>Page 11-23</u>

Facility Supervisor changed to Licensing & Compliance Officer.

<u>Page 12-1</u>

Paragraph 12.1

Health and Safety changed to Health Physics.

Paragraphs 12.2, 12.2.1, and 12.2.2

Health and Safety Group changed to Health Physics Group.

<u>Page 12-2</u>

Paragraphs 12.2.2, 12.2.3, 12.2.4, and 12.2.5

Health and Safety Group changed to Health Physics Group.

<u>Page 12-3</u>

Paragraph 12.2.5

Health and Safety Group changed to Health Physics Group.

<u>Page 12-4</u>

Paragraph 12.3.4

Health Physics Engineer changed to Health Physicist.

Page 12-5

Paragraph 12.3.4.3

Senior Health Physics Engineer changed to Health Physicist.

Health and Safety Group changed to Health Physics Group.

Paragraph 12.4

Health and Safety Group changed to Health Physics Group.

Health Physics Engineer changed to Health Physicist.

Page 12-6

Paragraph 12.5

Health and Safety Group changed to Health Physics Group.

Health and Safety Supervisor audits changed to Health Physics Supervisor audits.

Paragraph 12.6.1

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Health and Safety Group changed to Health Physics Group.

Page 12-8

Paragraph 12.6.2

National Bureau of Standards (NBS) has been changed to National Institute of Standards and Technology (NIST).

Page 12-9 to 12-11

Paragraph 12.8.1.1

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Page 12-12 to 12-13

Paragraph 12.8.1.2

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Page 12-14

Paragraph 12.8.1.3

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Paragraph 12.8.2

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Manager, RR changed to Manager, SS.

<u>Page 12-15</u>

Paragraph 12.8.3.1 and 12.8.3.2

Health and Safety Group changed to Health Physics Group.

<u>Page 12-16</u>

Paragraph 12.8.4

Health and Safety Group changed to Health Physics Group.

Paragraph 12.8.5.1

Health and Safety Group changed to Health Physics Group.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

<u>Page 12-18</u>

Paragraph 12.8.5.2

Health and Safety Group changed to Health Physics Group.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

<u>Page 12-19</u>

Paragraph 12.8.5.3 and 12.9

Health and Safety Group changed to Health Physics Group.

<u>Page 12-28</u>

Paragraph 12.10.2.2.2

Health and Safety changed to Health Physics.

<u>Page 12-35</u>

Paragraph 12.12

Health and Safety Group changed to Health Physics Group.

Page 12-36

Paragraph 12.12 and 12.13.1

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Paragraph 12.13.1.1

Health Physics Engineer changed to Health Physicist.

Page 12-37

Paragraph 12.13.2

Health and Safety Group changed to Health Physics Group.

Page 12-38

Paragraph 12.14.1

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Page 12-38 and 12-39

Paragraph 12.14.1.3

Health and Safety Group changed to Health Physics Group.

Page 12-41

Paragraph 12.14.2

Health Physics Engineer changed to Health Physicist.

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Page 12-42

Note for Table 12-24

Supervisor, Health and Safety changed to Supervisor, Health Physics.

Page 12-43

Paragraph 12.14.3

Health and Safety Group changed to Health Physics Group.

Page 13-2

Paragraphs 13.2 and 13.3

Health and Safety Group changed to Health Physics Group.

Page 14-1

Paragraph 14.1

Manager, RR changed to Manager, SS.

Facility Supervisor changed to Licensing & Compliance Officer.

License Administrator changed to Licensing & Compliance Officer.

Since the License Administrator and the Facility Supervisor are combined into the Licensing & Compliance Officer, the requirement to discuss the report prior to submission has been deleted.

Page 14-8

Paragraph 14.3.2.2

Facility Supervisor changed to Licensing & Compliance Officer.

Attachment

LIST OF REVISED PAGES

REMOVE			ADD		
Page	Rev	Date	Page	Rev	Date
9-10	0	10/85	9-10	12	9/89
10-6	9	3/88	10-6	12	9/89
10-9	8	11/87	10-9	12	9/89
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12-38	7	9/87	12-38	12	9/89
12-39	4	4/87	12-39	12	9/89
12-41	4	4/87	12-41	12	9/89
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13-2	8	11/87	13-2	12	9/89
14-1	7	9/87	14-1	12	9/89
14-8	8	11/87	14-8	12	9/89

FIGURE 9-4

RL-229
6/90

Facilities Work Order Form

To: PLANT ENGINEERING Date: ____________

From: ____________ Section: ____________ Signed: ____________

Section Mgr: ____________ Date: ____________

Date Required: ____________ Charge No: ____________ (Labor) ____________ (Material)

DESCRIPTION OF WORK TO BE DONE ____________

SIGNATURE REQUIRED: Industrial Safety Officer: ____________

Health Physics: ____________ Licensing & Compliance Officer: ____________

Space Below This Line for Plant Engineering Use Only

Order Received Date: ____________ Signed: ____________

Planned Starting Date: ____________ Planned Completion Date: ____________

Order Completed: ____________ Work Order Number

Date: ____________ Signature: ____________

Building J consists of three courses of block. The Annex is provided with exhaust ventilation through ducting which connects Building J with the Annex thereby permitting the smoke detector and air sampler in Building J to serve both. The Annex is provided with a metal roof which is hinged to Building J, capable of being locked and provided with side panels which permit the roof to fit flush with the top of the block walls. Containers are loaded into the Annex from the top. A curbing will be placed on the approach side of the addition to prevent a loading vehicle from accidentally contacting the wall. Two individuals are involved in loading containers into this facility to prevent a container from striking the walls. This facility provides storage of waste that is contaminated with irradiated fuel and is being stored on site until it is accepted by the DOE under the Nuclear Waste Policy Act of 1982. The maximum quantity of SNM per container shall be limited to 45 grams.

10.4.2.5 The Outside Waste Storage Area is located adjacent to Building J. This area is fenced, locked and paved. Waste stored in this area is limited to that contained in closed metal containers. Each container is limited to not more than a Type A quantity (10 CFR 71.4) or 0.5 grams of fissile material or both. Pu shall not be stored in this area. Containment of stored waste is assured by a quarterly visual inspection by the Supervisor, Health Physics. |

10.4.2.6 The High Level Waste Storage Tubes are located adjacent to the south side of the Liquid Waste Disposal Facility. These tubes are constructed of two sections of iron pipe, immersed in concrete, and below ground level. The upper section of pipe (approximately 42-inches long) is 6-inches in diameter. The lower section (approximately 80-inches long) is welded to the upper section and is 5-inches in diameter. Each tube is fitted with a concrete-filled iron plug. These tubes are locked and under the direct control of the Health Physics Group. Waste | stored in these tubes is limited to that which is produced in the Hot Cells and must be in closed metal containers. The quantity of fissile material permitted in each tube is limited to one unit.

10.4.2.7 The Temporary Storage Facility is located adjacent to the Retention Basin, within the fenced and locked restricted area (Fig. 10-1). This facility (Fig. 10-3) consists of an in-ground array of eight vertical, concrete "silos" arranged in two rows of four. The silos rest on a common concrete pad and are surrounded at the top by a concrete apron that promotes rain water runoff. Each silo is equipped with a 24-inch thick concrete lid. The lid

10.5.2 Insurance Inspection Reports - The site is inspected twice annually the Arkwright-Boston Insurance Company on behalf of the Mutual Atomic Energy Reinsurance Pool (MAERP). The inspection reports list the following items in each report; housekeeping, maintenance & repair, Supervision fire equipment, watchmen, radioisotope handling, areas sprinklered, water supply, all valves found open, criticality control, and until the decommissioning of the last reactor, nuclear reactor operation. These reports have consistently found that the site meets the requirements in each category for a "satisfactory" rating. On a few occasions there have been recommendations that the site add fire protection equipment when the use of an area has been changed. Each such recommendation has been addressed at the site in a manner that has been found acceptable to the inspectors upon their reinspection. The reports on which the above statement is based are dated from 1977 through 1985.

10.5.3 Fire protection equipment is installed in response to recommendations made by the Industrial Safety Officer, the Corporate Fire Protection Engineer, or the insurance underwriters. Installed systems are approved and inspected by Factory Mutual Engineering Association. Routine inspection and maintenance is described below:

EQUIPMENT	MAINTENANCE	RESPONSIBILITY	REFERENCE
Portable fire extinguishers	Insp./test	Industrial Safety	NFPA 10 FM 4-5
Fire hoses	Insp./test	Industrial Safety	NFPA 10
Sprinklers	Test	Plant Engineering	NFPA 13 FM 4-5
Fire suppres. systems (Halon)	Inspection	Plant Engineering	NFPA 12-A FM 4-8N Mfg.
Smoke det.	Test	Plant Engineering	Mfg.
Heat det.	Test	Plant Engineering	Mfg.
Housekeeping	Inspection	Industrial Safety	---
Emer. equip.	Inspection	Industrial Safety	Mfg.

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TABLE OF CONTENTS (Continued)

List of Figures

11.0 ORGANIZATION AND PERSONNEL

11.1 SITE ORGANIZATION

11.1.1 Vice President, NNFD - The Vice President, NNFD is responsible for ensuring that all operations on site are conducted safety and in full compliance with NRC requirements.

11.1.2 The Manager, Safety & Safeguards (Manager, SS) - The Manager, SS is responsible for the safety of site operations. The Manager, Safety and Licensing reports to him.

11.1.3 Manager, Safety and Licensing - The Manager of Safety and Licensing is appointed by and reports to the Manager, SS. He is responsible for the proper management of the materials accounting function, licensing function, nuclear criticality safety function, and the Health Physics Group. He manages the allotment of funds and other resources and assures the proper assignment of personnel priorities. The Supervisor, Health Physics, Accountability Specialist, Nuclear Criticality Safety Officer, and Licensing & Compliance Officer, report to him.

11.1.4 Licensing & Compliance Officer - Research and development work at the site will be performed by personnel who do not report to the Manager, SS. Therefore, the positions of Licensing & Compliance Officer and Area Supervisor have been established to control the workers and their activities.

The Licensing & Compliance Officer shall report to the Manager, Safety and Licensing. He shall be responsible for the safety of all operations performed pursuant to License SNM-778. He shall utilize the expertise of the Supervisor, Health Physics, the Accountability Specialist, Nuclear Criticality Safety Officer, and the Industrial Safety Officer to ensure the safety of operations.

The Licensing & Compliance Officer is also responsible for administering the license. He is the primary liaison between the site and the NRC and other federal, state, and local agencies regarding nuclear matters. He is the coordinator of the Safety Review Committee and Chairman of the Safety Audit Sub-committee and represents site management on both. The Licensing & Compliance Officer is responsible for ensuring that corrective action is taken in response to audit findings as they pertain to licensed activities.

The Licensing & Compliance Officer shall review and have approval authority for Area Operating Procedures. He shall have authority to terminate any operation that he deems contrary to license conditions, Area Operating Procedures, or general safety conditions. The Licensing & Compliance Officer shall become familiar with all license conditions and procedures concerned with radiation safety, nuclear safety, industrial safety, and nuclear materials safeguards. He may consult with the following personnel to ensure compliance with all safety regulations and principles:

Supervisor, Health Physics

Nuclear Safety Officer

Industrial Safety Officer

Accountability Specialist

11.1.5 Area Supervisors - Area Supervisors are selected by their Division Management and shall be jointly approved by the Licensing & Compliance Officer and the Supervisor, Health Physics. Area Supervisors functionally report to the Licensing & Compliance Officer and are responsible for the safe performance of all activities in their assigned area and that all activities within their assigned areas are performed in full compliance with the license.

11.1.6 Supervisor, Health Physics - The Supervisor of Health Physics is appointed by the Manager, SS and reports to the Manager, Safety and Licensing. The Supervisor directs the overall operation of the Health Physics Group. He also serves on the Safety Review Committee. He has the authority to stop any operation that he believes is contrary to accepted safety practices, or license requirements. The Supervisor has overall responsibility for the shipment and receipt of licensed material and exercises signature authority on all Area Operating Procedures. He performs audits of the site for compliance with Health Physics rules. The Health Physicists report to him.

11.1.7 Health Physicists - The Health Physicists report to the Supervisor, Health Physics. They administer the activities of the Health Physics Group, which include:

1. Performing area surveys

2. Administering the air sampling program

3. Administering the respiratory protection program

4. Administering the bioassay program

5. Leak testing radioactive sources

6. Supervising shipping and receiving of licensed material

7. Supervising and coordinating the waste disposal program

8. Assisting in personnel, equipment, and facility decontamination

9. Conducting radiation safety training

10. Providing expertise in all aspects of radiation protection

11. Generating, maintaining and distributing records and reports that are required by NRC regulations or Health Physics procedures

12. Providing expertise in health physics to the Licensing & Compliance Officer.

11.1.8 Industrial Safety Officer - The Industrial Safety Officer reports to the NNFD Manager, Health and Safety. His responsibilities include the following:

1. Administering the industrial safety program

2. Reviewing proposed facility changes to ensure fire safety

3. Providing expertise in fire prevention to the Licensing & Compliance Officer and the Safety Review Committee

4. Performing tests, maintenance, and inspection of fire protection, control, and extinguishing equipment

5. Providing training for the site Fire and Rescue Team and off site support agencies

6. Inspecting all areas of the site periodically to ensure:

   a. Proper storage and use of flammable solvents

   b. Proper placement of fire extinguishing equipment

c. Elimination of fire hazards

d. Reduction, to the extent practicable, of the accumulation of flammable materials

e. Proper use and maintenance of electrical equipment.

7. Working with Area Supervisors to formulate safety rules and elimination of hazards

8. Investigation of all personnel injuries

9. Keeping management informed concerning industrial safety activities

10. Conducting industrial safety training.

11. Signature authority on all new or revised Area Operating Procedures and Radiation Work Permits (RWP's).

11.1.9 Accountability Specialist - The Accountability Specialist reports to the Manager, Safety and Licensing. He is responsible for the maintenance and retention of SNM accountability records. He prepares and transmits the reports required by regulation to inform regulatory agencies of SNM transactions.

11.1.10 Nuclear Criticality Safety Officer - The Nuclear Criticality Safety Officer is appointed by the Manager, SS and reports to the Manager, Safety and Licensing. The Nuclear Criticality Safety Officer is responsible for ensuring that no operation at the site can lead to the inadvertent assembly of a critical mass. To help assure this, he has signature authority for all new Area Operating Procedures and changes to these procedures, he observes operations, institutes educational programs if and when he deems them necessary, and carries out confirming nuclear criticality safety calculations.

The Nuclear Criticality Safety Officer will inspect all site operations where special nuclear material is being processed, quarterly. Other areas may be inspected less frequently, but all licensed facilities will be inspected at least twice a year. He will consider area operations when scheduling these inspections and will, if necessary, schedule his inspection at more frequent intervals. His consideration should include inspection of new operations, an audit of nuclear safety records, a check for area posting, a review of current practices and a review of corrective actions recommended during previous audits and the status of the recommended actions.

He shall submit a report of his finding to the Manager, SS, with a copy to the Licensing & Compliance Officer. The following information is to be included:

1. Areas visited
2. Operations observed
3. Unsafe practices and situations noted
4. Nuclear safety activity of the quarter
5. Recommendations.

11.1.11 Safety Review Committee - The Safety Review Committee (SRC) shall be comprised of at least five technically trained and experienced members appointed by the Manager, SS. One member shall be selected by the Manager, SS to be the SRC Chairman. The Chairman shall preside at the meetings and keep the minutes. The Manager, SS shall appoint an Alternate Chairman who shall act for the Chairman during absences. One member shall be appointed by the Manager, SS to be the SRC Coordinator. The Coordinator shall represent site management on the SRC, set the meeting agenda, and maintains the permanent files of the Committee.

The SRC membership shall have expertise in chemistry, nuclear physics, health physics, and the safe handling of radioactive material. The SRC membership shall have a general understanding of nuclear criticality safety as it pertains to site operations. Consultants with special expertise are available to the Committee when needed.

The SRC shall meet at least four times a year. A quorum shall consist of a simple majority of the membership including the Chairman. The SRC shall review and approve all Area Operating Procedures. It shall review and approve new projects that utilize licensed material that are significantly different from previously reviewed and approved projects. The SRC shall review the annual report issued by the Supervisor, Health Physics which summarizes site workers' exposures, environmental releases, and a summary of the ALARA program accomplishments. The SRC Chairman shall forward the Committee minutes to the Manager, SS, with copies to the Vice President, NNFD and the SRC Coordinator.

The Manager, SS shall appoint the members of the Safety Audit Subcommittee (SAS). The SAS shall be comprised of at least two individuals, one of whom shall be designated as Chairman and he shall report to the Chairman, SRC. The SAS shall audit site operations at least three times annually, with successive audits separated by at least two months. Additional audits may be performed at any time. The SAS Chairman shall develop the audit report and submit it to the SRC Chairman. The SRC Chairman shall submit the audit report to the Manager, SS with appropriate comments, with a copy to the Licensing & Compliance Officer.

11.2 EDUCATION AND EXPERIENCE OF KEY PERSONNEL

11.2.1 Safety and Licensing Manager - Richard L. Bennett

Education:

B.Ch.E. - Chemical Engineering, University of Delaware, 1958

Experience:

(1985-Present) Babcock & Wilcox, Manager, Safety and Licensing, NNFD Research Laboratory, Lynchburg, Virginia.

See Section 11.1.3

(1982-1985) Babcock & Wilcox, Manager, Building C Decommissioning, Lynchburg Research Center, Lynchburg, Virginia

He was responsible for decontaminating facilities that were used for preparation of experimental quantities of nuclear fuels containing plutonium.

(1973-1982) Babcock & Wilcox, Supervisor, Process Technology Group, Lynchburg Research Center, Lynchburg, Virginia

This group was responsible for long-range studies, design assistance, start-up assistance, and preparation of environmental reports and safety analyses related to nuclear fuel conversion. Some of the specific projects performed by the group were preparation of the designs for a low-enriched nuclear fuel conversion plant, preparation of a conceptual design for a spiked nuclear fuel fabrication plant, process engineering assistance to nuclear fuel conversion plants, development of a halide volatility scrap recovery process, development of alternative effluent treatment systems for various nuclear fuel conversion processes, and evaluation of fabrication methods for advanced fuels.

(1971-1973) Babcock & Wilcox, Senior Research Engineer, Lynchburg Research Center, Lynchburg, Virginia

He was responsible for the conceptual design of a facility to treat the effluent from a nuclear fuel plant and developing and evaluating processes for recovering byproducts from B&W wastes.

(1959-1971) American Cyanamid Company, Process Engineer, Piney River, Virginia

He has had broad experience in chemical engineering. This includes research and development, designing equipment and processes, testing and operating new equipment, pilot plant operation, process engineering, and economic evaluation. He has specific knowledge in pigment manufacture, effluent treatment, and byproduct recovery.

Professional Affiliations:

American Institute of Chemical Engineers (Member)
American Nuclear Society (Member)

11.2.2 Supervisor, Health Physics - Steven W. Schilthelm

Education:

B.S. - Nuclear Engineering, University of Wisconsin, Madison, 1983
M.S. - Health Physics, University of Wisconsin, Madison, 1985
- Domestic & International Shipping of Radioactive Material.

Experience:

(1985-Present) Babcock & Wilcox, Senior Health Physicist, NNFD Research Laboratory, Lynchburg, Virginia

Mr. Schilthelm is responsible for administering the Health Physics Program at the NNFD Research Laboratory. His duties include external and internal exposure control, shipping and receiving of radioactive material, maintaining the respiratory protection program, preparation and presentation of radiological safety training courses, maintaining the support for licensed activities.

Mr. Schilthelm is the Emergency Radiological Safety Officer and is the designated alternate for the position of Supervisor, Health and Safety.

(1984-1985) Research Specialist, Synchrotron Radiation Center, University of Wisconsin, Madison, Wisconsin

Mr. Schilthelm was responsible for Radiation Surveys and subsequent shielding calculations and design at the 800 Mev electron accelerator/storage ring. He co-authored a shielding upgrade proposal that was presented to the National Science Foundation, and he provided the experimental basis for the proposal. Mr. Schilthelm presented a paper at the 1985 Health Physics Society meeting, entitled "Radiation Survey Measurements at the Aladdin Synchrotron Light Source."

Professional Affiliation:

American Nuclear Society (Member)
Health Physics Society (Member)

11.2.3 Industrial Safety Officer - Anthony J. Ambrose

EDUCATION:

M.S. - Safety Management, West Virginia University, 1989
B.S. - Physical Education & Health Education, West Virginia University, 1988

Continuing Education and Certifications:

- FEMA Certified Hazardous Material Incident Analysis, West Virginia University, 1989
- EPA Certified Asbestos Abatement Supervisor, West Virginia University, 1989
- EPA Certified Asbestos Abatement Worker, West Virginia University, 1989
- Red Cross Certified CPR Instructor, West Virginia University, 1987
- Red Cross Certified Advanced First-Aid, West Virginia University, 1987
- Red Cross Certified Water Safety Instructor, West Virginia University, 1986
- Weirton Heights Rescue School, Weirton, West Virginia, 1986

Experience:

(1989-Present) Babcock & Wilcox, Industrial Safety Officer, NNFD Research Laboratory, Lynchburg, Virginia

Mr. Ambrose is the NNFD-RL's Industrial Safety Officer. He is responsible for compliance with the regulations of the Occupational Health and Safety Administration. He advises the NNFD-RL on the standards and requirements of the National Fire Protection Association and performs reviews of equipment and systems for compliance with NFPA standards. He performs inspections of facilities and equipment for fire protection purposes. He reviews facility changes and modifications to ensure fire safety. Mr. Ambrose performs tests, maintenance, and inspection of fire protection, control and extinguishing equipment. He is responsible for investigating all accidents, and keeping his management informed of safety activities. He performs fire and rescue training for the members of the NNFD-RL's Fire and Rescue Team, and serves as the Captain of the team.

(1988-1989) West Virginia University, Safety & Industrial Hygiene Assistant/Graduate Assistant, W.V.U. Environmental Health & Safety Department, Morgantown, West Virginia

Responsible for assuring a healthy and safe working environment for employees of West Virginia University. Duties included: data base development, legislation/compliance, inspections/audits, environmental monitoring; air, bulk and noise sampling, training development and implementation.

(1988-1989) Monongalia County Schools, Substitute Teacher, Morgantown, West Virginia

Responsibilities included classroom supervision at the elementary and high school levels, training development and implementation utilizing educational strategies.

Professional Affiliations:

American Nuclear Society (Member)

11.2.4 Accountability Specialist - Kenneth D. Long

Education:

Graduate - White Sulphur Springs High School, 1958
Certificate - Bookkeeping, Central Virginia Community College, 1983

Experience:

(1974-Present) Babcock & Wilcox, Accountability Specialist
NNFD Research Laboratory, Lynchburg, Virginia

Mr. Long, as the Accountability Specialist, is responsible to the Manager of Safety and Licensing for the accurate accounting of all Special Nuclear, Source, and Byproduct material at the NNFD-RL. He is responsible for recording all transfers of SNM that are made within the NNFD-RL and for preparing the reports and records of off site transfers. He prepares all NRC/DOE 741 Transaction Forms. He is responsible for the timely completion of inventories of licensed material. He initiates the paper work required for all shipments of licensed material.

In addition to his normal duties he is a Document Custodian. In this capacity, he is responsible for the safe storage of all classified DOE and DOD documents at the NNFD-RL. He is also an authorized classifier and an authorized courier of classified material.

(1970-1974) Babcock & Wilcox, Shipping & Receiving Clerk
Lynchburg Research Center, Lynchburg, Virginia

Mr. Long was responsible for the shipment and receipt of all materials at the LRC. This assignment included the processing of all the necessary forms and documents used for shipping and receiving licensed materials as well as the many items that are required for operation of a research and development laboratory.

(1967-1970) Babcock & Wilcox, Technician
Lynchburg Research Center, Lynchburg, Virginia

Mr. Long was a technician in the Plutonium Development Laboratory during this period. He performed chemical operations utilizing uranium and plutonium materials and was responsible for the accountability of SNM materials into and out of his area.

Professional Affiliations:

Institute of Nuclear Materials Management (Senior Member)
Nuclear Materials Control Committee, B&W (Secretary)
American Nuclear Society, Virginia Chapter (Member)

11.2.5 Licensing & Compliance Officer - Charlie C. Boyd

Education:

B.S. - Physics, U. S. Naval Academy, 1976
Nuclear Criticality Safety Short Course, 1987
Nuclear Criticality Safety Workshop, 1986
Professional Certification:
Professional Quality Assurance Auditor, 1989

Experience:

(1989-Present) Babcock & Wilcox, Licensing & Compliance Officer, NNFD Research Laboratory, Lynchburg, Virginia

Responsible for coordination of all licensing activities at the NNFD Research Laboratory and for the regulatory compliance auditing system at NNFD.

(1987-1989) Babcock & Wilcox, Licensing & Compliance Officer, NNFD, Lynchburg, Virginia

Responsible for coordination of all licensing activities at NNFD and for the establishment of a regulatory compliance auditing system.

(1986-1987) Babcock & Wilcox, Nuclear Safety & Licensing Officer, NNFD, Lynchburg, Virginia

Responsible for nuclear criticality safety and coordination of all licensing activities for NNFD.

(1985-1986) Babcock & Wilcox, Lead Engineer, NNFD, Lynchburg, Virginia

Responsible for the development of process and production of control rods for NNFD's Advanced Reactor Development Section.

(1984-1985) Babcock & Wilcox, Lead Engineer, NNFD, Lynchburg, Virginia

Developed processes and procedures for fuel preassemblies within NNFD's Advanced Reactor Development Section.

(1976-1984) Officer, U. S. Marine Corps

Held positions ranging from Platoon Commander to Marine Amphibious Brigade Communications Electronic Officer. Responsibilities ranging from planning, coordinating, deploying, and operating communications assets of a Brigade size task force involving local and world-wide communications to planning and coordinating military and high school testing for the state of South Carolina, fourteen counties in Georgia, and the Panama Canal Zone.

11.2.6 Nuclear Criticality Safety Officer - Francis M. Alcorn

Education:

B.S. - Nuclear Engineering, North Carolina State College, 1957
M.B.A - Business Administration, Lynchburg College, 1974
- Graduate study in Nuclear Engineering, University of Virginia

Experience:

(1971-Present) Babcock & Wilcox, Manager, Nuclear Criticality Safety Group, NNFD Research Laboratory, Lynchburg, Virginia

This unit is the Company's central organization which provides guidance, develops and validates the analytical methods needed for criticality evaluations, does criticality calculations, performs nuclear safety audits, and gives assistance to the various divisions of the Company and the Company's customers in matters related to nuclear criticality safety. In addition to his responsibility as manager of this group, he is the Nuclear Safety Officer for the NNFD-RL.

(1969-1971) Babcock & Wilcox, Criticality Specialist, Nuclear Safety Engineer, Lynchburg Research Center, Lynchburg, Virginia

Transferred to the LRC as Nuclear Criticality Safety Specialist for Babcock & Wilcox's Naval Nuclear Fuel Plant, Commercial Nuclear Fuel Plant, and the LRC. He was appointed Nuclear Safety Officer for the LRC.

(1964-1969) Babcock & Wilcox, Power Generation Division, Lynchburg, Virginia

Mr. Alcorn was a physicist in the PWR Development Section and was responsible for determining the most economical method for utilizing plutonium as a recycle fuel in B&W's pressurized water reactor concepts. In addition, he was Nuclear Criticality Safety Advisor to the Company's Naval Nuclear Fuel Division.

(1961-1964) Babcock & Wilcox, Nuclear Power Generation Division
Lynchburg, Virginia

He has been concerned with core neutron physics analysis and design of the Consolidated Edison Reactor, the Liquid Metal Fuel Reactor, the Babcock & Wilcox Test Reactor, the Advanced Test Reactor, the Heavy Water-Organic Cooled Reactor Concept, and Babcock & Wilcox Pressurized Water Reactor Concepts. He developed methods for and performed calculations for criticality, fuel depletion, nuclear safety coefficients, power profiles, nuclear fuel costs and critical experiment analysis. He has also worked in the areas of kinetic safety analysis.

(1957-1960) Babcock & Wilcox, Atomic Energy Division
Lynchburg, Virginia

He functioned as a nuclear engineer doing both core neutron physics and shielding calculations.

(1960-1961) General Nuclear Engineering Corporation, Staff Physicist

Mr. Alcorn engaged in core neutron physics design and analysis of the Boiling Nuclear Superheat Reactor. He also wrote physics articles for Power Reactor Technology which were published by GNEC for the AEC.

Professional Affiliations:

Sigma Pi Sigma (Member)
Tau Beta Pi (Member)
American Nuclear Society - Past Chairman of ANS Nuclear Criticality Safety Division
- Member Standards Subcommittee ANS-8.

11.2.7 Health Physicists

11.2.7.1 Health Physicist - Carl R. Yates

Education:

B.S. - Biology, University of Pittsburgh,
Johnstown, Pennsylvania, 1979
M.S. - Biology, West Virginia University,
Morgantown, West Virginia, 1981

Additional Training - "Radioactive Sample Analysis,"
Gaithersburg, Maryland, 1989
- "Environmental Radiation Surveillance,"
Boston, Massachusetts, 1983.

Experience:

(1988-Present) Babcock & Wilcox, Health Physicist,
NNFD Research Laboratory, Lynchburg, Virginia

Mr. Yates is responsible for tracking and reviewing the Personnel Dosimetry records of the NNFD Research Laboratory employees, ensuring all health physics instruments are calibrated accurately and in a timely manner, and managing the environmental monitoring program.

Additional responsibilities include preparation of health physics technical procedures and various radiation work permits.

(1986-1988) Science Applications International Corporation (SAIC), Radiological Scientist, Rockville, Maryland

Mr. Yates was responsible for the on-site categorization of fuel pool-stored components for compliance with 10 CFR 61, scaling factor determination, and studies involving the behavior of radioiodine in sampling lines at operating power stations.

Additional responsibilities included writing the quality control data report for the radiological laboratory, and acting as Project Manager for the EPA and NIST intercomparison programs.

(1981-1988) NUS Corporation, Environmental Scientist/Project Manager, Gaithersburg, Maryland and Pittsburgh, Pennsylvania

Mr. Yates was responsible for conducting on-site environmental surveys for several Department of Energy sites as a member of the DOE/NUS Environmental Survey Team, writing annual reports for various nuclear power plant's environmental monitoring programs, writing technical procedures, sample collection auditing, and preparing the environmental study plan for a candidate high-level nuclear waste repository site.

Professional Affiliations:

American Nuclear Society (Member)
Health Physics Society (Member)

11.2.7.2 Health Physicist - David L. Spangler

Education:

B.S. - Biology, Core Study - Health Physics/Nuclear Science Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia
- Radioactive Material Shipping Regulatory Awareness
- Contamination and Hot Particle Control.

Experience:

(1988-Present) Babcock & Wilcox, Health Physicist
NNFD Research Laboratory, Lynchburg, Virginia

Mr. Spangler is responsible for administering and implementing the Health Physics Program at the NNFD-RL. His duties include shipping and receiving radioactive material, shipping low-level waste, developing and implementing programs and procedures for; external exposure, contamination control, area surveillance, and instrument calibration.

(1982-1988) Health Physicist, H. B. Robinson Nuclear Power Plant, Hartsville, South Carolina

Mr. Spangler was responsible for developing and implementing radwaste, volume reduction and shipping programs and procedures. He was responsible for training and supervising waste processing and packaging groups. Mr. Spangler's other duties included: area surveys, radiation work permits, ALARA programs, instrument calibration and technical training and qualification programs.

Professional Affiliation:

American Nuclear Society (Member)
Health Physics Society (Member)

11.2.7.3 Health Physicist - Teofil Grochowski

Education:

B.S. - Nuclear Medicine Technology, University of Virginia Medical Center/Lynchburg College, 1986
- Certificate in Nuclear Medicine Technology, University of Virginia Medical Center, 1985

B.S. - Biochemistry, Lynchburg College, 1985

A.S. - Science, Central Virginia Community College, 1983

Experience:

(1986-Present) Babcock & Wilcox, Health Physicist, NNFD Research Laboratory, Lynchburg, Virginia

Primary responsibilities include administration of the respiratory protection program, bioassay program, radiation safety training of new employees, technical procedure development, preparation of radiation work permits, and instrument calibrations. Also appointed as the alternate site Radiological Safety Officer.

Professional Certification:

Certified Nuclear Medicine Technologist
Nuclear Medicine Technology Certification Board
Registered Technologist, Nuclear Medicine
American Registry of Radiologic Technologists

Professional Affiliations:

Health Physics Society (Plenary Member)
Society of Nuclear Medicine (Associate Member)
Virginia Chapter, Health Physics Society (Member)
Virginia Chapter, American Nuclear Society (Member)
Virginia Society for the Advancement of Nuclear Medicine (Member)
Virginia Academy of Science (Member)
Society of Nuclear Medicine (Technologist Member)

11.3 PROCEDURES

11.3.1 Area Operating Procedures (AOP) - All operations with licensed material shall be conducted in accordance with Area Operating Procedures or a Radiation Work Permit. Area Operating Procedures are prepared by any technically competent person. The proposed procedure is delivered to the Licensing & Compliance Officer who ensures that the procedure is in the proper format. The Licensing & Compliance Officer routes the procedure to the Nuclear Criticality Safety Officer who reviews it to assure that any nuclear criticality safety issues are properly addressed. If the Nuclear Criticality Safety Officer has additions or corrections, he notes them on the procedure and forwards it to the Supervisor, Health Physics. If the Nuclear Criticality Safety Officer approves it, he signs the procedure in the space provided and forwards it to the Supervisor, Health Physics. The Supervisor, Health Physics reviews it for proper radiological content. If he has additions or corrections, he notes them on the procedure and forwards it to the Licensing & Compliance Officer. If the Supervisor, Health Physics approves the procedure, he signs the procedure in the space provided and forwards it to the Licensing & Compliance Officer. The Industrial Safety Officer reviews it to assure that any industrial safety issues are properly addressed. If the Industrial Safety Officer has additions or corrections, he notes them on the procedure and forwards it to the Licensing & Compliance Officer. If the Industrial Safety Officer approves it, he signs the procedure in the space provided and forwards it to the Licensing & Compliance Officer. The Licensing & Compliance Officer reviews it for general safety and determines its impact on other work and facilities. The Licensing & Compliance Officer is responsible for resolving all additions or changes recommended by the previous reviewers. When the procedure is approved by the four reviewers, the Licensing & Compliance Officer forwards it to the Safety Review Committee. The Safety Review Committee (SRC) may approve the procedure as written, approve the procedure conditionally with specific changes to be made prior to issuance or the SRC can disapprove it. The SRC co-ordinator signs for the SRC when approval is voted. The procedure may be implemented subsequent to SRC approval.

Revisions to AOP's will follow this same approval route, except that the revised procedure may be implemented after receiving the approval signatures of the Nuclear Criticality Safety Officer, Supervisor, Health Physics, Industrial Safety Officer and the Licensing & Compliance Officer. The revised procedure will be placed on the agenda for the next regularly scheduled meeting of the SRC. AOP manuals shall be placed in areas where the procedures apply.

11.3.2 Technical Procedures - Technical procedures provide detailed technical standards and instructions for performing specific tasks. Pursuant to this license application, they are not intended for use by operations personnel and are not distributed in the same manner as AOP's. Neither are they necessarily approved by the Safety Review Committee.

Technical procedures for the Health Physics Group and the Nuclear Criticality Safety Group are reviewed and approved by a Health Physicist and the Nuclear Criticality Safety Officer, respectively, or by their designated alternates. The distribution list for each procedure is specified in the procedure.

11.4 TRAINING

11.4.1 General Radiation Protection Training

The site provides three training programs covering the nature, use and control of radiation, and radioactivity. These courses are presented to ensure that all site personnel receive training appropriate to their activities and to fulfill obligations under the NRC license to provide such training.

The courses consist of a series of lectures intended to present the proper background and technical base to allow workers to understand the principles of radiation safety. The Supervisor, Health Physics or his designated alternate administers the course and, in general, teaches each course. Where practical, basic general procedures and federal regulations are included and discussed. Training aids, such as motion pictures and self-study materials, are used as appropriate.

Program 1 is intended for site workers and non-site workers who will be authorized access to the restricted area. Program 2 is intended for site and non-site workers who may enter the restricted and controlled areas but who will not be permitted to work with licensed material without supervision. Program 3 is intended for authorized users (those who will be authorized to work with licensed material and to supervise such work).

Training in area operating procedures and special area procedures is the responsibility of the Area Supervisor. This training should be accompanied with appropriate formal and on-the-job training as the job requirements dictate.

11.4.2 Program 1

This course is presented to site workers and non-site workers who will be granted access to the restricted area but who will not be granted unescorted access to the controlled areas. The course provides an introduction to radiation and radioactivity (understandable to a non-technical person) and a thorough coverage of safety rules and procedures, including the site emergency procedures. Subjects include the types of radiation, ALARA, radiation effects on humans, decontamination procedures, radiation exposure to females, warning signs, basic health physics rules, a history of radiation protection, worker's rights and responsibilities, and health physics terms.

11.4.3 Program 2

This course is presented to site workers and non-site workers who will be granted unescorted access to the restricted area and controlled areas but who will not be permitted to work with radioactive materials without supervision. This course is intended to provide the workers with a knowledge of the hazards of working in radiation and controlled areas and ways to minimize their dose. Subjects include types of radiation, radiation exposure limits, ALARA, personnel dosimetry and its use, dose calculation, biological effects, radiation exposure to females, radiation protection measures, warning signs and labels, radiation work permits, emergency procedures, rights and responsibilities of workers, and health physics terms.

11.4.4 Program 3

This course is presented to site workers and non-site workers who will be granted unescorted access to the restricted area and controlled areas and will be permitted to work with radioactive materials and supervise such work. This course is intended for meeting the requirements for designation of a worker as an authorized user. Subjects include fundamentals of radiation, external and internal radiation protection, biological effects, radiation detection, instrumentation, contamination control, license requirements, site organization, rights and responsibilities under 10 CFR 19, ALARA, dose calculation, personnel dosimetry requirements and use, posting and labeling, and health physics terms.

11.4.5 Respiratory Protection Training

Training in respiratory protection techniques will be required of all workers before the use of such equipment will be allowed. This training will be carried out by a qualified individual, as defined in NUREG-0041 (Section 12.1), who will document that such training as been completed. Those persons who direct the work of workers using respiratory protection will be included in the training courses. Biennial retraining will be scheduled, at the discretion of the qualified individual, to ensure that a high degree of proficiency in the use of respiratory protective devices is maintained.

Training in respiratory protection shall include the following subjects:

a. Discussion of the airborne contaminants present in the work environment including their physical properties, physiological actions, toxicity, means of detection, and maximum permissible concentrations (MPC's).

b. Discussion of the importance of selecting the proper respirator based on the hazard and the dangers of using respirators for a purpose other than that intended.

c. Discussion of the construction, operating principles, and limitations of the available respirators.

d. Discussion of the use of engineering controls as a substitute for respiratory protection and the need to make every reasonable effort to reduce or eliminate the need for respiratory protection.

e. Instruction in methods to be used to determine that the respirator is in proper working order.

f. Instruction in fitting the respirator properly, field testing for proper fit, and factors that may influence a proper fit.

g. Instructions in the proper use and maintenance of the respirator.

h. Discussion of the uses of various cartridges and canisters available for air-purifying respirators.

i. Review of radiation and contamination hazards, including a review of other protective equipment that may be used with respirators.

j. Instruction in emergency actions to be taken in the event of respirator malfunction.

k. Classroom instruction to recognize and cope with emergency situations while working with a respirator.

l. Any additional training as needed for special use.

m. The wearer must pass a written examination on the material presented on respiratory protection.

11.5 FACILITY CHANGE

Changes and modifications to buildings, exhaust ventilation systems, gas supply systems, emergency electrical systems, etc. are requested on Form RL-229, "Facilities Work Order Form" (Figure 11-2). All work orders are forwarded to the maintenance supervisor. The Plant Engineering Supervisor determines if the request involves a facility change. If a facility change is involved, the work order is forwarded to the Licensing & Compliance Officer. It is the Licensing & Compliance Officer's responsibility to determine that all safety and licensing considerations have been addressed and if the request must be approved by the Safety Review Committee. Space is provided on the form for the approval signatures of the Supervisor, Health Physics, the Industrial Safety Officer, and the Licensing & Compliance Officer.

Completed forms are kept on file by the maintenance supervisor and are audited once a month by the Health Physics Group.

FIGURE 11-1

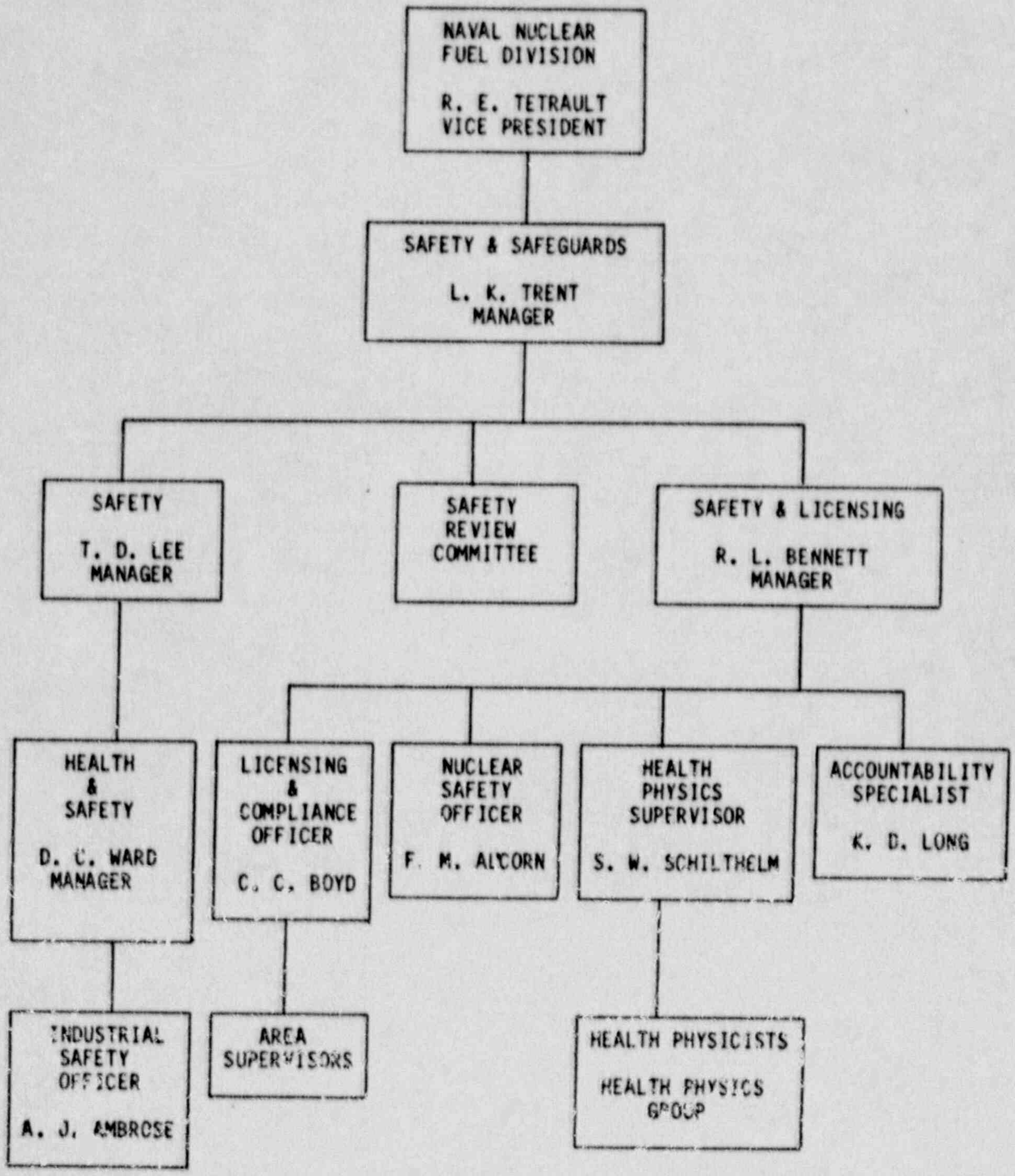
NAVAL NUCLEAR FUEL DIVISION
R. E. TETRAULT VICE PRESIDENT
SAFETY & SAFEGUARDS
L. K. TRENT MANAGER
SAFETY
T. D. LEE MANAGER
SAFETY REVIEW COMMITTEE
SAFETY & LICENSING
R. L. BENNETT MANAGER
HEALTH & SAFETY
D. C. WARD MANAGER
LICENSING & COMPLIANCE OFFICER
C. C. BOYD
NUCLEAR SAFETY OFFICER
F. M. ALCORN
HEALTH PHYSICS SUPERVISOR
S. W. SCHILTHELM
ACCOUNTABILITY SPECIALIST
K. D. LONG
INDUSTRIAL SAFETY OFFICER
A. J. AMBROSE
AREA SUPERVISORS
HEALTH PHYSICISTS
HEALTH PHYSICS GROUP

FIGURE 11-2

RL-229 4/88

Facilities Work Order Form

To: PLANT ENGINEERING Date: ____________

From: ____________ Section: ____________ Signed: ____________

Section Mgr: ____________ Date: ____________

Date Required: ____________ Charge No: ____________ (Labor) ____________ (Material)

DESCRIPTION OF WORK TO BE DONE ____________

SIGNATURE REQUIRED: Industrial Safety Officer: ____________

Health Physics: ____________ Licensing & Compliance Officer: ____________

Space Below This Line for Plant Engineering Use Only

Order Received Date: ____________ Signed: ____________

Planned Starting Date: ____________ Planned Completion Date: ____________

Order Completed: ____________ Work Order Number: ____________

Date: ____________ Signature: ____________

12.0 RADIATION PROTECTION

12.1 PROGRAM

The radiation protection program at the site is implemented to protect employees and the general public from the harmful effects of radiation and radioactive material, to comply with NRC regulations, and to maintain personnel exposures as far below the limits established by the NRC as is reasonably achievable.

Implementation of the program requires the active participation of all personnel who work with licensed material or in areas were licensed material is handled. To support the worker, the site has established the Health Physics organization and vested it with the authority and resources necessary to meet the program goals.

12.2 POSTING AND LABELING

Many areas in the site are required to be posted to indicate the hazard present. This posting is required by the federal regulations and is a fundamental part of an effective radiation protection program. Posting of areas makes the workers aware of the potential hazards in the area and assists workers in keeping their exposures ALARA. Permanent postings are the responsibility of the Health Physics Group. Temporary postings are the responsibility of Authorized Users. This section discusses the posted areas at the site. Persons not directly familiar with conditions existing in a posted area shall contact the area supervisor prior to entering and shall enter only under his direction.

12.2.1 Radioactive Materials Area - Any area where radioactive materials are stored, handled, or processed in amounts exceeding 10 times the quantities specified in 10 CFR 20, Appendix C is designated a radioactive materials area. Each area is clearly marked at every normal entry with a sign bearing the radiation caution symbol and the words - CAUTION - RADIOACTIVE MATERIAL(S). Monitoring equipment and protective clothing required for use in the area will be specified by the Health Physics Group.

12.2.2 Contamination Area - This is any area in which loose contamination is present in quantities in excess of those specified in Table 12-24 or an area designated by the Health Physics Group as one in which there is a risk of contamination. Each contamination area is clearly marked at every normal entry. Work in these areas may require a Radiation Work Permit. Protective clothing, respiratory protection, and personnel monitoring devices required for entry into these areas must be specified by the Health Physics Group. Entry into the area without the prescribed equipment is prohibited. When exiting a contamination area, workers must remove the protective clothing and monitor himself in accordance with established procedures.

12.2.3 Radiation Area - A Radiation Area is an area in which an individual could receive a radiation exposure to a major portion of the body greater than 5 mRem in 1 hour or 100 mRem in 5 consecutive days. Each radiation area is clearly marked at every normal entry with a sign bearing the radiation caution symbol and the words - CAUTION - RADIATION AREA. Work in these areas may require a Radiation Work Permit. Personnel monitoring devices and protective clothing to be worn in the area will be specified by the Health Physics Group.

12.2.4 High Radiation Area - Any area in which an individual may receive an exposure to a major portion of the body greater than 100 mRem in 1 hour is a High Radiation Area. High radiation areas are designated by a sign at each normal entrance bearing the radiation caution symbol and the words - CAUTION - HIGH RADIATION AREA. Entry into high radiation areas is limited to qualified persons, or under the direct supervision of a qualified person and, working under an approved radiation work permit. Protective clothing, protective equipment, and personnel monitoring devices appropriate for the area will be specified by the Health Physics Group and <u>must</u> be worn. When protective clothing is required, each person must remove the protective clothing and monitor himself in accordance with established procedures, when exiting the area.

12.2.5 Airborne Radioactivity Area - This is an area in which airborne radioactivity concentrations could exceed the maximum permissible concentration limits given in 10 CFR 20, Appendix B or in which the concentration of airborne radioactivity averaged over the number of hours individuals are in the area could exceed 25% of the limits given in 10 CFR 20, Appendix B. Each area is clearly designated by a sign at each normal entrance bearing the radiation caution symbol and the words - CAUTION - AIRBORNE RADIOACTIVITY AREA. Entry is limited to those qualified persons classified as radiation workers, working under an approved radiation work permit. No entry is permitted until an appropriate area survey has been made and a member of the Health Physics Group is present. Protective clothing, protective equipment, and personnel monitoring devices to be worn in the area will be specified by the Health Physics Group and must be worn. When exiting these areas, each person must remove the protective clothing and monitor himself in accordance with established procedures.

12.3 EXTERNAL RADIATION - PERSONNEL MONITORING

12.3.1 Administrative Exposure Control - Limits for external radiation exposure are set forth in 10 CFR 20.101 and these general limits are used at the site. The applicable exposure limits to be used for operations at the site are:

1. Whole body - 300 mRem/week (with long-term exposure controlled within the 1.25 Rem/quarter limit by the worker's immediate supervisor)

2. Skin of the whole body - 1.5 Rem/week

3. Hands and forearms, feet and ankles - 3.0 Rem/week.

The Manager, Safety and Licensing has the authority to approve whole body exposures up to, but not exceeding, 3.0 Rem/calendar quarter. In emergencies, the Emergency Officer is authorized to allow personnel exposures to the whole body of up to 3.0 Rem/calendar quarter. Higher exposures may be authorized by the Emergency Officer in accordance with the Radiological Contingency Plan.

12.3.2 Personnel Monitoring for Site and Non-site Workers - All site and non-site workers will be issued a film badge, a SRD, and a TLD. This dosimetry will be worn by the workers when they are in the restricted area. When the workers leaves the restricted area they will place their dosimetry on a rack provided for this purpose.

12.3.3 Visitor Monitoring and Escort Requirements - Visitors to the restricted area will be issued a TLD. This dosimetry will be worn by the visitor when they are in the restricted area and will be surrendered to the receptionist when they depart the site. Visitors must be escorted by a site worker when in the restricted area.

12.3.4 Monitoring Devices

The primary device used for monitoring exposure on site is the film badge. The exposure measured by this badge (reported in units of dose equivalent) becomes a part of the workers permanent exposure record. Films are changed monthly and are mailed off-site for evaluation. In some cases, a Health Physicist may choose to base the monthly exposure of an employee on the monthly thermo-luminescent dosimeter (TLD). This determination shall be recorded in the employees exposure record.

In general, the worker should wear the dosimeters on the portion of the whole body expected to receive the highest dose (with the exception of extremity dosimetry issued in special cases). The film badge and/or monthly TLD badge should always be worn in the proper orientation to ensure that exposure to non-penetrating radiation (e.g., beta radiation) is recorded. For cases in which the exposure may vary significantly within a small area, several badges may be worn to ensure that the maximum whole body dose is measured. In this context, whole body includes the head, lens of the eyes, the gonads, the upper legs above the knees, and the upper arms above the elbows.

12.3.4.1 Pocket Dosimeters - These dosimeters are small, air-filled ionization chambers used to provide a check of the daily exposure of workers and to ensure that the administrative limit for weekly exposure is not exceeded. Indirect dosimeters are capable of measuring external exposure to gamma radiation in the range 0 to 200 mR (other ranges are also available). These dosimeters are read, recorded, and rezeroed daily. Daily readings are used also as an indication of the need to evaluate the primary dosimeter before the normal exchange period.

Some workers may be issued self-reading pocket dosimeters (SRD). These dosimeters do not require reading and recharging on a daily frequency and the worker may evaluate his accumulated exposure without the need for a special reading device. Workers are encouraged to read their self-reading dosimeters at least on a daily basis. These dosimeters are capable of measuring external exposure to gamma radiation in the range 0 to 200 mR, but other ranges are available.

12.3.4.2 Film Badges - These dosimeters are the primary monitoring device used on site, i.e., the film badge results are entered in the employee's permanent exposure record. Film badges monitor external exposure to beta and gamma radiation typically in the range 15 mRems to 500 Rems. For situations in which neutron exposure is probable, film packets sensitive to neutrons also are used.

Films in use on site are changed monthly and mailed to an off-site dosimetry service for processing (reading, recording, and reporting).

12.3.4.3 Thermoluminescent Dosimeters (TLD) - TLD's are small, solid-state dosimeters capable of measuring external exposure from beta and gamma radiation in the range 10 mRems to 10,000 Rem. The monthly TLD's are used to duplicate the readings of the film badge. These badges are also changed monthly and mailed off-site for processing.

At the discretion of a Health Physicist persons handling radioactive materials may be issued extremity dosimeters. These dosimeters are small TLD chips attached to a ring and are to be worn on the fingers. TLD "finger rings" are capable of measuring external exposure to beta and gamma radiation in the range 10 mRems to 10,000 Rems. These dosimeters are evaluated on a frequency established by the Health Physics Group.

12.4 DIRECT RADIATION SURVEYS

Surveys of the direct radiation exposure in areas on site are to be performed on a frequency established by the Health Physics Group. In general, these surveys require the selection of the appropriate portable survey instruments based upon the anticipated radiation levels, the types of radiation expected, and the nature or type of survey to be performed. Survey maps of the areas to be surveyed may be used to record the measured ambient radiation levels and/or, in some cases, to designate specific areas in which the exposure rates should be measured. The survey should also include a visual examination of the area for any unusual conditions or work habits which could affect the exposures received by personnel working in these areas. Items of this nature should be reported immediately to a Health Physicist or corrected immediately, if practical.

Results of these surveys should be reviewed by a Health Physicist to ensure that the proper posting requirements are in effect for the area and to ensure that appropriate actions are taken to keep all exposures ALARA.

12.5 REPORTS AND RECORDS

The following records will be maintained by the Health Physics Group for the periods indicated.

Health Physics Supervisor audits	2 years
Shipping and receiving RM forms	5 years
Waste disposal records	(*)
Personnel dosimetry records	(*)
Results of Bioassays and Whole Body Counting	(*)
Releases to the environment	(*)
Radiation survey data	2 years
Contamination survey data	2 years
Radiation Work Permits (completed)	5 years
Radiation detection instrument calibration	2 years
Leak tests of sealed sources	2 years
Worker training	(*)
Worker retraining	(*)
Airborne radioactivity sampling data	(*)
NRC-4 forms	(*)
NRC-5 forms	(*)

* - indicates that the record will be retained until the NRC authorizes its disposition.

12.6 INSTRUMENTS

12.6.1 Types - The commitment of site management to an effective radiation protection program includes the obligation to provide the adequate equipment and supplies for such a program. It is the responsibility of the Manager, Safety and Licensing and the Supervisor of Health Physics to ensure the appropriate radiation protection instrumentation is available for use on site. In addition, the Health Physics Group has the responsibility to ensure that this instrumentation is used properly, and is calibrated, maintained, and repaired as necessary. Minimum instrumentation requirements for maintaining an effective radiation protection program are listed in Tables 12-1 and 12-2. Other specialized instrumentation may not be included in this list. However, the exclusion of these instruments does not imply that their availability does not enhance the effectiveness of the radiation protection program.

Stack particulate monitor	Alpha, Beta	Bkgd. to 1,000,000 cpm	<1 mg/sq. cm.
Stack gas monitor	Beta, gamma	Bkgd. to 100,000 cpm	30 mg/sq. cm.

12.6.2 Calibration - Portable survey instruments shall be calibrated twice annually using approved procedures and sources traceable to the National Institute of Standards and Technology (NIST). In addition, frequent operational checks will be performed on survey instruments while in use. For example, Geiger-Mueller survey instruments always indicate the presence of radiation above the ambient background. This provides an indication that the instrument is functioning. Portable alpha survey instruments are equipped with check sources which can be used to ensure that the instruments are operating correctly. Portable ionization chamber survey instruments are not equipped with an internal check source and the user must make sure these instruments are functioning before making a radiation survey.

Fixed and stationary radiation monitoring equipment is calibrated on either a semi-annual or annual basis depending on the applicable manufacturer's recommendations and established health physics procedures. Operational checks are performed routinely by the Health Physics technicians on the laboratory counting equipment and "friskers" located at exits from selected areas on site.

12.7 PROTECTIVE CLOTHING

12.7.1 Clothing - The following is a list of protective clothing that is available for use by personnel during normal and maintenance conditions:

1. Laboratory coats
2. Coveralls
3. Shoe covers, treated fabric (reusable)
4. Shoe covers, plastic
5. Pants, plastic
6. Coats, plastic
7. Hoods, fabric (reusable)
8. Shields, spatter
9. Glasses, plastic
10. Glasses, glass
11. Gloves, plastic

12. Gloves, surgeons
13. Gloves, heat resistant
14. Coats, heat reflective
15. Hard-hats.

12.7.2 Emergency Clothing - In the event of an accident that requires special clothing or personnel protective equipment, the Fire and Rescue Team is provided with the following:

1. Hard-hats, heat resistant with face shields
2. Coats, flame resistant
3. Boots, high top rubber with steel toe shields
4. Gloves, chemical resistant

12.8 ADMINISTRATIVE CONTROL LEVELS

12.8.1 Internal Occupational Exposure

12.8.1.1 Plutonium bioassay action criteria.

TABLE 12-3

PLUTONIUM BIOASSAY ACTION CRITERIA

Bioassay Technique	Action Level	Action To Be Taken
Urinalysis	< 0.2 dpm/L	None
	> 0.2 dpm/L	1. Resample the individual within 5 working days. 2. The Supervisor, Health Physics shall consider the need for worker restriction to prevent further exposure until the diagnostic evaluation is complete. Only the Supervisor, Health Physics may lift any work restriction once it is imposed.

3. If #1 is positive, investigate the cause and correct.

4. If the exposure is confirmed by #1, investigate to determine how exposure was incurred and correct it. If the exposure exceeds 50% of the maximum permissible annual dose, the worker shall be restricted from further exposure until the Supervisor, Health Physics authorizes the lifting of their restriction.

TABLE 12-4

PLUTONIUM BIOASSAY ACTION CRITERIA

Bioassay Technique	Action Level	Action To Be Taken
In-vivo	< 1.6E-8 Ci Pu-239	None
	> 1.6E-8 Ci Pu-239	1. Restrict worker from further exposure.
		2. Resample the individual within 10 working days.
		3. Determine if area surveys support the analysis results.
		4. If area surveys confirm result, investigate the

cause and take corrective actions.

5. If the resample results do not confirm the exposure, the Supervisor, Health Physics may lift the work restrictions.

6. If resample results confirm the exposure, the Supervisor, Health Physics shall determine the organ dose.

7. If the exposure has exceeded 50% of the maximum permissible annual dose, the worker shall remain on a work restriction until the Supervisor, Health Physics authorizes the removal of the restriction.

12.8.1.2 Uranium bioassay action criteria.

TABLE 12-5

URANIUM BIOASSAY ACTION CRITERIA

Bioassay Technique	Action Level	Action To Be Taken
a. Urinalysis	< 9 ug/L	None
b. Urinalysis	9-16 ug/L	1. Determine if area surveys support the analysis results.

		2. If #1 is positive, investigate and correct as needed.
		3. Make sure individual is in-vivo counted during the next time that the counting service is at the B&W site.
c. Urinalysis	> 16 ug/L	1. Restrict the worker from further exposure. Resample the individual within 5 working days.
		2. Determine if area surveys support the analysis results.
		3. If #2 is positive, investigate the cause and correct as needed.
		4. If exposure is confirmed by #2, investigate to determine how exposure was incurred and correct it. If the exposure exceeds 50% of the maximum permissible annual dose, the worker shall be restricted from further exposure until the Supervisor, Health Physics authorizes the lifting of this restriction.
d. In-vivo	< 30 ug U-235	1. None
e. In-vivo	30-120 ug	1. Determine if area surveys support the analysis results.

		2. If #1 is positive, investigate and correct as needed.
f. In-vivo	> 120 ug U-235	1. Resample the individual within 10 working days.
		2. Determine if area surveys support the analysis results.
		3. If #2 is positive, investigate the cause and correct as needed.
		4. If exposure is confirmed by #1, investigate to determine how exposure was incurred and correct it. If the exposure exceeds 120 ug, the worker shall be restricted from further exposure until the Supervisor, Health Physics authorizes the lifting of this restriction.

12.8.1.3 Beta-gamma activity - Workers who work in areas where beta-gamma internal exposure is likely (Hot Cells, Radiochemistry, Health Physics) shall be in-vivo counted at approximately annual intervals.

TABLE 12-6

FISSION PRODUCT ACTION CRITERIA

Analysis	Action Level	Action to be Taken
In-vivo	>10% MPCB	Remeasure subject to determine effective half life of the contaminant and plot decay curves.

		Followup program will continue until the contamination present is <5% MPOB or the effective half life has been determined.
Estimation from nasal smears or air sample	>10% MPOB	Submit in vitro sample for analysis within 5 working days.
In-vitro	>5% MPOB	Resample excreta to confirm presence of contamination and to establish rate of elimination. Perform isotopic analysis if >10% MPOB is a possibility.
In-vitro	>10% MPOB	In vivo measurement to be made as soon as practicable.

The Supervisor, Health Physics shall be responsible for evaluations to determine the location and amount of deposition; to provide data necessary for estimating internal dose rates, retention functions, and dose commitments; and to determine whether work restrictions or referrals for therapeutic treatment are required for any case where a result indicating a greater than 10% MPOB deposition of a radionuclide is verified.

12.8.2 External Occupational Exposure - Personnel monitors (film badges, dosimeters, or other suitable devices) are provided to measure the radiation exposure of visitors and workers. Personnel dosimeters issued pursuant to 10 CFR 20.202 shall be read on a monthly basis.

The Area Supervisors are responsible for keeping exposures below 300 millirem per week and 1250 millirem per quarter. The Supervisor, Health Physics may approve weekly exposures above 300 millirem, but the quarterly limit of 1250 millirem shall not be exceeded without the approval of the Manager, SS. If a worker has received the quarterly limit and the Manager, SS has not authorized exceeding the limit. the worker shall be restricted to prevent further exposure for the remainder of the quarter.

12.8.3 Airborne Activity

12.8.3.1 Air Monitoring Program - Air monitoring in operating areas of the site is accomplished with continuous monitors in predetermined, fixed locations. A monitor is placed in each radioactive materials handling area in which there is a potential for the release of airborne radioactivity. Locations are selected based upon the ability of the monitor to provide a reasonable evaluation of the airborne activity in a particular area and to provide adequate warnings to those in the area of changing conditions. The determinations are made by the Health Physics Group based upon the operations in the area, the potential for release, the quantity and chemical form of the material.

Alarms are set in accordance with a particular operation, the material being handled, and the potential for release. Actual alarm points are set as low as possible commensurate with the ambient radiation levels in the area. Personnel are instructed through procedures and training to evacuate, up wind, if an air monitor alarms and to notify the Health Physics Group. Re-entry is controlled by the Health Physics Group.

12.8.3.2 Effluent Monitors - Potentially contaminated air from chemical hoods, hot cells, and glove boxes is discharged ultimately through the 50-meter stack. Generally, exhaust air containing beta-gamma activity is passed through a single-stage HEPA filter which is sufficient to remove airborne particulates. Air from more hazardous operations, e.g., from glove boxes, is passed through a two-stage HEPA filter.

Discharges through the stack are monitored with a sampling head located in the stack about 25 feet above the base. Air removed by the sampler passes through a fixed filter, into the chamber of the gas monitor, and is returned to the stack. The fixed filter is monitored continuously for alpha and beta activity by a gas-flow proportional counter. The second monitor, the gas monitor operates continuously utilizing a halogen-quenched GM tube. The stack monitor flow rate is maintained at a minimum of 2 cfm. Both monitors are equipped with adjustable alarms. The set points for these alarms are determined by the Health Physics Group. The alarms are connected to an alarm panel located in the Health Physics Area in Building B. Alarms of the system are responded to by the Health Physics Group. The alarm condition is first verified by the Health Physics Group. If the alarm is actual, the exhaust fan is secured, operations personnel are advised to stop all operations with radioactive material, the cause is investigated by the Health Physics Group, corrected by operations personnel, and the fan restarted.

TABLE 12-7

STACK RELEASE ACTION LEVELS

Release Product	Action Levels
Beta Particulate	200 uCi/week
Alpha Particulate (long lived)	1 uCi/2 weeks
Kr-85	70 Ci/week
H-3	3 Ci/week
I-131	200 uCi/week

12.8.4 Liquid Activity - Liquids containing radioactive material are discharged from the area where they are generated, to the Liquid Waste Disposal Facility. This facility is comprised of a series of tanks. All radioactive liquid waste is held in this facility for sampling prior to release. If the concentration of radioactivity exceeds 25% of the MPC values listed in Table I, Col. 2, of 10 CFR 20, Appendix B, the waste must be diluted to levels that meet this specification. Liquid waste is discharged to the liquid waste processing system at the NNFD. The NNFD must be notified and approve of each discharge from the site prior to discharge. No alarms are associated with this system because its operation is under the positive control of the Health Physics Group.

12.8.5 Surface Contamination

12.8.5.1 Work Areas - The Health Physics Group performs smear surveys in the work areas listed in Table 12-8. The frequencies specified in Table 12-8 are minimum frequencies. More frequent surveys are performed based on the level of work performed in the specified areas. Action is taken to protect personnel and reduce the levels of contamination below those specified. The Health Physics Group will supervise and direct the protection and decontamination activities. Decontamination to reduce levels of contamination will commence within 24 hours of discovery. The Supervisor, Health Physics shall evaluate and approve any delays on decontamination work that are longer than 24 hours.

TABLE 12-9

ACTION LEVELS FOR LARGE AREA SMEARS

1. Routine Large Area Smears (1000-5000 dpm) - Repeat the large area smear. If results show levels of contamination above 1000 dpm, take smears in smaller areas to locate the source. Decontaminate all areas in which the smear results indicate contamination above 1000 dpm/100 square feet.

2. Routine Large Area Smears (5000-10,000 dpm) - Repeat the large area smear. If results show levels of contamination above 5000 dpm, isolate the contaminated area. Take smears in smaller areas to locate the source. Decontaminate all areas in which the smear results show contamination in excess of 1000 dpm/100 square feet.

3. Routine Large Area Smears (>10,000 dpm) - Isolate the contaminated area. Survey all personnel in the contaminated area. Take smaller smears in the area to locate the source. Decontaminate all areas in which the smear results show contamination in excess of 1000 dpm/100 square feet. Survey all persons leaving the building.

12.8.5.2 Personnel Contamination Surveys - Personnel are required to monitor themselves for activity present on their hands, shoes, clothing and person before exiting a contamination area. Contamination monitors (friskers) are located at all normal exits from contamination areas for this purpose. The detector should be held as close to the surface of the item being monitored as possible, without touching the item, and the probe should be moved at a slow speed over the surface. Allowable levels of contamination on skin surfaces and on items of clothing are given in Tables 12-10. Any contamination in excess of these limits should be reported immediately to the Health Physics Group. The Health Physics Group will supervise the decontamination and determine if clothing must be discarded. The approval of the Supervisor, Health Physics shall be required to allow any individual to leave a contaminated area who is contaminated above background radiation levels.

TABLE 12-10

MAXIMUM PERMISSIBLE CONTAMINATION FOR PROTECTIVE CLOTHING

($dpm/100\ sq.\ cm^2$)

Item	Alpha	Beta + Gamma
Clothing	2,200	22,000
Shoes	22,000	220,000

12.8.5.3 Release of Equipment or Packages - Packages and equipment are surveyed by the Health Physics Group. The Health Physics Group has the authority to prohibit the release of items that are found to exceed the limits specified in Annex C to License SNM-778 "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use of Termination of Licenses for Byproduct, Source, or Special Nuclear Material, dated July, 1982."

12.9 RESPIRATORY PROTECTION

The primary objective of a respiratory protection program is to limit the inhalation of airborne radioactive materials and other hazardous materials. This objective is normally accomplished through the use of engineering controls, including process, containment, and ventilation equipment. When engineering controls are not feasible or cannot be applied, respiratory protection must be used. The Health Physics Group is responsible for the implementation of the respiratory protection program. The program is based on the guidance contained in 10 CFR 20, Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," and NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactive Materials."

The respiratory protection program will include the following:

1. Air sampling and other surveys sufficient to identify the hazard, to evaluate individual exposures, and to permit proper selection of respiratory protection equipment.

support equipment, and any other operations where Health Physics believes that there is a potential of airborne activity.

5. It should to be noted that a major operation is occurring in the decommissioning of Building C that is requiring the use of respiratory protection for industrial safety reasons, not for protection from radioactive materials. A number of operations are very dusty (paint chipping, concrete destruction, etc.). A NIOSH approved full flow hard hat system is used. With no protection factor, no one in Building C has been exposed in excess of 2 MPC hr in one week. In most cases, radioactivity above background is undetectable.

12.10.2.2.3 Table 12-17 presents a summary of the air sampling program for calendar year 1984, for fixed air samplers.

TABLE 12-17

1984 AIR ACTIVITY

(VALUES IN μCi/ml)

Labs	Approximate Average	Maximum Concentration	MPC
15*	3E-15	1.6E-14	1E-10
16*	2E-15	5E-15	1E-10
17*	5E-15	3.9E-13	4E-11
19	7E-15	1E-13	1E-10
27**	2.4E-14	7.5E-15	1E-10
Soil Processing***	1E-15	7.4E-15	4E-11
Cask Handling Area	5E-13	1.2E-11	9E-9
	5E-15	5E-13	4E-11

This method has been changed such that the workers, Area Supervisors and signators of the RWP gather at a meeting where the proposed work scope and methods are discussed in detail. All facets of work are agreed to before any authorization signatures are placed on the RWP. This new approval process requires more time being spent for the planning stage of a task but considerable exposure savings have resulted.

12.12 BIOASSAY PROGRAM

Those workers routinely working in contamination or airborne radioactivity areas will be scheduled for participation in the bioassay program. The Health Physics Group will select those workers to be sampled in the program. This selection will be based on the probability of exposure, the worker's work habits, the type of work in the area, air sample data, previous bioassay data, etc. Routine bioassay may consist of check or whole-body counting (in-vivo bioassay) or excretion analysis (in-vitro bioassay). In-vivo bioassay is performed routinely by a bioassay service which comes on-site for the evaluations. In-vitro bioassay is performed by a commercial laboratory located off-site.

Bioassay action criteria for plutonium are outlined in Table 12-3 & 12-4. In general, no action is required if the excretion result (i.e., urinalysis) is less than 0.2 dpm/liter or the in-vivo measurement of material in the lung is less than 16 nanoCuries. All compounds of plutonium are considered to be either class W or Y. This classification refers to the most recent evaluation of the ICRP for internal dose calculations. Class W compounds are moderately soluble and clear from the pulmonary region of the lung with half-times in the range 10 to 100 days. Class Y compounds are essentially insoluble and are considered to clear from the pulmonary region with half times of >100 days. No compounds of plutonium are considered by the ICRP to be readily soluble (i.e., class D compounds which clear from the lungs in <10 days).

The bioassay program for uranium generally follows that outlined in Regulatory Guide 8.11, "Application of Bioassay For Uranium," June 1974. There are two exceptions to this general guidance:

1. Workers off-site during the regular visit of the bioassay service will not be scheduled for a special, make-up count, if the count was scheduled only for routine exposure control monitoring.

2. Bioassays of workers working in areas in which both plutonium and uranium may be airborne shall be evaluated for both plutonium and uranium. The Supervisor, Health Physics may decide to analyze for only one of these elements, if it can be demonstrated that the analysis for a single element is a more sensitive indicator of an uptake. |

Bioassay action criteria for uranium are outlined in Table 12-5 & 12-6.

Workers working primarily with beta and gamma emitting radionuclides will also be included in the <u>in-vivo</u> bioassay analysis program. Any worker suspected of an exposure greater than 40 MPC-hours will be scheduled for a bioassay evaluation as soon as practicable after the exposure. Bioassay action criteria for beta-gamma are outlined in Table 12-7.

12.13 <u>AIR SAMPLING AND MONITORING</u>

The presence of airborne radioactive materials in the working areas is determined through the combined use of air samplers and monitors. These programs are discussed below:

12.13.1 <u>Air Sampling Program</u>

The air sampling program can be divided into two categories; fixed and portable. Selection of the sampling category and the frequency of sampling is left to the discretion of the Supervisor, Health Physics. |

12.13.1.1 Fixed Air Samplers - Air samples are obtained at designated points through the use of a central vacuum system. Sampling points are located as close as possible to a permanent op[illegible]tor station to permit continuous sampling of the air near the worker's breathing zone. These samples are usually c[illegible] weekly. However, the frequency may vary as the situ[illegible] dictates.

Normally, these are evaluated within two weeks, afte[illegible]ing the appropriate decay period for the radon daughter products. However, based on the particular operation, etc., a Health Physicist may determine that it is necessary to evaluate the samples without allowing for the decay period. In these cases, an applicable radon decay correction factor must be applied to the results. |

12.13.1.2 Portable Samplers - Air samples in the approximate breathing zone of a worker may be obtained through the use of a lapel sampler. The lapel sampler consists of a small sampling head attached to the worker's lapel (or collar) connected through a small flexible tube to a small air-pump worn at the waist. The flow rates through these samplers are quite low when compared to the fixed system. However, since the sampler is located near the nose and mouth and moves with the worker as he moves about the area, it provides a reasonable estimate of the concentration of airborne radioactivity in the breathing zone of the worker.

Air samples obtained with these samplers are evaluated on a low background, proportional counting system. Factors are applied to the counting results to account for background activity and detector efficiency. All results are reported in units of activity/unit volume of air sampled.

12.13.2 Air Monitoring Program

Air monitoring in operating areas is accomplished with continuous monitors in predetermined, fixed locations. Normally, a monitor is placed in each radioactive materials handling area in which there is a potential for the release of airborne radioactivity. Locations are selected based upon the ability of the monitor to provide a reasonable evaluation of the airborne activity in a particular area and to provide adequate warnings to those in the area of changing conditions. These determinations are made by the Health Physics Group based upon the operations in the area, the potential for release, and the quantity and chemical form of the material.

Alarms are set in accordance with the particular operation, the material being handled, and the potential for release. Actual alarm points are set as low as possible commensurate with the ambient radiation levels in the area.

12.14 SURFACE CONTAMINATION

12.14.1 Smear Surveying

Smear surveys are performed in all areas specified in the license and which, in the judgment of the Supervisor, Health Physics, have a potential for surface contamination. The frequency of these surveys will be based upon the potential for contamination in the area, previous experience with contamination in the area, and the need to keep the area free from contamination. Typical areas and survey schedules are listed in Table 12-8, however, both the areas included and the frequencies of surveys are subject to change based upon the current research activities. The frequency of smear surveys in areas not included in the table are generally specified in the procedure covering the particular area.

12.14.1.1 Smear Samples - Smear samples are obtained with small, absorbent filter papers. The smear paper is moved across an area of approximately 100 sq. cm. using about 5 pounds of pressure. The smear may be counted with a portable gas-flow proportional counter capable of detecting alpha or beta radiation. Normally, smear samples are evaluated in a stationary counter located in the Health Physics Laboratory. Appropriate conversion factors are applied to the net counts to express the smear results in units of disintegrations per minute.

12.14.1.2 Large Area Smears - Large area smears are obtained using the dust mop technique in areas around the site, the hot cell operations area, the change room and main hallways in Building B. These smears are intended to indicate the general contamination environment in an area and may lead to a more extensive survey, if unexpected contamination is indicated. Normally, large area smears are evaluated with a hand-held, portable survey instrument (e.g., a gas-flow proportional counter such as the PAC 4G). Actions to be taken in response to the results of large area smears are outlined in Table 12-22.

12.14.1.3 Action Levels - Included in Table 12-24 are the appropriate action levels to be used in designated areas. Decontamination shall be initiated in areas in which the removable surface contamination levels exceed these action levels. The Health Physics Group shall determine and direct the actions to be taken to protect workers working in these areas and to reduce contamination levels as far below those listed in Table 12-1 as is possible. Normally, decontamination of an identified area shall begin within 24 hours of the discovery.

In some cases, for example, if the contamination is discovered just prior to a weekend or a regularly scheduled holiday, the contaminated area may be marked and posted appropriately. Such a determination shall be made by the Health Physics Group based upon the severity and extent of the contamination and the potential for further contamination of equipment and/or personnel during the interval. Decontamination of the area shall begin on the first regular work-day after discovery.

TABLE 12-22

ACTION LEVELS FOR LARGE AREA SMEARS

1. Routine Large Area Smears (1000 - 5000 dpm)

   Repeat the large area smear. If results show levels of contamination above 1000 dpm, take smears in smaller areas to locate the source.

   Decontaminate all areas in which the smear results indicate contamination above 1000 dpm per 100 sq. ft.

2. Routine Large Area Smears (5000 - 10,000 dpm)

   Repeat the large area smear. If results show levels of contamination above 5000 dpm, isolate the contaminated area. Take smears in smaller areas to locate the source.

   Decontaminate all areas in which the smear results show contamination in excess of 1000 dpm per 100 sq. ft.

3. Routine Large Area Smears (>10,000 dpm)

   Isolate the contaminated area.

   Survey all personnel in the contaminated area.

   Take smaller smears in the area to locate the source.

Hot Cell Operations Area	twice monthly	2,000
Cask Handling Area	twice monthly	22,000
Radiochemistry Laboratory	twice monthly	22,000
Exit Portals From Controlled Areas	twice monthly	2,000

12.14.2 Direct Radiation Surveys

Surveys of the direct radiation exposure are to be performed on a frequency established by a Health Physicist. In general, these surveys require the selection of the appropriate portable survey instruments based upon the anticipated radiation levels, the types of radiation expected, and the nature or type of survey to be performed. General maps of the areas to be surveyed may be used to record the measured ambient radiation levels and/or, in some cases, to designate specific areas in which the exposure rates should be measured. The survey should also include a visual examination of the area for any unusual conditions or work habits which could affect the exposures received by personnel working in these areas. Items of this nature should be reported immediately to the Supervisor, Health Physics,or corrected immediately, if practical.

Results of these surveys should be reviewed by a Health Physicist to ensure that the proper posting requirements are in effect for the area and to ensure that appropriate actions are taken to keep all exposures ALARA.

Action levels for direct radiation surveys are presented in Table 12-24.

TABLE 12-24

CONTAMINATION ACTION LEVELS

Area	Type of Radiation	Fixed Surface Reading	Transferable Surface Contamination (dpm/100 sq. cm.)
Uncontrolled	Alpha	300 dpm/100 sq. cm.	30
	Beta-Gamma	0.1 mRad/h	220
Contamination*	Alpha	3000 dpm/100 sq. cm.	2,200
	Beta-Gamma	1.0 mrad/h**	22,000

* The Supervisor, Health Physics may raise these action levels. Justification for this action must be documented and forwarded to the Safety Review Committee for their review and approval. |

** This action limit applies to contamination areas which are normally radiation areas. This level of contamination will not cause a significant increase in radiation exposure.

NOTE:

This table provides limits above which decontamination must be initiated. These action levels pertain to areas normally accessible to personnel performing normal work functions. The levels do not apply to areas requiring extraordinary precautions for entry, e.g., the Isolation Area, waste water tanks, etc. In these cases, direct health physics coverage is the primary control mechanism.

12.14.3 Personnel Contamination Surveys

Workers are required to monitor themselves for activity present on their hands, shoes, clothing, and person before exiting a contamination area. Contamination monitors (friskers) are located at all exits from contamination areas for this purpose. The detector (probe) should be held as close to the surface of the item being monitored as possible (without touching the item) and the probe should be moved at a speed of about 0.5 inch/second. Allowable levels of contamination on skin surfaces and personal clothing must not exceed background. Permissible levels of contamination on protective clothing are given in Table 12-10. Any contamination in excess of these limits should be reported immediately to the Health Physics Group.

Discharge through the stack is accomplished with a large blower, powered normally by a large electric motor operated on off-site power. Emergency power is supplied by an internal combustion engine coupled to the blower shaft through a centrifugal clutch. On loss of off-site power, the engine starts automatically and takes over the load upon reaching the proper speed.

Discharges through the stack are monitored with a sampling head located in the stack about 25 feet above the base. Air removed by the sampler passes through a fixed filter, into the chamber of the gas monitor, and is returned to the stack. The fixed filter is monitored continuously for alpha and beta activity by a gas-flow proportional counter. The second monitor, the gas monitor, operates continuously utilizing a halogen-quenched GM tube. The stack monitor flow rate is maintained at a minimum of 2 cfm. Both monitors are equipped with adjustable alarms. Set points for these alarms are determined by the Health Physics Group. These alarms are connected to an alarm panel located in the Health Physics Laboratory in Building B.

Air from areas equipped with continuous air monitors (and which is below the applicable MPC for an unrestricted area) may be exhausted, through HEPA filters, directly to the roof of the building. Air from areas which have a low potential for airborne activity may be exhausted directly to the roof of the building.

13.3 LIQUID EFFLUENT MONITORING

All potentially radioactive liquids are collected in tanks located in the Liquid Waste Disposal Facility. The contents of each tank are mixed, samples are obtained, and are analyzed for radioactivity before the liquids are released to the waste treatment plant at the Naval Nuclear Fuel Division (NNFD).

Liquid waste tanks are sampled on a quarterly frequency, before release to the NNFD or at other times determined by the Health Physics Group. Results of all analyses are reported in units of activity per unit volume and records of these evaluations are retained by the Health Physics Group.

Water samples are also obtained on a quarterly basis from the retention basin located behind Building C, the sample pit and collection tank located adjacent to the Temporary Storage Facility, and the holding pond located near Building J.

14.0 NUCLEAR CRITICALITY SAFETY

14.1 ADMINISTRATIVE AND TECHNICAL PROCEDURES

The ultimate responsibility for nuclear criticality safety rests with the Manager, SS. However, first-line responsibility is with the Licensing & Compliance Officer supported by the Nuclear Criticality Safety Officer.

The Nuclear Criticality Safety Officer is generally responsible for establishing nuclear safety limits and nuclear safety considerations in operating procedures, processes, and the like. His duties are shown more specifically in the following statement.

The position of Nuclear Criticality Safety Officer has been established at the site. It will be this officer's responsibility to ensure, as far as possible, that no operations on site can lead to the inadvertent assembly of a critical mass. To this end, he will review all new procedures which involve the handling of special nuclear materials as well as changes in old procedures, observe operations, inaugurate educational programs if and when he deems them necessary, and carry out confirming criticality calculations.

This appointment does not in any way relieve the Licensing & Compliance Officer of his responsibilities for ensuring the safety of operations, nor will it eliminate the necessity for the reviews by the Safety Review Committee required by the license.

Once a quarter the Nuclear Criticality Safety Officer or qualified person designated by him will inspect all site operations where special nuclear materials are being processed. Other areas shall be inspected less frequently; however, all areas shall be inspected at least once a year. He shall consider area operations when scheduling these inspections and shall, if necessary, schedule his inspection at more frequent intervals. His consideration should include inspection of new facilities, inspection of hazardous non-routine operations, an audit of nuclear criticality safety records, a check for area posting and a review of current practices.

A written report is to be filed with the Manager, SS quarterly with a copy to the Licensing & Compliance Officer. The report shall be brief, concerning itself with inspections made during the quarter and with the nuclear criticality safety activity of the quarter.

From these data it is concluded that for 850 grams U-235 per unit an array of 24-inch centers should be safe for 40 units or less and on 36-inch centers, an array would be safe with 90 units or less. A slight increase in the array multiplication, on the order of 1%, may occur for low levels of interspersed water moderation. However, the safety of these arrays would still be maintained.

To avoid confusion and possible mistakes, additional procedural controls are applied when low-enrichment limits are used.

These preclude enrichment combinations of below and above 4.0 wt% U-235. (These are not necessarily unsafe - no calculations were made and no such combinations are desired.)

4. The unit and its limit (laboratory, furnace, transfer cart, etc.) are established by the Licensing & Compliance Officer, who authorizes posting the limit showing the maximum quantity of plutonium, U-233, and U-235 allowed. The fissile material content of the material transferred to or from a unit is established from process records, analyses, or previous analytical data. Only authorized users of SNM may transfer SNM between units and must do so only according to approved procedures. A board, sign, or other acceptable device is used to record the new balance and compares to balance with the unit limit.

14.3.2.3 Hot Cell - The demonstration for the units and array is identical to that of 14.3.2.1 and 14.3.2.2. The individual hot cells are isolated from all other arrays by a minimum of 2 feet of high density concrete.

14.3.2.4 Underwater Storage - Transfer Canal - Underwater aluminum or stainless steel storage racks are constructed to ensure 12-inch edge-to-edge spacing of each unit. Units are limited to those in 4.2.2.2.1 & 4.2.2.2.2 excluding PWR fuel assemblies and, since they are separated by 12 inches of water, units are considered isolated. Therefore, any number of these units may be used.

Racks and fixtures are constructed with sufficient integrity and strength to withstand reasonable structural deformity, thereby providing the spacing previously outlined. Supervisory approval is required for removing or inserting any subcritical unit out of or into its storage rack.