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| NRC FORM 313 (4-2004) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40 | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0120 Estimated burden per response to comply with this mandatory collection request: 7 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov , and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection. | EXPIRES: 10/31/2005 |
| APPLICATION FOR MATERIAL LICENSE | | | |

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

| | |
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| APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH: DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS U.S. NUCLEAR REGULATORY COMMISSION WASHINGTON, DC 20555-0001 | IF YOU ARE LOCATED IN: ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO: MATERIALS LICENSING BRANCH U.S. NUCLEAR REGULATORY COMMISSION, REGION III 2443 WARRENVILLE ROAD, SUITE 210 LISLE, IL 60532-4352 |
| ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS: IF YOU ARE LOCATED IN: ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, MISSISSIPPI, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO: LICENSING ASSISTANCE TEAM DIVISION OF NUCLEAR MATERIALS SAFETY U.S. NUCLEAR REGULATORY COMMISSION, REGION I 475 ALLENDALE ROAD KING OF PRUSSIA, PA 19406-1415 | ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO: NUCLEAR MATERIALS LICENSING BRANCH U.S. NUCLEAR REGULATORY COMMISSION, REGION IV 611 RYAN PLAZA DRIVE, SUITE 400 ARLINGTON, TX 76011-4005 |

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

| | | | | | |
|--|----------------|--|----------------------------------|---------------------|-----------------|
| 1. THIS IS AN APPLICATION FOR (Check appropriate item) <input type="checkbox"/> A. NEW LICENSE <input type="checkbox"/> B. AMENDMENT TO LICENSE NUMBER _____ <input checked="" type="checkbox"/> C. RENEWAL OF LICENSE NUMBER 37-23370-01 | | 2. NAME AND MAILING ADDRESS OF APPLICANT (Include ZIP code) Prime NDT Services, Inc. 5260 W. Coplay Rd. Whitehall, PA 18052 | | | |
| 3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED | | 4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION Don B. Shumway Sr. | | | |
| | | TELEPHONE NUMBER (800) 819-9195 | | | |
| SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE. | | | | | |
| 5. RADIOACTIVE MATERIAL a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time. | | 6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED. | | | |
| 7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE. | | 8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS. | | | |
| 9. FACILITIES AND EQUIPMENT. | | 10. RADIATION SAFETY PROGRAM. | | | |
| 11. WASTE MANAGEMENT. | | 12. LICENSE FEES (See 10 CFR 170 and Section 170.31) FEE CATEGORY 0 AMOUNT ENCLOSED \$ 0.00 | | | |
| 13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF. WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION. | | | | | |
| CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE Don B. Shumway Sr. | | SIGNATURE <i>Don B. Shumway Sr.</i> | DATE 12/10/2004 | | |
| FOR NRC USE ONLY | | | | | |
| TYPE OF FEE | FEE LOG | FEE CATEGORY | AMOUNT RECEIVED | CHECK NUMBER | COMMENTS |
| | | | \$ | | |
| APPROVED BY | | | | DATE | |
| | | | | | 136151 |

PRIME NDT SERVICES, INC.

5260 West Coplay Rd.

Whitehall, PA 18052

Phone 610-262-4954

Fax 610-262-1516

dshumway@primendt.com

December 10, 2004

Licensing Assistance Team
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

License No. 37-23370-01

03020982
X

Attached is Prime NDT Services, Inc.'s (PNDT) license renewal. To aid in your review, we are listing all of the changes since our last renewal below.

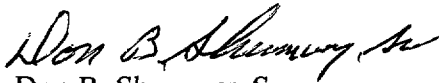
1. Chapter 2. – Radiation Safety Organization
 202. Changed Technical Director to President
 202. Sec. V. Changed to read “under the direct supervision”
 203. Deleted Technical Director
2. Chapter 3. – Radiation Exposure Monitoring
 302. Sec. I part B. Revised dose limit for minors Ref. table 3-1
 302. Sec. II. Revised extremity dose Ref. table 3-1
3. Chapter 4. –Radiation Exposure Control
 401. Sec. III. Revised Table 4-2, Exposures to Minors
4. Chapter 5. – Radiography Safety Training Program
 503. Sec. I part C. Revised to delete June 27, 1999 requirement
 - Sec. I part D. Deleted the June 27, 1999 requirement which changed the other part number
 503. Sec. III. Changed requirements for a radiographer
 505. Changed to a minimum of 8 hours of refresher training
 507. Deleted
5. Chapter 6. - Qualification and Certification
 605. Added 8 hour refresher training, total 40 hours over 5 years
6. Chapter 7. Operating Procedures
 - 704-A. Sec. V. Added requirement to check alarm at the beginning and end of each shift
 709. Sec. II. Revised the order of hooking up the 880 projector
 710. Sec. IV part D. Deleted note for 660 projector
 713. Added more requirements when working with inoperable alarms
 713. Sec. VII. Requirement for locking projector
 714. Sec. IV. Sec. A-2. Deleted 360 deg. Survey
7. Chapter 8. Emergency Response to Radiological Incident
 806. Changed emergency phone numbers
 808. Sec. I. part E. Deleted
 808. Sec. II. Deleted part C

- 7. Chapter 8 (Continued)
 - 809. page 8-11 Revised contact list
- 8. Chapter 10. Control and Accountability of Radioactive Sources
 - 1003. Sec. II. Added part F. Licensee name, address, and phone no.
- 9. Chapter 12. Total re-write
- 10. Appendix
 - A. Glossary of Terms
 - 1. Many additions to were added
 - B. Company Record Forms
 - 1. Operations report 4-4 – part E. deleted 6" reading
 - 2. Shipping report 10-1 – Added AEA 880
 - 3. Quarterly Maintenance RS7-1 – added part J. Port Cover for 880
 - 4. Revised Leak Test procedure and Source Change qualification
 - C-1. Training Course Materials
 - 1. Revised many of the questions
 - E. Pocket Dosimeters, Alarm Meters, and Chargers
 - 1. Sec. III parts A. and B. Added retesting required at end of shift and noted on 4-1 report
 - F. Radioactive Material License
 - 1. Current NRC, NY, and Ohio licenses
 - G. Safe Use of Sealed Sources and Devices
 - 1. Sec. II. Part E. deleted 360 deg. Survey
 - 2. III. Part C. deleted 360 deg. Survey
 - 3. Revised Sec. IV. Through VII. With more detailed instructions
 - J. Source Change Instructions
 - 1. Total re-write
 - K. Survey Meter Calibration
 - 1. Total re-write
 - L. Pocket Dosimeters, Alarm Rate Meters, and Gamma Alarm Cal. Checks
 - 1. Changed title to include Gamma Alarm Calibration Checks
 - 2. Sec. I part C-3 Added d. for out of service dosimeters
 - 3. Sec. III. Added part D Operational test
 - 4. Added Sec. IV. Safety considerations
 - 5. Revised Pocket Dosimeter Response Certificate, Alarm Rate Meter Calibration Record, and Daily Exposure Room Alarm Check Sheet
 - M. Sealed Source Leak Tests
 - 1. Added Leak test kit Model 518 – deleted notice-
 - 2. New Spec Model 1 instructions
 - 3. Added CIS Model 818 Leak test kit
 - N. Audit Forms
 - 1. Revised audit form
 - O. Facilities
 - 1. Revised written procedure
 - P. Agreement State Contacts
 - 1. Revised for current Agreement states and contacts
 - R. Procedures for Retrieval and Recovery of a Source
 - 1. Total revision

During our review we closely followed NUREG 1556 Vol. 2 - Consolidated Guidance About Materials Licenses. This guide was a joy to use. Many of our changes were language only.

Item 12 – License fee category “0”. We are still classified as a small business in accordance with 10CFR171.16(C). If I understand that correctly, we only pay a fee on NRC Form 526 and do not pay a separate fee for renewal or amendments.

Sincerely,

A handwritten signature in cursive script, appearing to read "Don B. Shumway Sr.", written in dark ink.

Don B. Shumway Sr.
President

Item No. 5
Radioactive Material
Sealed Sources and Devices

1. Please refer to the attached license, section no.'s 6 thru 10.

Item No. 6

Purpose for which licensed Material will be used

1. Equipment will only be used for **industrial radiography**.

Item No. 7
Individuals responsible for Radiation Safety Program
And their training experience

1. Don B. Shumway Sr. – President
2. Don B. Shumway Jr. - RSO

Don B. Shumway, Jr. has worked as a certified radiographer since April 4, 1993. During that time he has worked an average of 2500 hours per year. IRRSP certified May 8, 2004.

In addition to the initial 40 hours training and annual refresher training, Don Jr. has successfully completed a course in Inspection and Maintenance of Industrial Radiographic Equipment, May 16, 2002; Administration of Isotope Radiography Safety Programs, March 5, 2002; and Source Retrieval, March 8, 2002.

Don Jr. does most of the calibrations of our survey meters, alarm rate meters, booth alarms, and most quarterly and annual projector maintenance, source changes, and has assisted in radiation safety training over the last few years.

Item No. 8

Training for Radiographers and Radiographer Assistants

1. Chapter 5 – Radiography Safety Training Program
2. Chapter 6 – Qualification and Certification

Item No. 9

Facilities and Equipment

1. Chapter 7, Para 713, Permanent Radiographic Installation
2. Appendix "O" Facilities
3. Chapter 10, Para 1007, Radioactive Material Storage (Field)

Item No. 10

Radiation Safety Program

Instruments

1. Appendix K – Survey Meter Calibration
2. Appendix L – Pocket Dosimeters, Alarm Rate Meters and Gamma Alarms

All calibrations will be done by the RSO or radiographer certified by the RSO to do calibrations.

Material Receipt and Accountability

1. Chapter 10 – Control and Accountability of Radioactive Sources

Leak Testing

1. Appendix M – Sealed Source Leak Test

Occupational Dosimetry

1. Chapter 3 – Radiation Exposure Monitoring

Quarterly Maintenance

1. Chapter 9, Para. 903 and 904

Handling and Use of Sealed Sources and Radiography Exposure Devices

1. Chapter 7 – Operating Procedures
2. Chapter 9, Para. 904 – Source Installation and Replacement
3. Appendix G – Safe Use of Sealed Sources and Devices
4. Appendix J – Source Change Instructions

Methods and Occasions for Conducting Radiation Surveys

1. Chapter 4, Para. 408 – Area Definitions and Posting
2. Chapter 4, Para. 409 – Access Control
3. Chapter 7, Para. 708 – Controlling the Area

Item No. 10 (Continued)

Radiation Safety Program

Methods for Controlling Access to Radiographic Areas

1. Chapter 7, Para. 715 – Security of Radiography Sources and Containers

Methods and Occasions for Locking and Securing Radiographer Exposure Devices, Storage Containers, and Sealed Sources

1. Appendix G – Safe Use of Sealed Sources and Devices

Personnel Monitoring and the Use of Personnel Monitoring Equipment

1. Chapter 3 – Radiation Exposure Monitoring

Transporting Sealed Sources to Field Locations, Securing Exposure Devices and Storage Containers in Vehicles, Posting Vehicles, and Controlling Sealed Sources during Transportation

1. Chapter 12 – Transportation of radioactive Material

Daily Inspection and Maintenance of Radiographic Equipment

1. Chapter 9, Para. 902 – Daily Inspection and Maintenance of Radiographic Equipment

Ratemeter Alarms or Off Scale Dosimeter Readings

1. Chapter 3, Para. 305 and 306 – Radiation Exposure Monitoring

Procedures for Identifying and reporting Defects and Non-Compliances as Required by 10CFR Part 21

1. Prime NDT's interpretation of 21.1 is that we fall outside reporting under Part 21.
2. IN 91-39 refers to manufacturers and suppliers.
3. Our reporting is done in accordance with 34.101 notifications.

Item No. 10 (Continued)

Radiation Safety Program

Notification of Proper Person in Case of an Accident

1. Chapter 8 – Emergency Response to Radiological Incident
 - Para. 807 Accident Notification Responsibilities
 - Para. 808 Regulatory Notification
 - Para 809 Emergency Telephone Contacts

Minimizing Exposure of Persons in the Event of an Accident – Emergency Procedures

1. Chapter 8 – Emergency Response to Radiological Incidents

Source Retrieval

1. Appendix R – Procedure for Retrieval and Recovery of a Source

PRIME N.D.T. SERVICES, INC.

RADIATION SAFETY MANUAL

FOREWORD

Prime NDT Services, Inc. performs radiography operations at various sites throughout the United States as authorized by a byproduct material license issued by the United States Nuclear Regulatory Commission. It is the policy of Prime that such operations be conducted in accordance with the applicable rules, regulations, and license conditions of the Commission. Prime is committed to maintain the radiation exposures of its employees and the general public as low as reasonably achievable (ALARA). Accordingly, this document describes the Prime's commitments for maintaining radiation exposures ALARA and to comply with the applicable directives.

Prime's management organization is responsible for the development and control of specific procedures to implement this program. Scheduled overview of this program is provided. Prime employees assigned to operations involving occupational radiation exposures will be trained in principles of radiation safety including understanding of Prime's procedures. Written and practical demonstration tests will be conducted to measure employee understanding of the Radiation Safety Program requirements.

Prime management will evaluate the cost of recommended modifications and improvements to operating systems and procedures against the projected reduction in radiation exposure. When the benefits of exposure reduction justify the changes, or when changes are required for regulatory compliance, Prime will implement the proposed change.

Prime's Radiation Safety Officer is responsible for implementation of the Radiation Safety Program and to assure the on-going program is in compliance with these requirements. Radiographers are responsible for maintaining their own exposures and the exposure of others in the vicinity of their work area ALARA. They are responsible for the safe conduct of operations under this direction. Radiographers shall emphasize the ALARA concept and the Prime commitment to maintain exposures ALARA.

Adherence to the stated regulations, the procedures, and the protocols ensure the radiation safety of radiographic operations conducted by Prime. Failure to follow these commitments may result in excessive personnel radiation exposure, and may result in partial or total suspension of radiographic operations.

Prime welcomes input from its staff about the radiation safety program.

RADIATION SAFETY MANUAL

TABLE OF CONTENTS

| | <u>PAGE</u> |
|---|-------------|
| <u>Chapter 1, Introduction</u> | 1-1 |
| 101. Radiation Safety Manual | 1-2 |
| 102. Radiation Safety Program | 1-2 |
| 103. General Rules for Work in Restricted Areas | 1-3 |
| 104. Administration of the Program | 1-4 |
| 105. Interpretation | 1-5 |
| <u>Chapter 2, Radiation Safety Organization</u> | 2-1 |
| 201. General | 2-2 |
| 202. Radiation Safety Organization | 2-2 |
| 203. Backup Capability | 2-11 |
| <u>Chapter 3, Radiation Exposure Monitoring</u> | 3-1 |
| 301. External Dosimetry | 3-2 |
| 302. Dosimetry Issue Requirements | 3-2 |
| 303. Film Badge Issue and Use | 3-3 |
| 304. Film Badge Processing | 3-5 |
| 305. Self-reading Dosimeter Issue and Use | 3-5 |
| 306. Alarm Rate Meter Issue and Use | 3-6 |
| 307. Exposure Records | 3-6 |
| 308. Exposure reports and Notifications | 3-7 |
| 309. Exposure Incident Evaluation | 3-7 |
| 310. Internal Exposure Monitoring | 3-8 |
| 311. Bioassay Follow-up Action | 3-8 |
| <u>Chapter 4, Radiation Exposure Control</u> | 4-1 |
| 401. Maximum Permissible Exposure | 4-2 |
| 402. Prime's Administrative Control Levels | 4-3 |
| 403. Prenatal Exposure | 4-3 |
| 404. ALARA Program | 4-4 |
| 405. ALARA Responsibilities | 4-4 |
| 406. Personnel Training | 4-5 |
| 407. Investigational Dose Levels | 4-6 |
| 408. Area Definitions and Postings | 4-6 |
| 409. Access Control | 4-9 |

| | <u>PAGE</u> |
|---|-------------|
| <u>Chapter 5, Radiography Safety Training Program</u> | 5-1 |
| 501. General | 5-2 |
| 502. Radiation Safety Training Objectives | 5-2 |
| 503. Training Requirements | 5-3 |
| 504. Conduct of Training | 5-7 |
| 505. Refresher Training | 5-8 |
| 506. Training Course Materials | 5-8 |
| <u>Chapter 6, Qualification and Certification</u> | 6-1 |
| 601. General | 6-2 |
| 602. Position Qualification Requirements | 6-2 |
| 603. Re-examination | 6-4 |
| 604. Certification | 6-4 |
| 605. Recertification | 6-5 |
| 606. Certification Records | 6-5 |
| <u>Chapter 7, Operating Procedures</u> | 7-1 |
| 701. General | 7-2 |
| 702. Prerequisites for Performing Radiography | 7-3 |
| 703. Film Badge or TLD Instructions | 7-3 |
| 704. Pocket Dosimeters | 7-4 |
| 704-A. Alarm Rate Meters | 7-4 |
| 705. Survey Instruments | 7-5 |
| 706. Sealed Sources and Devices | 7-5 |
| 707. Getting the Source to the Job | 7-5 |
| 708. Controlling the Area | 7-6 |
| 709. Setting up the Exposure | 7-7 |
| 710. Making the Exposure | 7-8 |
| 711. Securing Radiographic Operations | 7-10 |
| 712. Use of X-Ray Equipment - Field | 7-11 |
| 713. Permanent Radiographic Installation | 7-12 |
| 714. Physical Radiation Survey | 7-13 |
| 715. Security of Radiography Sources and Containers | 7-15 |
| 716. Sealed Source Receipt, Transfer and Disposal | 7-15 |
| 717. Transfer of Sealed Sources | 7-16 |
| 718. Transportation | 7-16 |
| 719. Leak Testing of Sources | 7-16 |

| | |
|---|------|
| <u>Chapter 8, Emergency Response to Radiological Incident</u> | 8-1 |
| 801. General | 8-2 |
| 802. Loss or Theft of Radiographic Equipment or Sources | 8-2 |
| 803. Fires, Explosions, or Major Emergencies | 8-3 |
| 804. Minor Accidents | 8-4 |
| 805. Accidents Involving Possible External Radiation Overexposure | 8-5 |
| 806. Vehicle Accident Involving Radioactive Material | 8-5 |
| 807. Accident Notification Responsibilities | 8-6 |
| 808. Regulatory Notification | 8-6 |
| 809. Emergency Telephone Contacts | 8-8 |
| Reporting Requirements - Part 34 | 8-9 |
| Emergency Contacts and Phone Numbers | 8-11 |
| <u>Chapter 9, Maintenance, Inspection, Calibration, and Leak Test</u> | 9-1 |
| 901. General | 9-2 |
| 902. Daily Inspection and Maintenance of Radiography Equipment and Facilities | 9-2 |
| 903. Periodic Inspection and Maintenance of Radiography Equipment and Facilities | 9-4 |
| 904. Source Installation and Replacement | 9-7 |
| 905. Survey Meters | 9-7 |
| 906. Pocket Dosimeters | 9-8 |
| 907. Sealed Source Leak Tests | 9-8 |
| 908. Alarms Rate Meters | 9-9 |
| <u>Chapter 10, Control and Accountability of Radioactive Sources</u> | 10-1 |
| 1001. General | 10-2 |
| 1002. Radioactive Material Definition | 10-2 |
| 1003. Labeling for Containers of Licensed Radioactive Materials | 10-2 |
| 1004. Radioactive Materials Area | 10-3 |
| 1005. Receipt of Radioactive Materials | 10-4 |
| 1006. Radioactive Material Accountability | 10-5 |
| 1007. Radioactive Material Storage | 10-6 |
| <u>Chapter 11, Disposal of Radiography Sources</u> | 11-1 |
| 1101. Radioactive Waste Disposal | 11-2 |
| 1102. Shipment of Radioactive Waste | 11-2 |

| | <u>PAGE</u> |
|---|-------------|
| <u>Chapter 12, Transportation of Radioactive Material</u> | 12-1 |
| 1201. General | 12-2 |
| 1202. Shipment of Radiographic Sources | 12-3 |
| 1203. Shipment of Empty Depleted Uranium Shielded Containers | 12-6 |
| 1204. Shipment of Empty Lead Shield Containers | 12-8 |
| 1205. Air Shipments | 12-8 |
| 1206. Transporting Radioactive Materials in Company Vehicles on Public Highways | 12-9 |
| 1207. Shipping Papers and Forms | 12-10 |
| 1208. Hazardous Materials Transportation Training | 12-11 |
| <u>Chapter 13, Quality and Assurance</u> | 13-1 |
| 1301. General | 13-2 |
| 1302. Quality Control | 13-2 |
| 1303. Quality Assurance | 13-3 |
| <u>Chapter 14, Manual transmittal and Revision</u> | 14-1 |
| 1401. General | 14-2 |
| 1402. Manual Transmittal and Revision | 14-2 |
| 1403. Implementation | 14-2 |

APPENDIX

- A. Glossary of Terms (Definitions)
- B. Company Record Forms
- C. Training Course Materials
- D. Personnel Dosimetry Instructions
- E. Pocket Dosimeters, Alarm Meters, and Chargers
- F. Radioactive Material License
- G. Safe Use of Sealed Sources and Devices
- H. Survey Instrument Use
- I. Restricted, Radiation and High Radiation Areas-Boundary Charts
- J. Source Change Instructions
- K. Survey Meter Calibration
- L. Pocket Dosimeters, Alarm Rate Meters, and Gamma Alarms Calibration Checks
- M. Sealed Source Leak Tests
- N. Audit Forms
- O. Facilities
- P. Agreement State Contacts
- Q. Shipping Container Quality Assurance Program
- R. Procedures for Retrieval and Recovery of a Source

RADIATION SAFETY MANUAL

CHAPTER 1

INTRODUCTION

Section

- 101. Radiation Safety Manual
- 102. Radiation Safety Program
- 103. General Rules for Work in Radiation Control
- 104. Administration of the Program
- 105. Interpretation

RADIATION SAFETY MANUAL

INTRODUCTION

101. Radiation Safety Manual

- I. This Radiation Safety Manual prescribes the standards practices for the protection of personnel and members of the general public against the potential hazards of radiation exposure resulting from Prime N.D.T. Services, Inc. radiography operations. These standards and policies implement applicable provisions of the Code of Federal Regulations and by-product material licensing conditions.
- II. This Radiation Safety Manual is also applicable to licensed activities conducted by Prime at temporary job sites under NRC or Agreement State jurisdiction.

102. Radiation Safety Program

I. General Provisions

- A. The Radiation Safety Manual and supporting procedures form the basis of the Radiation Safety Program. The primary objective of the Radiation Safety Program is to maintain the radiation exposure of personnel, contractors, and visitors as low as reasonably achievable (ALARA) and within regulatory requirements. This objective is accomplished by the following activities:
 1. The assessment of hazards associated with work in radiological areas, or work involving the handling of radiography sources or x-ray equipment.
 2. The indoctrination of personnel to the potential radiation exposure in their workplaces and appropriate radiation work practices relevant to their work assignments.
 3. The preparation and implementation, as needed, of written procedures, instructions, and directives providing guidance for the control of radiation safety activities, and radiation work practices.

4. Training in radiation protection
5. Handling, maintenance, and use of radiography exposure equipment and protective devices/instrumentation
6. Personnel monitoring
7. Implementation of ALARA program
8. Records

103. General Rules for Work in Radiation Control

- I. The following general rules apply to work in radiation control areas. These general rules represent techniques or requirements typical for most work performed in restricted areas. All personnel should understand these basic rules:
 - A. Perform assignments in a manner which will result in the least possible radiation exposure. Apply the principles of time, distance, and shielding.
 - B. Remain alert to radiological posting, labels, and other warnings. Be alert to detect unauthorized entry into radiation and high radiation areas and take appropriate action as may be required.
 - C. Wear specifically assigned dosimetry devices when inside restricted areas. Read pocket dosimeters periodically in radiation areas and high radiation areas.
 - D. When working in nuclear utility controlled areas, abide by the procedures and instructions provided, but do not violate Prime's radiation safety requirements.
 - E. Notify the Radiation Safety Officer or his designee of the malfunctioning of any radiation protection equipment, alarms on radiation protection equipment, significant changes (or suspected changes) in the radiological conditions at the work site, or a condition which appears to warrant the attention of the Radiation Safety Officer or his designee.

- F. Keep track of personal radiation exposure dose so as not to exceed administrative limits, or regulatory controlled exposure standards. Report promptly the loss or damage of any assigned dosimetry device.
- G. Whenever radiography will be performed outside of a permanent radiographic installation the radiographer must be accompanied by another qualified radiographer, or an individual with at least the qualifications of a radiographer's assistant, who is observing the operations and is capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.

104. Administration of the Program

- 1. Operation of the Radiation Safety Program is integrated with the management structure of the company. Radiation safety considerations and regulatory compliance directions are distributed through the Radiation Safety Officer. The project manager or the site lead radiographer have overall responsibility for successful implementation. These individuals will ordinarily resolve conflicts between client requirements, business needs, regulatory directions, and ALARA concepts.
- 2. Oversight is exercised through Prime management, at the direction of the President and Chief Executive Officer, for regular review of operation for the Program as impacted by changes in business and regulatory priorities.
- 3. The Radiation Safety Program, which is defined and specified in this radiation Safety Manual, has been submitted to the United States Nuclear Regulatory Commission for approval and becomes an integral part of Prime's radioactive material license. Accordingly, changes or updates to this manual must be controlled. Changes to this manual are formalized by use of the Manual Transmittal and Revision Receipt Form, some of which must be submitted to and approved by the Commission whenever licensing commitments are diluted.

- a. In general, the Manual Transmittal and Revision Receipt Form (Appendix B) is issued by the Radiation Safety Officer to accommodate relatively quick adjustments needed for operational efficiency. The Radiation Safety Officer is also responsible to assure that the appropriate regulatory review is accomplished.
 - b. The Manual Transmittal and Revision Receipt Form is issued as a formal revision to the manual resulting from a scheduled review process. In general, permanent changes may incorporate previously issued transmitting memorandum(a) and may be proposed to the Commission before being issued to holders of this manual.
4. Detailed procedures in the following chapters and appendices provide the instructions and guidance to satisfy both operational and regulatory safety requirements. Suggestions or recommendations for improvement of the Radiation Safety Program or this manual should be coordinated with the Radiation Safety officer.

105. Interpretation

The final interpretation of this Radiation Safety Manual rests with the Radiation Safety Officer.

RADIATION SAFETY MANUAL

CHAPTER 2

RADIATION SAFETY ORGANIZATION

Section

- 201. General
- 202. Radiation Safety Organization
- 203. Backup Capability

RADIATION SAFETY MANUAL

RADIATION SAFETY ORGANIZATION

201. General

- I. A radiation safety organization has been established within Prime to administer the operation of the Radiation Safety Program at the permanent facility and temporary job sites operated by Prime. The responsibilities and duties of the radiation safety functions within Prime are outlined in this chapter.
- II. The Radiation Safety Organization is responsible to ensure that Prime conducts its activities in compliance with applicable regulations and consistent with protection of its employees and the general public from the potential hazards of ionizing radiation. The Radiation Safety Organization applies to all Prime activities related to handling radiography sources and x-ray equipment.

202. Radiation Safety Organization

All activities of Prime related to the receipt, possession, storage, use, and transportation of radiography sources and x-ray devices are coordinated, reviewed, supervised, and executed by the Radiation Safety Organization shown in Figure 2-1.

The Radiation Safety Officer is responsible to establish the program, to assure program implementation.

I. Radiation Safety Officer

The primary function of the Radiation Safety Officer (RSO) is to ensure that all Prime activities related to the receipt, possession, storage, use, and transportation of radiography sources/x-ray devices and personnel exposure are conducted in accordance with the Prime Radiation Safety Program and as prescribed by the Radiation Safety Manual. The Radiation Safety Officer has the authority to immediately terminate any project that is found to be a threat to health, safety, or property. The Radiation Safety Officer carries out the program and functionally reports to the President of Prime NDT.

A. Responsibilities

The responsibilities of the Radiation Safety Officer are as follows:

1. Ensure that all elements of the Prime Radiation Safety Program are communicated to employees within the Radiation Safety Organization.
2. Ensure that all matters related to the Prime Radiation Safety Program are brought to the attention of the President for review, discussion, and/or advice.
3. Ensure that all Prime activities related to radiography source/x-ray devices and radiation exposure are conducted in compliance with applicable regulatory requirements and the Prime Radiation Safety Program.
4. Ensure that records pertinent to Prime activities are appropriately maintained within the Radiation Safety Organization.
5. Ensure that adequate radiation protection coverage is provided for Prime personnel during all radiographic operations.

B. Duties

The duties of the Radiation Safety Officer are as follows:

1. Coordinate and generally supervise all radiation-safety related activities conducted within the company.
2. Determine compliance with rules and regulations, license conditions, and the conditions of proposed project prior to approval for project initiation.
3. Provide specialized assistance and guidance to operations within Prime in the development of the radiation safety aspects of the program.
4. Evaluate and approve proposed uses of radiographic sources, devices, and facilities prior to program use.

5. Review and approve radiographers and their assistants who have qualified under the Prime training program as authorized under a license of a specific scope.
6. Develop and approve plans, procedures, and methods for keeping exposure of personnel ALARA.
7. Conduct and/or supervise the conduct of personnel audits, equipment reviews, and facility evaluations.
8. Solicit comments from the Radiation Safety Organization concerning additions and/or modification to the Prime Radiation Safety Program, including the initiation of and revision to procedures.
9. Recommend and prepare license applications, amendments, and renewals.
10. Resolve license operational matters.
11. Identify and implement corrective actions for activities being performed which are not in compliance with the license.
12. Supervise the development and implementation of training programs related to work involving radiography sources/x-ray devices or exposure to radiation.
13. Authorize the receipt, transfer, and disposal of all radiography sources and x-ray devices.
14. Review personnel exposure records to ensure that ALARA goals are met. Recommend and implement corrective actions as necessary.
15. Maintain current information regarding applicable laws and regulations and corporate directives and guidelines. Promptly update the Radiation Safety Program as laws, regulations, directives, and guidelines change.
16. Act as the emergency coordinator in the event of a radiological emergency.
17. Determine the need for outside radiological or medical consultation.

II. Assistant Radiation Safety Officer

The primary functions of an Assistant Radiation Safety Officer is to ensure that all Prime activities related to personnel protection are conducted on a daily basis in accordance with the Prime Radiation Safety Program and as prescribed by the Radiation Safety Officer.

A. Responsibilities

The responsibilities of an Assistant Radiation Safety officer are as follows:

1. Ensure that those elements of the Prime Radiation Safety Program pertinent to personnel protection are implemented.
2. Ensure that all facility records required by the Prime Radiation Safety Program are maintained in good order.
3. Ensure that the Radiation Safety Organization members are trained in accordance with the Prime Radiation Safety Training Program.
4. Ensure all workers working in or frequenting restricted areas are kept informed of the storage, transfer, or use of radiography sources or radiation levels in the area.
5. Ensure all workers are instructed of responsibility to report promptly any condition which may lead to or cause a violation of a regulatory requirement or license terms and conditions or unnecessary exposure to personnel.
6. Ensure all workers are instructed in the appropriate actions to be taken in the case of a radiological emergency.
7. Ensure radiologically controlled areas are posted with the appropriate warning signs.
8. Ensure radiography sources and x-ray devices are properly labeled, inventoried, and stored within designated areas.
9. Ensure radiological waste materials are properly collected, identified, and disposed.

B. Duties

The duties of an Assistant Radiation Safety Officer, under the direction of the Radiation Safety Officer, are as follows:

1. Provide or arrange for the calibration of radiation survey equipment.
2. Conduct the personnel radiation protection training program, including the appropriate indoctrinations for visitors to the facility and instruct personnel in the proper procedures before they are allowed to use radiography/x-ray sources and devices and as required by changes in procedures, equipment, regulations, etc.
3. Procure, store, and supervise the use of health physics related supplies.
4. Make recommendations to the Radiation Safety Officer concerning additions, and/or modifications to the Radiation Safety Program, including initiation and revisions to procedures.
5. Perform radiological surveillance at Prime permanent facilities and temporary job sites and maintain radiological survey records to identify trends and to ensure compliance with regulatory requirements.
6. Keep records of radiography sources/x-ray devices received and transferred from the Prime program.
7. Keep an inventory of all radiography sources at Prime facilities and limit the quantities of these sources to the amounts authorized by the license(s).
8. Supervise the receipt, opening, and delivery of all radiography sources received at Prime facilities and supervise the packaging and shipment of all radiography sources leaving Prime facilities including the preparation of radioactive shipment papers.

9. Ascertain the hazards associated with proposed work to be performed and make recommendations to Radiation Safety Officer.
10. Ensure the performance of adequate radiological surveys.
11. Distribute, collect, and arrange for the processing of personnel and area radiation dosimetry devices and maintain exposure records for Prime facilities and operations.
12. Supervise and coordinate the collection, storage, and disposal of radiography sources including keeping source storage and disposal records for Prime facilities.
13. Ensure the performance of periodic source leak tests as required by the Radiation Safety Program.
14. Maintain emergency response supplies and kits in good condition and in a state of readiness.

III. Lead Radiographer

The primary function of a Lead Radiographer is to execute tasks as directed by the Assistant Radiation Safety Officer in surveying and monitoring radiation exposures received by Prime personnel from radiographic and other operations and the radiation levels of the related materials, work areas, and adjacent unrestricted areas.

A. Responsibilities

The responsibilities of a Lead Radiographer are as follows:

1. Ensure that all assigned activities are conducted in accordance with the Prime Radiation Safety Program and as directed by an Assistant Radiation Safety Officer.
2. Ensure that assigned tasks and the tasks of other personnel they monitor are conducted in a manner consistent with maintaining radiation exposure as low as reasonably achievable.

3. Ensure that all site personnel are properly qualified before allowing them to conduct or participate in radiographic operations.

B. Duties

The duties of a Lead Radiographer are as follows:

1. Perform assigned tasks relative to surveying and monitoring radiation levels from radiographic operations in accordance with approved procedures.
2. Record radiological survey data in legible form and in the appropriate units as defined by procedure for transmittal to the Radiation Safety Officer or Assistant Radiation Safety Officer.

IV. Radiographer

The primary function of a Radiographer is to safely use radiographic sources and devices and/or directly supervise assistant radiographer(s) in the conduct of such work activities involving radioactive sources or exposure to radiation, and to ensure that such activities are in full compliance with the applicable provisions of the Prime Radiation Safety Program, regulatory requirements, and license terms and conditions.

A. Responsibilities

The responsibilities of a Radiographer are as follows:

1. Ensure that those elements of the Prime Radiation Safety Program pertinent to cell or field radiography are implemented.

B. Duties

1. Withdraw, inventory, and replace or return radiography sources, devices and survey equipment and health physics supplies required for work.
2. Properly store all radiography sources not in current use.
3. Prepare daily logs and reports as required by the Radiation Safety Officer.

4. Perform, supervise and/or coordinate all assigned radiographic work operations.
5. Report any accident, unusual incident, or personal injury, no matter how slight.
6. Report promptly any conditions which may lead to or cause a violation of a regulatory requirement or license condition or unnecessary exposure to personnel.
7. Protect himself and others by acting carefully and working safely at all times.
8. Use safety equipment properly.
9. Observe radiation safety rules and postings for his area.
10. Know operating procedures provided for the safe execution of the work activity.
11. Immediately report any suspected overexposure to radiation, or any other suspected event that could have negative consequence to working personnel or members of the general public.
12. Attend training sessions and safety meetings as assigned.

V. Assistant Radiographer

Under the direct supervision of a Radiographer, an assistant Radiographer may execute tasks related to radiographic source and device handling and exposure to radiation in a safe manner.

A. Responsibilities

The responsibilities of an assistant radiographer are as follows:

1. Ensure that all assigned tasks are conducted in accordance with the Prime Radiation Safety Program and as directed by supervisory personnel.
2. Ensure that assigned tasks are conducted in a manner consistent with maintaining radiation exposure as low as reasonably achievable.

B. Duties

The duties of an Assistant Radiographer are as follows:

1. Perform radiographic operations only under the direct supervision of a qualified radiographer.
2. Report any accident, unusual incident, or personal injury, no matter how slight.
3. Report promptly any conditions which may lead to or cause a violation of a regulatory requirement or license condition or unnecessary exposure to personnel.
4. Protect himself and others by acting carefully and working safely at all times.
5. Use safety equipment properly.
6. Observe radiation safety rules and postings for his/her area.
7. Know operating procedures provided for the safe execution of the work activity.
8. Immediately report to supervisory personnel any suspected overexposure to radiation or any other suspected event that could have negative consequence to working personnel or members of the general public.
9. Attend training sessions and safety meetings as assigned.

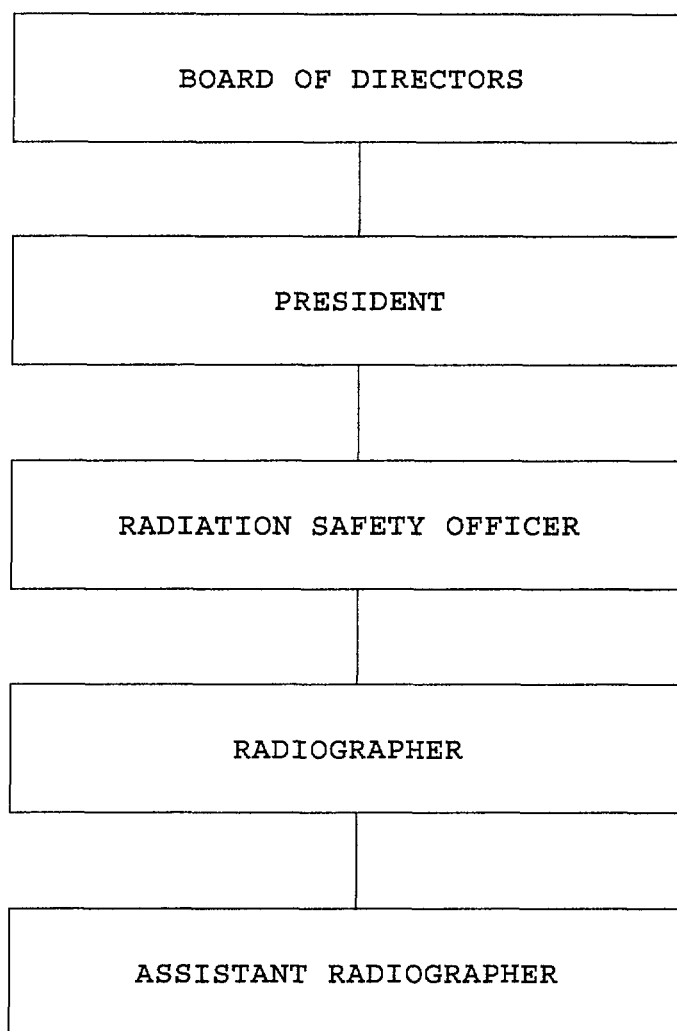
203. Backup Capability

- I. Due to the irregular and sometimes unpredictable nature of certain activities (e.g., request for emergency radiography services), the designated Radiation Safety Officer or designated Assistant Radiation Safety Officer may be backed up by the President, or a qualified outside consultant, each of whom by virtue of their individual training and experience, is qualified to act as an alternate Radiation Safety Officer or alternate Assistant Radiation Safety Officer. These individuals will be empowered by Prime N.D.T. Services, Inc. to act as Radiation Safety Officer or Assistant Radiation Safety Officer only if the designated primary Radiation Safety Officer or Assistant Radiation Safety Officer is not available for any reason.

There will be only one Radiation Safety Officer at any given time, but the probability will be substantially increased that one would be available on short notice should the situation require his presence. In any event, Prime N.D.T. Services, Inc. would consider itself bound by the decision and/or actions of the acting Radiation Safety Officer or Assistant Radiation Safety Officer in charge at the time.

FIGURE 2-1

"ORGANIZATIONAL CHART"



RADIATION SAFETY MANUAL

CHAPTER 3

RADIATION EXPOSURE MONITORING

Section

- 301. External Dosimetry
- 302. Dosimetry Issue Requirements
- 303. Film Badge Issue and Use
- 304. Film Badge Processing
- 305. Self-reading Dosimeter Issue and Use
- 306. Alarm Rate Meter Issue and Use
- 307. Exposure Records
- 308. Exposure Reports and Notifications
- 309. Exposure Incident Evaluation
- 310. External Exposure Monitoring
- 311. Bioassay Follow-up Action

RADIATION SAFETY MANUAL

RADIATION EXPOSURE MONITORING

301. External Dosimetry

- I. A personnel monitoring program must be maintained consistent with the requirements of Title 10, Code of Federal Regulations, Part 20 and corresponding Agreement State regulations. The personnel monitoring program is accomplished through the use of film badges or thermoluminescent dosimeters (TLD), self-reading pocket dosimeters and alarm rate meters. Self-reading dosimeters in the 200 milliroentgen range and alarm rate meters must be worn by Prime personnel when performing gamma or x-ray radiography. The official and permanent record of accumulative external dose received by individuals is obtained principally from the film badge or TLD.
- II. Dose information from sources other than film badge may supplant or supplement film badge results. Such action may be necessary if the film badge result is unavailable due to loss or damage; if the film badge result is suspect; or an operating nuclear utility dose assessment from bioassay results indicate significant additional exposure. In these cases, the action taken and the justification for such action must be documented and approved by the Radiation Safety Officer.

302. Dosimetry Issue Requirements

- I. Whole Body and Skin Dose
 - A. Any individual (18 years or older) who enters a restricted area under such circumstance that he receives, or is likely to receive in excess of 0.002 Rem in any one hour or is likely to receive more than 0.1 Rem in a year, must be issued and required to wear a film badge or TLD with a beta-gamma detection capability at all time in the restricted area. A skin dose is unlikely unless Prime personnel are working in a nuclear utility restricted area where there is radioactive contamination.

- B. The annual occupational dose limits for minors are 10% of the annual dose limits specified for adult workers in table 3-1.

2. Extremity Dose

I. Occupational exposures to radiation shall be monitored by Prime NDT and individual monitoring devices shall be provided under the following conditions.

- A. Adults likely to receive in one year from radiation sources external to the body a dose in excess of 10% of the limits in table 3-1.
- B. Minors likely to receive in one year from radiation sources external to the body a deep dose equivalent in excess of 0.1 Rem, a lens dose equivalent in excess of 0.15 Rem or a shallow dose to the skin or to the extremities in excess of 0.5 Rem.
- C. Declared pregnant women likely to receive during the entire pregnancy from radiation sources external to the body a deep equivalent in excess of 0.1 Rem and individuals entering a high or very high radiation area.

303. Film Badge Issue and Use

- I. This section provides administrative guidance to the issuance of film badges and record-keeping associated with the issue process. The issuance of film badges must be in accordance with these procedures and the provisions of this section.

- II. Each individual, prior to working in the radiography program during each employment or work assignment, and prior to dosimetry issue, under such conditions that the individual is likely to receive, in one year, an occupational exposure in excess of ten percent (10%) of the applicable limits in TABLE 3-1:

TABLE 3-1

ADMINISTRATIVE EXPOSURE LIMIT

| | |
|---|----------------------|
| <u>Body Organ</u> | <u>> 18 Years</u> |
| Whole body; head and trunk; active blood forming organs. | 5 REM/YR. |
| Skin or Extremities | 50 REM/YR. |
| Eyes | 15 REM/YR. |

shall disclose in a written statement (completed Form 4 or equivalent is acceptable) that either:

- A. The individual had no prior occupational dose during the current calendar year, or,
 - B. The nature and amount of any occupational dose during the current calendar year from sources of radiation not under the control of Prime operations.
- III. Any individual who receives, or is likely to receive in a calendar year, a dose to the whole body in excess of 10% of an applicable limit, must complete an NRC Form 4, Occupational External Radiation Exposure History, or equivalent.
- IV. The film badge is worn on the trunk of the body. For individuals completely suited-up in protective clothing, the film badge may be worn beneath the protective clothing.

304. Film Badge Processing

I. Frequency

- A. Film badges issued to personnel must be processed at intervals not to exceed one month.
- B. Film badges issued to personnel may be processed more frequently than the normal processing periods. If the individual to whom the film badge was issued has exceeded dose limits specified in Table 4-1 (Chapter 4), is suspected to have exceeded these limits, or has the 200 milliroentgen range self-reading pocket dosimeter go off range during routine use, the badge will be processed immediately.

II. Processing

Film/TLD film badges issued to personnel shall be submitted to the badge vendor for processing. Badge vendors must be NAVLAP approved.

305. Self-Reading Dosimeter Issue and Use

- I. Each individual involved in radiographic operations will be issued a self-reading pocket dosimeter in the 200 milliroentgen range. The individual must wear the assigned device(s) as specified in this section.
 - A. The self-reading dosimeter is worn adjacent to the film badge or other concurrently worn dosimetry devices.
- II. Each individual must rezero their pocket dosimeter at the beginning of each work shift unless it is within ten percent of the zero value.
- III. Each individual within a radiation or high radiation area must periodically read the self-reading dosimeter. The periodicity of this reading should be consistent with the radiation dose rate in the area in which the individual is present.

- IV. Each individual within a radiation or high radiation area must have his assigned self-reading dosimeter rezeroed when the indicated response of the dosimeter exceeds about 75% of full scale. The value must be recorded prior to the dosimeter being rezeroed.
- V. Any individual whose pocket dosimeter goes off scale while in a radiation or high radiation area must immediately exit the area and report it to the Radiation Safety Officer. If the off-scale reading is due to dropping the dosimeter, a new dosimeter should be obtained unless otherwise directed by the Radiation Safety Officer before re-entering the restricted area. The dropped dosimeter must be evaluated for reliability before it is reissued.

306. Alarm Ratemeter Issue and Use

- I. Each individual involved in radiographic operations will be issued an alarm rate meter pre-set at 500 MR. The individual must wear the assigned ratemeter at all times during radiographic operations.
 - A. The alarm ratemeter is worn on the front part of the body preferable close to the Film Badge and Dosimeter.
- II. Before entering a radiation field, the test button should be depressed using a pencil point, paper clip or similar object. When the test is activated, a single, steady tone will be heard while the button is depressed. The signal indicates that the instrument is functioning and the battery is satisfactory.
- III. When the test function fails to work, replace the battery. The positive terminal should be at the top when inserted. If this does not correct the problem, call for a replacement.

307. Exposure Records

Exposure records must be maintained for all individuals for whom personnel monitoring was provided. This includes both film badge/TLD and pocket dosimeter results. These records must be kept on an NRC Form 5 or equivalent. Exposure records are preserved until disposal is authorized by the NRC or appropriate Agreement State agency.

308. Exposure Reports and Notifications

I. Reports

- A. Reports of exposures must be made in accordance with the requirements of Title 10, Code of Federal Regulations, Parts 20.2203, 20.2204 and 20.2206 or corresponding Agreement State regulations. These reports are concerned with routine reports to employees, termination reports, annual reports to NRC, as necessary, and non-routine reports on overexposures. Part 20.2205 requires that a copy of the report be submitted to the Commission and also be sent at the same time to the individual.

II. Notifications

- A. Notifications of radiological incidents shall be made in accordance with Title 10, Code of Federal Regulations, Part 20.2202 "Notification of Incidents".

309. Exposure Incident Evaluation

- I. In the event that any individual loses, misplaces, or damages his film badge, or both the film badge and dosimeter, the individual involved must immediately exit any restricted area he may be in and contact the Site Radiation Safety Officer.
 - A. An exposure evaluation must be performed before authorizing the individual to return to work in a restricted area. A replacement film badge will not be issued until the outcome of the exposure evaluation is known.
 - B. The exposure evaluation must be based on all available exposure information on the individual. This includes, but is not limited to, self-reading dosimeter results, film badge results of co-workers, dose assessments based on time versus dose rate calculations, and previous exposure history performing the same or similar tasks.
 - C. The assigned dose result of the exposure evaluation must be discussed with the involved individuals and a copy of the evaluation and supporting documents must be placed in the individual's exposure file.

- II. Exposure evaluations are performed by the Radiation Safety Officer or a qualified consultant appointed by the Radiation Safety Officer, and appropriate adjustments made to exposure records if the result of the film badge processing is suspect, e.g., inconsistent with expected dose, inconsistent with self-reading dosimeter result, etc.

310. Internal Exposure Monitoring

- I. Radiographic operations conducted by Prime are of the kind and nature that normally do not require a routine internal monitoring program. However, operating nuclear utility plants have routine programs for internal exposure monitoring. Prime personnel must comply with nuclear utility requirements in this area when working at the utility on-site location. It is the responsibility of the nuclear utility to transmit personnel bioassay results to the Radiation Safety Officer. The results will be evaluated and added to each individual's personnel exposure file.

311. Bioassay Follow-up Action

- I. If the result of the nuclear utility bioassay analysis indicates that a given individual has an uptake of a radionuclide, or combinations of radionuclides, that has exceeded 5% of the concentrations specified in 10 CFR 20, Appendix B, Table 1 for that radionuclide, or group of radionuclides, an investigation must be performed by the Radiation Safety Officer. Recounts or additional samples/analyses may be performed to determine the validity of the result. If the result is valid, the following additional actions should be taken:
 - A. Restrict the access of the individual to prevent additional exposure until the extent of the uptake can be determined.
 - B. Arrange a schedule of additional analyses as necessary to further evaluate potential uptake.
 - C. Any dose that exceeds 10% of the applicable ALI will be added to the worker's dosimetry record.

RADIATION SAFETY MANUAL

CHAPTER 4

RADIATION EXPOSURE CONTROL

Section

- 401. Maximum Permissible Exposure
- 402. Administrative Control Levels
- 403. Prenatal Exposure
- 404. ALARA Program
- 405. ALARA Responsibilities
- 406. Personnel Training
- 407. Investigational Dose Levels
- 408. Area Definition and Posting
- 409. Access Control

RADIATION SAFETY MANUAL

RADIATION EXPOSURE CONTROL

401. Maximum Permissible Exposure

- I. This chapter prescribes the maximum permissible exposure from external sources as set forth in Title 10, Code of Federal Regulations, Part 20 and corresponding Agreement State regulations. All persons within restricted areas controlled by Prime are subject to the provisions of this section, and in addition, must maintain their exposure as low as reasonably achievable (ALARA).
- II. The maximum permissible occupational annual limit for individuals 18 years of age or older is limited as follows:

TABLE 4-1
OCCUPATIONAL RADIATION EXPOSURE

| BODY ORGAN | MAXIMUM PERMISSIBLE DOSE |
|---|--------------------------|
| Whole Body, Head & Trunk, Active Blood forming Organs | 5 REM/YR. |
| Skin or Extremities | 50 REM/YR. |
| Eyes | 15 REM/YR. |

- * Includes any occupational dose received during the calendar year from Licensee's other than Prime N.D.T. Services, Inc.

- III. Doses received in excess of the annual limits, including doses received during accidents, emergencies and planned special exposures, must be subtracted from the limits for planned special exposures that the individual may receive during the current year, and during the individual's lifetime. Planned special exposures will be handled as set forth in Title 10, Code of Federal Regulations, Part 20.

- IV. The Maximum permissible exposure in a calendar year for an individual less than 18 years of age within the restricted area is limited to the following:

TABLE 4-2
EXPOSURE TO MINORS

| BODY ORGAN | MAXIMUM PERMISSIBLE DOSE |
|---|--------------------------|
| Whole Body, Head & Trunk, Active Blood forming Organs | 500 MREM/YR. |
| Skin or Extremities | 5 REM/YR. |
| Eyes | 1.5 REM/YR. |

- * Includes any occupational dose received during the calendar year from Licensee's other than Prime NDT Services, Inc.

402. Prime Administrative Control Levels

- I. To maintain occupational radiation exposure of personnel within the limits established in section 401, administrative control levels are established at 75% of the maximum permissible dose. Those limits may be exceeded upon review and approval of the Radiation Safety Officer.

403. Prenatal Exposure

- I. In keeping with the recommendations in the ICRP and Regulatory Guide 8.13, instructions in the risk of prenatal exposure is provided to all female employees, their supervisors, and their co-workers. This instruction is incorporated into the Radiation Safety training. The administrative control level for the exposure of a declared pregnant woman is established at 500 mrem for the entire period of gestation. If the dose to the declared pregnant woman is found to have exceeded 500 MREM or is within 50 MREM of this dose by the time the woman declares the pregnancy, Prime NDT Services, Inc. shall be deemed to be in compliance if the additional dose to the declared pregnant woman does not exceed 50 MREM during the remainder of the pregnancy.

404. ALARA Program

- I. The corporate objective is to maintain the occupational exposure of its employees, contractors, and visitors as low as reasonably achievable (ALARA).

405. ALARA Responsibilities

I. Prime N.D.T. Services, Inc.

- A. It is the responsibility of Prime N.D.T. Services, Inc. to control radiography sources and other sources of radiation in its possession, and to use these sources in a manner to minimize inadvertent exposure, to minimize unnecessary exposure, and to maintain the necessary exposures, as low as reasonable achievable. This responsibility is met by the implementation of the Radiation Safety Program, the ALARA programs prescribed herein, design and modification controls, operational controls and procedures, personnel exposure monitoring, and internal audits and reviews.
- B. The responsibility and authority for the implementation of this ALARA program is vested in the position of the Radiation Safety Officer. This individual has the responsibility and authority:
 1. To ensure that the ALARA Program continues to integrate management philosophy and regulatory requirements, and,
 2. To ensure that an effective dose assessment system is established and maintained, and that the data obtained from this dose assessment system is periodically evaluated in order to assure achievement of the ALARA objectives.

II. Radiation Safety Officer

The Radiation Safety Officer is responsible for all aspects of the Radiation Safety Program. For the purpose of the ALARA program, the Radiation Safety Officer is responsible for the following:

Rev. 1
July 2004

- A. Establishing an atmosphere of support for ALARA among all Prime personnel, and ensuring the support of these personnel to ALARA principles.
- B. Coordinating the efforts of those individuals and groups responsible for aspects of the ALARA program, such as monitoring and dose assessment.

III. Individual Employees

The ultimate success of the ALARA program is highly dependent upon the adherence by each individual to the ALARA program. Specifically:

- A. Each individual is required to keep his radiation exposure as low as reasonably achievable consistent with the safe performance of his duties.
- B. Each individual must observe all rules adopted for his radiological safety, and must comply with recommendations on exposure reduction methods made by radiation protection personnel and his supervisors.
- C. Prime personnel should remain alert for new or unusual situations in the workplace which could have an adverse effect on ALARA, and bring these to the attention of radiation protection personnel.
- D. Prime personnel are encouraged to recommend exposure reduction methods to their supervisors and radiation protection personnel.

406. Personnel Training

Personnel receive training in radiation protection in accordance with Chapter V. Such training stresses the importance of exposure reduction efforts by every individual.

407. Investigational Level of Doses of Radiation to Occupational Radiation Workers.

A. Investigational levels of whole body dose are doses of radiation received in one badge period, (1 month) that exceed 750 MREM, or 3 REM during the calendar year. Any occupational radiation worker employed by Prime N.D.T. Services, Inc. that receive 750 MREM or more in one badge period, or 3 REM during the calendar year will be subject to investigation by the Corporate Radiation Safety Officer or one of his representatives as to the reasons involved for:

- A. Receiving a dose in excess of the investigational level.
- B. Steps to be taken to avoid further dose of the same.
- C. ALARA Re-occurrence Prevention.

408. Area Definitions and Postings

I. Areas within Prime licensed facilities and temporary field sites are categorized by the level of radiological hazard present within the area and by the degree of control necessary to minimize inadvertent exposures. These areas will be set apart by postings, and in some cases, barriers. The definitions of the various radiological areas are described in this sections.

II. Restricted Area

- A. A restricted area is defined as any area to which access is controlled by Prime for the purpose of the protection of individuals from exposure to radiation and radioactive materials.
- B. There are no specific posting requirements for restricted areas; however, the area is posted according to other sections of this manual if the radiological conditions addressed by those sections are present in the restricted area.
- C. An unrestricted area is any area to which access is not controlled for the purposes of the protection of personnel from exposure to radiation and radioactive materials. Radiation levels must be maintained at levels consistent with 10 CFR 20 1301 corresponding Agreement State regulations.

Rev. 1
July 2004

- D. Entrances to restricted areas, or at other conspicuous location(s) on the project frequented by company personnel, shall be posted as follows:
1. Form NRC - 3 or agreement State "Notice to Employees".
 2. Notice to comply with requirements 10 CFR 19:

"A copy of 10 CFR 19, 10 CFR 20, Prime N.D.T. Services, Inc. Radioactive Material License and Operating Procedures are available in this office and may be examined by contacting the Project Manager or RSO".
(Typical wording for Notice)
 3. Notice to comply with Agreement State Rules and Regulations:

"A copy of the Agreement States Rules and Regulations, Prime N.D.T. Services, Inc. Radioactive Materials License and Operating Procedures are available in this office and may be examined by contacting the Project Manager or RSO". (Typical wording for Notice)
 4. Emergency phone numbers ("in case of Emergency Call")
 5. A copy of Section 206 of the Energy Reorganization Act of 1974.

III. Radiation Area

- A. Areas accessible to personnel where there exists radiation originating in whole or in part within licensed radioactive material such that a major portion of the body could receive in any one (1) hour a dose in excess of five (5) mrem or in any five consecutive days a dose in excess of one hundred (100) mrem are classified as radiation areas.

Rev. 1
July 2004

- B. Radiation areas must be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION - RADIATION AREA

- 1. The word "Danger" may **NOT** replace "Caution".
- 2. In addition to the required wording, each radiation warning sign should, as appropriate, identify the maximum general area dose rate within the area, requirements for entry, and other explanatory information which may be helpful to personnel.

IV. High Radiation Area

- A. Areas accessible to personnel in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of one hundred (100) mrem are classified as high radiation areas.
- B. High radiation areas must be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

**CAUTION
HIGH RADIATION AREA**

- 1. The word "Danger" may replace "Caution".
- 2. In addition to the required wording, each high radiation area warning sign should identify, where appropriate, the maximum general area dose rate within the area, requirements for entry, and other explanatory information which may be helpful to personnel.

V. Radiation Warnings Signs - Color

The color of the radiation warning signs shall be as follows:

Radiation Symbol - Magenta or Purple or Black

Background - Yellow

Lettering - Black

409. Access Control

I. Restricted Area

A. Physical Access Control

1. Physical access to a restricted area is by key control and/or under the direct supervision of the lead radiographer.

B. Entry and Exit Requirements

1. All personnel entering a Prime restricted area must wear their own specifically issued filmbadge and pocket dosimeter. When working in a nuclear utility restricted area, Prime personnel must also wear utility issued dosimetry devices unless other arrangements have been made.
2. No employee should enter a Prime restricted area unless the entry is necessary and he has a specific task to perform, he is authorized by the lead radiographer and is qualified in radiation safety as certified by the Radiation Safety Officer.

II. Radiation Area Access Control

A. Physical Access Control

1. All radiation areas are encompassed by a restricted area. Physical access control to radiation areas is controlled by controlling access to restricted areas.
2. The radiation area must be posted as specified in 10-CFR part 20, Section 20.1902 paragraph (a) Posting of Radiation Areas.

B. Entry Requirements

1. All individuals desiring entry to radiation areas must meet the requirements for access to restricted areas.

III. High Radiation Area Access

A. Physical Access Control

1. All entrances or access points to high radiation areas must be equipped with doors or gates which are locked except as provided below:
 - a. High radiation areas which cannot be locked (such as temporary high radiation areas) must be under direct visual surveillance and physical control of Prime approved personnel until such time as the area can be locked or the radiation level reduced below 100 mrem/hour. This condition must not be allowed to exist beyond 30 days.
 - b. High radiation areas in which personnel are present need not be locked if the access door or gate is in direct surveillance of the personnel within.
 - c. A barrier must not prevent ready egress from high radiation area.
2. In lieu of locking the high radiation area, these areas may be equipped with a suitable control device which shall energize a conspicuous visible and audible alarm signal in such a manner that the individual entering the high radiation area or a supervisor of the activity may be made aware of the entry.
3. The high radiation area shall be posted as specified in 10-CFR part 20, Section 20.1902 paragraph (b) Posting of High Radiation Areas.
4. Entrances to permanent radiographic installation shall additionally have both visible and audible signals to warn of radiation as established in 10 CFR 34.29.

B. Key Control

1. The keys to high radiation areas must be controlled.

Rev. 1
July 2004

2. Keys to high radiation areas are issued only to those individuals authorized by the Radiation Safety Officer.

C. Entry Requirements

1. Normally, entries into high radiation areas are not authorized except in response to emergency conditions. Should a need to enter exist, each individual entering a high radiation area must comply with the following:
 - a. All individuals desiring entry to high radiation areas must meet the requirements for access to restricted areas.
 - b. All individuals entering high radiation area are authorized by the Radiation Safety Officer.
 - c. All individuals entering the high radiation area must have a continuously indicating dose rate instrument, and/or,
 - d. All individuals entering the high radiation area must have a radiation monitoring device (pocket dosimeter) which continuously integrates the radiation dose rate in the area. Entry to high radiation areas with this device may be made only after the dose rate in the area has been established by survey, and personnel made aware of the dose rate.

RADIATION SAFETY MANUAL

CHAPTER 5

RADIOGRAPHY SAFETY TRAINING PROGRAM

Section

- 501. General
- 502. Radiation Protection Objectives
- 503. Training Requirements
- 504. Conduct of Training
- 505. Refresher Training
- 506. Training Course Materials

RADIATION SAFETY MANUAL

RADIATION SAFETY TRAINING PROGRAM

501. General

- I. Prime has training courses for radiographers and assistant radiographers. These training courses shall be used as formal instruction material for individuals being trained as radiographers and assistant radiographers under Prime's NRC by-product material license. In addition to completion of the courses, an individual may receive on-the-job training as deemed necessary by the Radiation Safety Officer. After the appropriate formal instruction, the individual must pass written, oral, and practical examinations as a condition for certification. Records of the examination and their results are required to be maintained on file at the Radiation Safety Office.
- II. Appropriate instructional methods and materials such as classroom lectures and actual equipment are used to present the radiation protection training. Trainee participation should be maximized, particularly in the areas of survey instrument and pocket dosimeter use, exposure device use with dummy radiography sources, etc.
- III. It is not acceptable for a Radiographer's Assistant to receive classroom type training and instruction while participating in the actual radiographic operations.

502. Radiation Safety Training Objectives

The objectives of this procedure are to assure consistent training of personnel, to verify the understanding of training material by both examination and practical demonstration, and to assure thorough training prior to certification that the individual is prepared to safely perform assigned radiography functions.

503. Training Requirements

The following are the training requirements taken from 10 CFR Part 34, Table G.

I. Radiographer

| REQUIREMENT | TRAINING CRITERIA |
|--|--|
| 34.43 (a) (1) | RADIOGRAPHER |
| <p>A. Receive Training in 10 CFR 34.43 (g) Topics</p> <p>(Classroom Training - Approximately 40 hours in length)</p> | <p>Topics in 10 CFR 34.43 (g)</p> <p>Fundamentals of Radiation Safety</p> <ul style="list-style-type: none"> * Characteristics of gamma radiation * Units of radiation dose and quantity of radioactivity * Hazards of exposure to radiation * Levels of radiation from licensed material * Methods of controlling radiation dose (time, distance, and shielding) <p>Radiation Detection instruments</p> <ul style="list-style-type: none"> * Use, operation, calibration and limitations * Survey techniques * Personnel monitoring equipment <p>Equipment to be used</p> <ul style="list-style-type: none"> * Operation and control of radiographic exposure equipment, remote handling equipment, storage containers and pictures or models of source assemblies (pigtailed) * Storage, control and disposal of licensed material * Inspection and maintenance of equipment <p>Requirements of Pertinent Federal Regulations</p> <p>Case Histories of Accidents in Radiography</p> |
| <p>B. On-the-Job Training - 2 months or 320 hours</p> | <p>Under the supervision of a qualified radiographer</p> |
| <p>c. Certification by a Certifying Entity</p> | <p><u>Radiographer Certification</u></p> <p>Proof of training, work time experience, and a practical exam will be presented to a certifying entity that has been approved by the NRC or agreement state.</p> |

| REQUIREMENT | TRAINING CRITERIA |
|---|--|
| 34.43 (a) (2), (b) | RADIOGRAPHER |
| D. Must receive Copies of and Instruction in: (Classroom Training - Approximately 8 hours in length) | NRC Regulations * 10 CFR part 34 * 10 CFR 30.7, 10 CFR 30.9 and 10 CFR 30.10 * Applicable Parts of 10 CFR Parts 19 and 20 * Applicable DOT Regulations and 10 CFR Part 71 The NRC License The Licensee's Operating & Emergency Procedures |
| E. Pass Written or Oral Examination on Licensee's Operating & Emergency Procedures | * 25 Questions * Passing Grade 70% |
| F. Receive Equipment Training (Approximately 4 hours in length) | Training includes: * Exposure devices * Sealed sources * Associated equipment * Survey meters * Daily inspection |
| G. Demonstrate Understanding in Use of Equipment by Passing Practical Exam | Questions on topics determined by the licensee. Use the Six-Month Radiographer/Radiographer's Assistant Inspection Checklist as a potential source of questions. |
| H. Annual Refresher Training -Minimum of 8 hours annually | Review the following: * Radiation Safety review * New procedures or equipment * New regulations * Observations and deficiencies during audits and discussion of any significant incidents or accidents involving radiography * Employee questions |
| I. Records | To be maintained in accordance with 10 CFR 34.79. (5 years to aid in recertification) |
| | |

II. Assistant Radiographer

| REQUIREMENT | TRAINING CRITERIA |
|---|---|
| 34.43(c) | ASSISTANT RADIOGRAPHER |
| A. Must receive Copies of and Instruction in: (Classroom Training - Approximately 8 hours in length) | NRC Regulations * 10 CFR Part 34 * 10 CFR 30.7, 10 CFR 30.9, and 10 CFR 30.10 * Applicable Parts of 10 CFR Parts 19 and 20 * Applicable DOT regulations and 10 CFR Part 71 The NRC License The Licensee's Operating & Emergency Procedures |
| B. Pass Written Exam | * 50 Questions * Closed Book * Passing Grade 70% |
| C. Receive Equipment Training (Approximately 4 hours in length) | Training under the supervision of a qualified radiographer that includes: * Exposure devices * Sealed sources * Associated equipment * Survey meters * Daily inspection |
| D. Demonstrate Understanding in Use of Equipment by Passing Practical Exam | 25 - 50 questions on topics determined by the licensee. NRC suggests using the Semiannual Radiographer Audit Checklist for a potential source of questions. |
| E. Annual Refresher Training -Minimum of 8 hours annually | Review the following: * Any significant item identified in the annual review of the Radiation Safety Program * New procedures or equipment * New regulations * Observations and deficiencies during audits and discussion of any significant incidents or accidents involving radiography * Employee questions |
| F. Records | To be maintained in accordance with 10 CFR 34.79. 3 years minimum. |

Rev. 3
July 2004

- G. Upon fulfilling the above requirements the Radiation Safety Officer will issue the certification statement and card indicating the individual is a qualified assistant radiographer, provided other qualification requirements listed in Section 602 of Chapter 6 have been met.

III. Radiographer

- A. An assistant may become a radiographer after two months on the job training in accordance with the requirements of 10 CFR Part 34.43. Certifications shall be done by a certifying entity in accordance with criteria specified in 10 CFR part 34.43 (g):

| <u>Subject (Typical)</u> | <u>Approximate Hours</u> |
|--|--------------------------|
| Origin and Nature of Radiation | 3.0 |
| Characteristics of X and Gamma Rays | 2.0 |
| Interaction of Radiation with Matter | 2.0 |
| Biological Effects of Radiation | 2.0 |
| Units of Radiation Dose | 2.0 |
| Methods of Controlling Radiation Dose | 3.0 |
| Radiation Detection and Measurement | 4.0 |
| Survey Techniques | 3.0 |
| Radiographic Equipment | 4.0 |
| Case Histories of Radiography Accidents | 2.0 |
| Transportation Requirements | 2.0 |
| NRC Regulations | 2.0 |
| Radioactive Material License Conditions | 1.0 |
| Prime Operating and Emergency Procedures | 8.0 |

- B. Practical - The practical examination shall measure the employee's proficiency in performing required functions. Individuals will be required to demonstrate competence to use each specific radiographic exposure devices by model number, sealed sources, related handling tools and specific survey instruments.
- C. Oral Review - An oral review shall be conducted with the employee to clarify any questions and correct misunderstandings.
- D. Upon fulfilling the above requirements the Radiation Safety Officer will issue the certification statement and card indicating the individual is a qualified radiographer.

IV. Personnel Qualified for Radiography Under Other Licenses

- A. Radiography personnel who have been trained and qualified for radiography under another license may perform or assist in Prime radiography operations after:
 - 1. Verification that the individual has been certified as a radiographer or assistant radiographer under another license. The individual will undergo eight hours of training on the following subjects:
 - a. Company operating and emergency procedures, instrument sources, devices, and equipment.
 - b. Company's NRC by-product material license
 - 2. Passing general, specific, and practical examinations for a radiographer or assistant radiographer.
 - 3. Individuals holding third party certification will not take the general test, but must receive the training listed above and pass specific and practical tests.
- B. Upon fulfilling the above requirements, the Radiation Safety Officer will issue the certification statement and card indicating that the individual is a qualified radiographer or assistant radiographer.

504. Conduct of Training

- I. The above mentioned training programs should be administered by the Radiation Safety Officer or the Assistant Radiation Safety Officer or a qualified outside consultant service. The RSO will normally conduct the training for radiographic classifications, administer the tests, and grade written, oral and practical examinations.

- II. A consultant or consultant service shall be a person or company with sufficient training and background to be recognized as a professional in Radiation Safety training such as a recognized health physicist, or Amersham, or Hellier and Associates.

505. Refresher Training

- I. Prime conducts annual refresher training for personnel involved in the Radiation Safety Program. The training covers selected material from the initial training programs, lessons learned from in-field incidents, updates on regulatory requirements and/or changes, information bulletins, equipment upgrades, and changes in the operating and emergency procedures. The training is a minimum of 8 hours.

- II. Refresher Training Documentation

- A. Refresher training will be documented. The documentation will indicate the subjects discussed and the attendees. The attendees will sign on the attendance sheets as evidence of refresher training.

506. Training Course Materials

Training course materials can be found in Appendix C.

RADIATION SAFETY MANUAL

CHAPTER 6

QUALIFICATION AND CERTIFICATION

Section

- 601. General
- 602. Position Qualification Requirements
- 603. Re-examination
- 604. Certification
- 605. Recertification
- 606. Certification Records

RADIATION SAFETY MANUAL

QUALIFICATION AND CERTIFICATION

601. General

- I. The company conducts a qualification and certification program for radiography personnel. The objective of this program assures that personnel are competent in radiation safety at the level required by job assignment. The minimum age requirement for all radiographic job classification is 18 years. Unless approved by the Radiation Safety Officer, the minimum education requirement is a high school diploma or GED.

602. Position Qualification Requirements

I. Assistant Radiographer

- A. The individual qualifies as an assistant radiographer when he/she has:
 1. Received copies of and instructions in the requirements described in 10 CFR Part 34; in 30.7, 30.9, and 30.10; in the applicable sections of 10 CFR Parts 19 and 20; and in the applicable DOT regulations as referenced in 10 CFR Part 71. Training will also cover all license conditions and Prime NDT's operating and emergency procedures.
 2. Successfully completed a written or oral examination demonstrating knowledge of Prime NDT's license conditions and operating and emergency procedures.
 3. Demonstrated by successful completion of a practical examination the use of the radiographic exposure device, sealed sources, associated equipment, and the use of radiation survey instruments.
 4. The test results for the assistant radiographer are reviewed by the Radiation Safety Officer for approval. Upon review and approval, the Radiation Safety Officer will issue a certification card for this position to the individual.

II. Radiographer

- A. An assistant radiographer can qualify as a radiographer when he/she has:
1. Received training in the subjects listed in 10 CFR 34.43(q), completed two (2) months on-the-job training, and is certified through an authorized certifying entity in accordance with the criteria specified in Appendix A of 10 CFR Part 34.
 2. Successfully completed a written or oral examination demonstrating knowledge of Prime NDT's license conditions and operating and emergency procedures.
 3. Demonstrated by successful completion of a practical examination the use of the radiographic exposure device, sealed sources, associated equipment, and the use of radiation survey instruments.
 4. The test results for the radiographer are reviewed by the Radiation Safety Officer for approval. Upon review and approval, the Radiation Safety Officer will issue a certification card for this position level to the individuals.

III. Assistant Radiation Safety Officer

- A. An individual qualifies as an Assistant Radiation Safety Officer when:
1. The individual has a minimum of two years experience in radiation protection and health physics programs dealing with uses of licensed radioactive materials in commercial operations for radiography or managing health physics or radiation protection programs associated with operations or regulations of multiple use programs.
 2. The individual has completed the training and testing requirements for a radiographer listed in Para. 602, II of this Chapter.
 3. The individual has worked a minimum of 2000 hours as a radiographer.

4. The individual has received formal training on how to establish and maintain a Radiation Safety Program.

IV. Radiation Safety Officer

- A. An individual qualifies as the Radiation Safety Officer when:
 1. The individual can demonstrate a minimum of five years experience in radiation protection and health physics program dealing with multiple uses of licensed radioactive materials in commercial radiography operations or regulations of multiple user programs.
 2. The individual is approved by the Nuclear Regulatory Commission.

603. Re-examination

- I. Re-examination, after failure of an employee to satisfactorily complete a certification examination, shall not be conducted without a reasonable retraining period. The period shall be determined by the Radiation Safety Officer.

604. Certification

- I. All authority for issuing certification for position qualifications discussed in Section 602 resides only in the Radiation Safety Officer.
- II. This authority shall not be delegated by the Radiation Safety Officer.

III. Disqualifications and Withdrawals

- A. Restrictions may be placed on a certification as deemed necessary by the Radiation Safety Officer. Restrictions shall, in no case, constitute a waiver of the requirements of 10 CFR 20, 10 CFR 34, or licensing documents.
- B. Extensions may be added to the certification as testimony of capabilities beyond the requirements of the level. Extensions will require the employee be trained and demonstrate competence to the radiation Safety Officer in understanding and performing the required function.

- C. Certification can be rescinded by the Radiation Safety Officer if, in the opinion of the Radiation Safety Officer, the individual demonstrates an inability to understand, practice, or lacks knowledge of safety requirements.
- D. The Radiation Safety Officer shall have the authority to withdraw certifications for:
 - 1. Violation of safety procedures or disregard for safety practices.
 - 2. Inability to demonstrate correct procedures during audits.
 - 3. Reassignment to functions no longer requiring the certification.
 - 4. Termination of the employee.

605. Recertification

- I. Radiography personnel shall be recertified at least once every five (5) years.
 - A. Radiographers and Radiation Safety Officers shall be recertified by an authorized certifying entity as required by 10 CFR Part 34.
 - B. All personnel shall receive a minimum of 8 hours refresher training annually for a total of 40 hours over 5 years.

606. Certification Records

- I. The personnel records of all certified individuals shall include:
 - A. Name of certified individual.
 - B. Level of certification.
 - C. Educational background and experience.
 - D. Statement indicating satisfactory completion of the requirements in 10 CFR Part 34.
 - E. Actual grades obtained on each examination.
 - F. Date of certification and/or recertification.
 - G. Signature of Radiation Safety Officer.

RADIATION SAFETY MANUAL

CHAPTER 7

OPERATING PROCEDURES

Section

- 701. General
- 702. Prerequisites for Performing Radiography
- 703. Film Badge or TLD Instructions
- 704. Pocket Dosimeters
- 704-A. Alarm Ratemeters
- 705. Survey Instruments
- 706. Sealed Sources and Devices
- 707. Getting the Source to the Job
- 708. Controlling the Area
- 709. Setting up the Exposure
- 710. Making the Exposure
- 711. Securing Radiographic Operations
- 712. Use of X-Ray Equipment - Field
- 713. Permanent Radiographic Installation
- 714. Posting and Restricting Radiographic Areas
- 715. Security of Radiography Sources and Containers
- 716. Sealed Source Receipt, Transfer and Disposal
- 717. Transfer of Sealed Sources
- 718. Transportation
- 719. Leak Testing of Sources

RADIATION SAFETY MANUAL

OPERATING PROCEDURES

701. General

- I. Prime operating Procedures provide instructions for safely working with radiographic exposure devices and keeping radiation exposures ALARA. When performing industrial radiography, there must be a copy of these procedures, a copy of the radioactive material license, a copy of applicable parts of 10 CFR 19, 20, 34, and 71, also 10 CFR 30.7, 30.9, and 30.10, or corresponding Agreement State regulations, and a copy of the NRC Form-3 or equivalent Agreement State form available at the field site or operating facility.
- II. Prime personnel working with radiography sources or x-ray exposure devices must be trained, qualified, and certified in accordance with Chapters 5 and 6.
- III. Certified radiographers shall have the authority to use and supervise the use of the sealed sources for which the company is licensed. In a case where there is more than one radiographer present, there shall be one radiographer in charge of each source being used and the corresponding "Restricted Area" where it is being used. This lead radiographer shall be the one who signs the Radiographic Operations Report (Form RS-4-4) for the source being used in that area, and he shall make it clear to all persons in that area that he is in charge. The Lead Radiographer is directly responsible for assuring that the radiography job is performed in compliance with this manual, license conditions, and regulatory directives.

Certified assistant radiographers may operate the exposure equipment and perform other radiation safety tasks under the direct personal supervision of a qualified radiographer.

702. Prerequisites for Performing Radiography

- I. Before working with radioactive materials, each individual must have on their person:
 - A. Film Badge or TLD
 - B. Pocket Dosimeter (range 0-200 mR) in current calibration
 - C. Operable survey meter (range 0-1000 mR/hr) in current calibration
 - D. Certification card
 - E. A copy of the Operating and Emergency Procedures;
 - F. Alarm Ratemeter
- II. As stated in Section 701 and 702 requirements, the following items must be readily available for references or inspection:
 - A. A copy of the Radiation Safety Manual
 - B. A copy of USNRC radioactive materials license
- III. Pocket Dosimeters, Alarm Ratemeters, and Film Badges or TLD's shall be worn at all times by radiography personnel during radiographic operations, including inventories and inspection of exposure devices and shipping containers, and when working around any other sources of radiation. Radiography personnel are **NOT PERMITTED TO WORK WITHOUT A FILM BADGE OR TLD ON THEIR PERSON.**

703. Film Badge or TLD Instructions

- I. Film badges will be processed at least once a month or more frequently as directed by the Radiation Safety Officer.
- II. Radiography personnel will be given specific dates on which the film badges should be returned for processing.
- III. Each film badge shall contain the assigned person's name and social security number. **NO ONE ELSE IS PERMITTED** to wear that film badge.
- IV. A control badge will be maintained at the badge storage area and shall be included with each shipment.

- V. The Radiation Safety Officer shall review all film badge reports received for any high, unusual, or non-reported results. The President and individuals involved shall be informed of any high, unusual, or non-reported results.
- VI. The Office of Radiation Safety shall be responsible for maintaining all radiation exposure records.
- VII. Refer to personnel dosimetry instruction in Appendix D for additional instructions.

704. Pocket Dosimeters

- I. Operation Instructions for pocket dosimeters and dosimeter chargers are outlined in Appendix E.
- II. The pocket dosimeter measure total accumulated dose from zero to at least 200 milliroentgens (mR). Prior to each work shift, zero the dosimeter using a dosimeter charger. Check the dosimeter frequently to assure safe operation. Whenever the reading is above 75% of full scale, record it on Form RS-4-1 and recharge the dosimeter. An off-scale reading requires IMMEDIATE actions: stop work and contact the Radiation Safety Officer. If the dosimeter is lost, stop work immediately and contact the Radiation Safety Officer for a replacement. DO NOT WORK WITHOUT A DOSIMETER.
- III. Radiographic personnel work assignments involving radiography sources shall be regulated as required so that the total exposure for any given calendar quarter shall not exceed limits specified in Chapter 4 criteria.

704-A Alarm Ratemeter

- I. Operation Instruction for alarm rate meters are outlined in Appendix E.
- II. Alarm rate meters emit a warning signal at a pre-set dose rate of 500 mR/hr.
- III. Alarm rate meters are to be worn at all times when working in a radiation area.
- IV. Calibration is done at least annually as outlined in Appendix L.
- V. The alarm rate meter will be checked prior to and at the end of each shift and recorded on Form 4-1.

705. Survey Instrument

- I. A calibrated and operable survey instrument shall be maintained at each site where radiography is being performed. The instrument is not to be used unless properly calibrated.
- II. Survey instruments are delicate. It is essential that reasonable care be taken in their use to assure reliability. When transported in vehicles, survey instruments shall be placed in the driver's compartment. Adequate support of the instrument to prevent damage during transit is necessary.
- III. Should your survey instrument become inoperable for any reason, immediately cease work until the instrument has been repaired or a replacement obtained.
- IV. Additional instructions and information concerning survey instruments are provided in Appendix H.

706. Sealed Sources and Exposure Devices

- I. The company is licensed to use only the sealed sources and devices designated on its license. A copy of the current license is included in Appendix F of this manual.
- II. Instructions for the safe use of sealed sources and devices are outlined in Appendix G.
- III. Each device containing a sealed source is to be clearly labeled with the radiation symbol and the words "CAUTION- RADIOACTIVE MATERIAL" and be labeled with the following information:

Radioisotope
Number Curies
Date of Curie Determination
Device Serial Number

707. Getting the Source to the Job

- I. Select Equipment - Select the proper source tube, crank and drive cable for compatibility with the source and exposure device.

II. Removal from Storage - Survey all surfaces of the storage area or container for abnormal radiation levels. Radiation levels of a storage area should not exceed two mR/hr. Survey the exposure device for abnormal radiation levels before removing it from storage. No exposure device should have a surface reading in excess of 200 mR/hr. If such readings are observed, notify the Radiation Safety Officer for instructions. Abnormal radiation levels are those which are significantly different from reasonably expected levels for the devices and source strength.

III. Check Out of Equipment:

RADIOGRAPHY CAMERA - Utilization Log (RS-4-2 Rev. 1) - The radiographer must enter the following information on the Utilization Log:

- A. Date checked out
- B. Source and Camera number
- C. Name of individual removing the source
- D. Destination - Job site location
- E. Curies (Radioisotope and activity)
- F. Leak test due date
- G. Quarterly inspection due date
- H. Date returned
- I. Name of individual returning the source

IV. Daily Equipment Inspection - Equipment which is maintained in good working order seldom leads to an emergency situation. Perform the daily inspection of the exposure device by following the instructions and completing the Daily Inspection of Exposure Device, Form RS-4-4, Part D. (Refer to Chapter 9, Section 902.)

V. Carrying the Exposure Device - The total time an exposure device is hand-carried should be kept to a minimum. Remember, the radiation level on the exposure device's surface may be as high as 200 mR/hr. A good practice is to use a hand truck or cart whenever you are doing a lot of transporting.

708. Controlling the Area

I. Responsibility of the Radiographer - The radiographer is responsible for establishing the controlled "Radiation" and "High Radiation" areas and assuring unauthorized personnel are not allowed to enter the restricted area. The assistant radiographer may perform these duties only under the personal supervision of the radiographer.

- II. Preliminary Control - Prior to setting up the exposure device the Radiographer will establish preliminary controls by conspicuously posting an area that will prevent anyone from entering and receiving, at the perimeter of these areas, a dose in excess of two (2) mrem in any one (1) hour. The approximate perimeter of the restricted area shall be established; refer to the Restricted Area, Radiation Area and High Radiation Area Boundary Tables (Appendix I). The approximate perimeter of the high radiation area (100 mrem/hr. or more) will be calculated from the Tables mentioned above. Conspicuous posting of this area will be accomplished by using, "Caution - High Radiation Area" signs. "Caution - High Radiation Area" signs may not be used on the perimeters of the "Radiation Area". The signs shall be the conventional magenta or black and yellow colors used to indicate radiation area. It is recommended that perimeters be established using radiation barrier tape or rope (magenta or black and yellow colors).
- III. The radiographer is responsible for clearing the restricted area and visually checking enclosed or any area large enough to contain individuals in the restricted area. These areas must be checked before each exposure.

709. Setting up the Exposure

- I. Source Tube - Secure the source positioning tip in the desired position and distance from the object to be radiographed. Attach one (1), two (2), or three (3) lengths of source tubes, as needed, to reach the exposure device. Do not use more than three (3) seven (7) foot tubes. The source tubes should be laid out as straight as possible, avoiding bends, particularly bends of sharp radius. Collimation shall be used whenever applicable. Secure the collimator to the source positioning tip.
- II. Exposure Device Assembly
- A. Verify that the exposure device is locked.
 - B. Remove the safety plug from the exposure device, or if using an AEA 880 projector rotate the outlet port cover clockwise and connect the source guide tube to the exposure device.
 - C. Remove the storage (dust) cover from the cable connections. Assure that the exposure device is in the proper mode to enable completion of connections.

- D. Attach the cable to the source pigtail and connect the cable housing to the exposure device. Assure that these connections are properly made.
- E. Re-check all connections, verify that the restricted area is clear of personnel, and prepare to make an exposure.

710. Making the Exposure

- I. The lead radiographer is responsible for the safety of all personnel entering the restricted area. No one shall enter the area without his consent. If any person persists in attempting entry into the posted area, secure the source until the person leaves. Report the problem to the Radiation Safety Officer.

Note: When you warn persons of the danger of radiation, state the facts. Do not exaggerate.

During an exposure, all personnel shall stay outside the restricted area. The radiographer and assistant radiographer must be alert at all times to prevent anyone from entering the area. If unauthorized personnel cannot be prevented from entering the area, the source shall be immediately returned to its shielded position. No personnel shall enter these areas until they are given permission from the radiographer in charge or except as required under declared emergency conditions.

If a restricted area should exist such that all entrances to the area could not be in the direct line of sight of the radiographer or assistant radiographer, additional individuals shall be used "outside the restricted area" to confirm that no unauthorized entry takes place.

- II. Unlock the device and crank the control handle in the "exposure" direction to move the source out of the exposure device through the source tube(s) and into the source positioning tip.

CAUTION:

Undue pressure in either direction could damage the connection and even release the source from the cable; therefore, it is important that you do not force the crank. If undue resistance is encountered while moving the source into the exposure position, return the

source to the exposure device and correct the cause of the resistance.

DO NOT attempt to force the source beyond resistance. If undue resistance is encountered while returning the source to the exposure device, reverse the direction of the cranking until the unit operates smoothly. If, after a few reversals, cranking is still difficult, or there is reason to believe the source is loose from the drive cable, survey and reposition restricted area barriers, post a guard, contact the Radiation Safety Officer, and declare emergency conditions per Chapter 8 requirements.

- III. Final Control - After the exposure device is readied for operation, the source is driven to the end of the source tube and a survey performed to establish the restricted area. Resurvey the perimeter and correct the positioning of signs and barriers as necessary, and record readings on Form RS-4-4. Surveys shall be required for each shift and/or when the source-target configuration is substantially different from that of the preceding exposure. Survey readings in excess of two (2) mR/hr are permissible at perimeters of the restricted area when the total exposure time, during any one (1) hour, is less than 60 minutes.

Example:

$$\frac{\text{Any One Hour (60 Min.)}}{\text{Exposure Minutes}} \times 2 = \frac{\text{Maximum Allowable}}{\text{mR/hr.}}$$

Note: Normally, the perimeter posting and barricades will be placed at the 2 mR/hr isodose line. Under certain conditions it is permissible to set the perimeter at 2 mrem in any one hour. If that is the case, use the Calculations for Boundaries Exceeding 2 mR/hr. form in Appendix B prior to initiating this exposure condition.

All signs shall be magenta or purple on yellow background and display the conventional three-bladed radiation safety symbol.

- IV. Upon completion of an exposure, the radiographer shall:
- A. Return the source to the radiographic exposure device by turning the hand crank in the retract direction until a positive stop is encountered. Test to verify that the source assembly is secure by applying a slight forward cranking motion. The

source assembly should be unable to move forward.

- B. When assured that the source has been returned to the safe position, proceed toward the exposure device with a survey instrument in hand, carefully examining the survey readings.
CAUTION:
Make sure the survey readings are realistic and expected.
- C. When reaching the exposure device, immediately survey the area where the source guide tube connects to the device to verify that the source has been retracted to the safe position. If the radiographic exposure device has a source guide tube, the survey shall include the guide tube.
- D. Radiographers and assistant radiographers shall be required to remove keys from all locked exposure devices except during authorized use or when under the direct surveillance of said individuals.

711. Securing Radiographic Operations

- I. Upon completion of the scheduled radiographic operations, the following procedures will be observed:
 - A. Survey prior to locking the radiographic exposure device to assure the source is in the safe shielded position. Record the survey reading on Form RS-4-4, Part E.
 - B. Lock the exposure device.
 - C. Disconnect the control cable and secure the device.
 - D. Remove the source guide tube and insert the safety plug, or rotate the outlet port cover to the secured position for the 880 projector.
 - E. Dismantle the set-up and remove barricades.
 - F. Survey the exposure device.
 - G. Return exposure device to designated storage area.
 - H. Complete the entry on the Utilization log RS 4-2.
- II. An exposure device with a source that is not secured in

a locked storage area shall not be left unattended. Any deviation must be approved by the Radiation Safety Officer.

712. Use of X-Ray Equipment - Field

- I. Safety procedures of this paragraph shall apply to operations with x-ray producing machines, where applicable.
- II. Survey instruments shall be used in the same manner as when utilizing radioactive material. They shall be used to determine that the x-ray unit is off except in cases where the main power is disconnected.
- III. No x-ray unit shall be left unattended whereby unauthorized personnel could cause the unit to be energized resulting in a hazard. The control panel and/or power cables shall be stored or locked if the unit is to be left unattended. The key shall be controlled to prevent unauthorized access.
- IV. No individual shall operate an x-ray machine until such individual has received a copy of, instruction in, and demonstrates an understanding of the operating procedures for said unit.
- V. The X-Ray Equipment Procedure, although brief, does not relieve the radiographer and/or assistant radiographer of any of the other detailed requirements of this manual, which do not pertain directly to the operation of use of an isotope exposure device.
- VI. It will be the radiographer's responsibility to complete the appropriate parts on Form RS-4-4.

713. Permanent Radiographic Installation

Safety instructions of this paragraph shall apply to radiographic operations using the permanent installation (shielded radiation exposure room). Such requirements shall be in addition to those detailed elsewhere in this manual. Information on Prime facilities and the shielded radiation

exposure room can be found in Appendix O.

- I. The exposure room shall be used only with those sources of radiation authorized by license and approved by the Radiation Safety Officer.
- II. Specific requirements for the exposure room (other than listed in this paragraph) shall be posted at the radiographic installation.
- III. The exposure room shall be equipped with a visible and audible alarm signal.
 - A. The visible alarm shall be activated by radiation when the source is exposed.
 - B. The audible alarm shall be generated so that the radiographer would be aware of any attempt to enter during an exposure.
- IV. Inoperable alarm equipment shall be repaired or replaced immediately. The alarm shall be tested for proper operation daily before use. The test must include a check of both the visible and audible signals. A calibration check shall also be done on a quarterly basis. If an alarm is operating improperly, it must be immediately labeled as defective and repaired within seven (7) calendar days. We may continue to use the facility during the seven day period. Continuous surveillance must be maintained and alarm rate meters must be worn. The Radiographer must be accompanied by at least one other qualified radiographer or individual who has at a minimum met the requirements of 10 CFR 34.43. Records of the alarm check and operational status shall be maintained for two years.
- V. A functioning and currently calibrated survey instrument shall be available for use in the exposure room. The survey instrument shall be used for each entry to the exposure room to verify radiation levels.
- VI. The exposure room shall be checked prior to each exposure to assure the area is cleared of personnel.
- VII. If an exposure device (with radioisotope) is to be left unattended or not used for immediate planned radiography exposure, the source shall be returned to the shielding and locked in position. The room shall be locked.

Note: Specific details on shielding of the permanent radiographic installation and survey results can be found in Attachment O.

714. Physical Radiation Survey

I. General

Although the need for radiation surveys is discussed throughout this manual, the importance of these surveys may not be properly emphasized. All radiographers recognize that proper surveys can prevent serious exposure conditions. Most of the previous accidents in the radiography industry could have been prevented by proper survey. Radiographers must recognize that this data is the only positive indication of the source location. Radiographers should not depend on the source being "where it should be" unless verified by survey.

Therefore, it is prudent that survey requirements be summarized here for increased emphasis.

- II. A radiation survey and visual inspection shall be made during each exposure to ensure that no individual, other than authorized personnel, is in an area where he could receive, if continuously present in the area, a dose in excess of 2 mR in any one hour or 100 mR in a year and to ensure that these areas are properly posted.
- III. A minimum of at least two calibrated and operable survey instruments shall be maintained at each site to make radiation surveys. If an instrument fails during operation, it should be replaced as soon as possible (e.g., 48 hours). If both instruments fail, the radiographic operations shall stop and the Radiation Safety Officer notified. If an instrument is out of the current calibration period, it is to be tagged "Out of Service" and is not to be used until properly calibrated. General Survey Instrument Use Instructions are outlined in Appendix H.

IV. Type and location of Physical Radiation Surveys

A. Physical Radiation Survey Before Removing Exposure Device From Storage Facility

- 1. Perform radiation survey upon entry.

2. Survey the exposure device. If readings are significantly different ($\pm 20\%$), notify the Radiation Safety Officer since this may be an indication of abnormal conditions.

B. Physical Radiation Survey of Outer Surfaces of Transportation Vehicle

1. Since the outer surface and the passenger compartment of a transporting vehicle must be treated as an unrestricted area, a physical radiation survey of the vehicle shall be made after the exposure device is secured in the vehicle to assure that radiation levels outside the vehicle and inside the passenger compartment do not exceed 2 mR/hr.
2. If radiation levels in excess of 2 mR/hr are found, the exposure device shall be repositioned in the vehicle or shielding shall be employed.

C. Physical Radiation Survey During Exposure Period

1. Determine the restricted area for actual exposure from calculations of source strength and distance. (Refer to charts located in Appendix I.)
2. Rope off and post area in accordance with instructions in Section 704 of this chapter.
3. Upon initial source exposure, survey boundaries determined in step 1 above.
4. Make adjustments to boundary as necessary to maintain readings at 2 mR/hr or less, or as otherwise authorized by Section 704 for an exposure of short duration.
5. If more than one exposure is taken in the same area, and there is no change in the geometry of that area, it is not necessary that the limits of the restricted area be resurveyed.

D. Physical Radiation Survey of Device After Completion of Individual Exposure and Prior to Transport to a New Location

1. Return source to the shielded position.

2. Approach device using survey meter and check to insure the source is in the proper shielded position.

E. Physical Radiation Survey Prior to Storage of Device After Last Exposure

1. Survey the device as described in Paragraph 714, Section IV.
2. Document readings on the Operations Report RS 4-4, (Part E)
3. Return the device to the storage area.

F. Physical Radiation Survey of Storage Facility after Storage of Radioactive Material

1. Survey the perimeter of the storage facility to insure the dose rate outside the restricted area does not exceed 2 mR/hr.
2. Document reading on the Operations Report RS 4-4, (Part E)

715. Security of Radiography Sources and Containers

- I. Never leave an unattended radiographic exposure device or portable storage container outside of a locked storage area.
- II. Storage areas containing radiographic exposure devices and storage containers shall be kept locked at all times when not under the direct surveillance of a radiographer.
- III. Designated storage areas shall be posted using warning signs which contain the words "CAUTION - RADIOACTIVE MATERIAL" and the radiation symbol.

716. Sealed Source Receipt, Transfer and Disposal

A record (Form RS-7-2 - Appendix B) shall be kept by the Radiation Safety Officer for each sealed source transferred by Prime. These records shall document receipt, transfer, and disposal of each source.

717. Transfer of Sealed Sources

The transfer of sealed sources shall be accomplished as discussed in Chapter 12.

718. Transportation

The transportation of radioactive material shall be done as described in Chapter 12.

719. Leak Testing of Sources

The leak testing of sealed sources shall be done in accordance with Chapter 9.

RADIATION SAFETY MANUAL

CHAPTER 8

EMERGENCY RESPONSE TO RADIOLOGICAL INCIDENTS

Section

- 801. General
- 802. Loss or Theft of Radiography Equipment or Sources
- 803. Fires, Explosions, or Major Emergencies
- 804. Minor Accidents
- 805. Accidents Involving Possible External Radiation Overexposure
- 806. Vehicle Accident Involving Radioactive Materials
- 807. Accident Notification Responsibilities
- 808. Regulatory Notifications
- 809. Emergency Telephone Contacts

RADIATION SAFETY MANUAL

RADIOLOGICAL INCIDENTS

801. General

- I. This chapter describes the sequence of actions to be taken following a radiation incident in order to minimize the radiation exposure to personnel and the general public.
- II. It is the responsibility of each individual to become sufficiently familiar with emergency practices in order to perform necessary actions in the event of an emergency. Emergency training is incorporated into the Radiation Safety Training Program.

802. Loss or Theft of Radiography Equipment or Sources

- I. Loss or theft of licensed radiographic exposure equipment or radiography sources requires that certain specific actions must be taken without delay as soon as the loss or theft of a registered radiation device or a licensed source becomes known.
- II. If it appears likely that a substantial radiation hazard may result to persons in unrestricted areas, the loss or theft of radiography or sources must be reported by telephone immediately to the Radiation Safety Officer.
- III. In the event of a loss:
 - A. Immediately notify the Radiation Safety Officer and follow his instructions.
 - B. The following information shall be as appropriate:
 - 1. Obtain all information on the last known location of the source.
 - 2. Check the suspected area with survey meters and rope off as appropriate.
 - 3. Check non-monitored personnel who may have

been exposed and report the findings to the Radiation Safety Officer. Await his instructions.

803. Fires, Explosions, or Major Emergencies

- I. In the event of a Prime facility or customer plant accident in an area adjacent to radiography operations, immediately do the following, if possible:
 - A. Return the source to the shielded position in the exposure device and lock the unit. After the source has been returned to the stored position, survey the exposure device and the source guide tube.
 - B. Notify all other persons in the area to leave at once.
 - C. Remove the source guide tube and control cables from the exposure device. Insert the safety plugs, and remove the device from the danger area.
 - D. After the device has been removed from the area and secured, make a physical radiation survey to determine if any additional radiation hazard may exist.
 - E. Report the details of the incident to the Radiation Safety Officer as soon as possible, and await his instructions.
- II. If it is not possible to perform the above actions for an accident in an adjacent area, do the following:
 - A. After safely evacuating the area, notify safety personnel responding to the accident of the location and condition of the exposure device and source. Concurrently, make notification to the Radiation Safety Officer and follow his instruction.
 - B. If this is not immediately possible, upon their arrival, caution safety personnel such as firemen, ambulance workers, etc., where and what kind of radiographic exposure devices and sources are located, and advise them of the best entrance route around the radiation area and any precautions to avoid exposure or risk of creating unnecessary exposure conditions by use of high pressure water, etc.

- C. Do not permit safety personnel to enter the radiation area after the accident has been brought under control until a thorough examination can evaluate the extent of the damage to the radiographic exposure device and source.
 - D. Perform a thorough radiation survey of safety personnel and their equipment before they leave the controlled area. If equipment is found to be contaminated, notify the Radiation Safety Officer and follow his instructions.
- III. In the event of an accident involving the radiographic exposure device after the source has been exposed, such as crushing or crimping the source guide tube, source disconnection, or other malfunction, attempt to return the source to the stored position in the normal manner, if possible. If the source cannot be returned to the normal stored position by the usual manipulations, neither the radiographer nor the assistant radiographer shall attempt to correct an emergency situation themselves. Instead, the radiographer shall:
- A. Notify all personnel in the area of the accident and instruct them to safely exit the area.
 - B. Make a complete survey of the area and rope off and post that area as specified in Section 704 of Chapter 7 and survey any additional areas to ensure that there is not excessive radiation.
 - C. Maintain positive surveillance over the area after posting and roping off the area.
 - D. Notify the Radiation Safety Officer and await his instructions.
- IV. If an accident other than that described in the Section 803.3 occurs, then the radiographer shall follow the instructions given in Section 803.2.

804. Minor Accidents

- I. Attempt to put out fires by approved means if fire safety or radiation hazards are not immediately present.
- II. Govern fire fighting or other emergency activities by

instructions given by the Radiation Safety Officer.

III. Monitor all persons involved in combating the emergency, and the affected area, and report the findings to the Radiation Safety Officer. Follow his instructions.

IV. Prepare a complete history of the emergency and subsequent activity for review by the Radiation Safety Officer. Use the Radiation Safety Related Incident Data Report in Appendix B.

805. Accidents Involving Possible External Radiation Overexposure

I. Remove personnel involved from radiography operations immediately.

II. Make verbal notification to the Radiation Safety Officer. They will make arrangements to have the exposed individual(s) examined as soon as possible by a physician/radiologist.

III. Obtain and record all details of the incident by using the incident report form. Have the person or persons complete a statement of facts on how the exposure occurred and send it to the Radiation Safety Officer.

IV. Follow the instructions of the Radiation Safety Officer in sending the film badge(s) to supplier for immediate processing.

V. Upon receipt of all facts and exposure results, the Radiation Safety Officer, in consultation with medical and health physics specialists, will determine what action must be taken before the person or persons can return to radiography operations.

806. Vehicle Accident Involving Radioactive Materials (Driver's Instructions)

I. Should any kind of accident occur, make an immediate physical radiation survey to detect any radiation levels higher than normal. If any higher than normal radiation levels are detected, keep all persons out of the area, and obtain assistance from a local emergency response team. Do not leave the area unattended if the radiography sources are not in the shielded position. After the area has been secured, either yourself or a

member of the emergency response team shall notify Prime by calling the Emergency Response Number (800) 819-9195 and supply the following information:

- A. Nature of accident
 - B. Location of accident
 - C. Status of accident
 - D. Your status
 - E. A contact phone number
- II. Take necessary action to save life or prevent the destruction of property.
- III. Set up warning signals to prevent further accidents. Care should be taken when using flame producing signals to prevent possible fire or explosion.
- IV. Obtain the names and addresses of any witnesses.
- V. Keep people and sightseers away from the area, except to rescue people.
- VI. Give the shipping papers to emergency response team.

807. Accident Notification Responsibilities

- I. In the event of any of the above described incidents, it is the responsibility of the radiographer to see that the Radiation Safety Officer is notified with the pertinent details. The Radiation Safety Officer shall make appropriate regulatory notifications.

808. Regulatory Notifications

- I. Immediate Notification
 - A. Upon discovery, the theft or loss of licensed quantities of radioactive material
 - B. A total effective dose equivalent of 25 Rems, or an eye dose equivalent 75 Rems or more, or a shallow-dose equivalent to the skin or extremities of 250 Rads or more
 - C. The release of radioactive material inside or outside of a restricted area, so that had an

individual been present for 24 hours the individual could have received an intake five times the occupational annual limit

- D. Removable radioactive contamination in excess of 0.01 microcuries (22,000 disintegrations per minutes) on the surface of a package received by Prime.

NOTE: Prime must also notify the carrier which delivered the package, and obtain the phone number from the receipt papers.

- E. A package containing radioactive materials which has radiation levels in excess of 200 milliroentgens per hour on the package surface or greater than ten (10) milliroentgens per hour at three (3) feet from the package surface

II. Twenty-four (24) Hour Notification

- A. Any event involving loss of control of licensed material that may have caused an individual to receive a total effective dose equivalent exceeding 5 Rems or an eye dose equivalent exceeding 15 Rems or a shallow-dose equivalent to the skin or extremities exceeding 50 Rems
- B. The release of radioactive material inside or outside of a restricted area so that had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational annual limit

III. Thirty (30) Day Written Notification

- A. Radiation exposure to adults in excess of the occupational dose limits
- B. Radiation exposure to minors in excess of the occupational dose limit
- C. The limits for an embryo/fetus of a declared pregnant woman in excess of 0.5 Rem
- D. Radiation exposure to a member of the public in excess of .002 Rem in one hour or 0.1 Rem in a year
- E. Levels of radiation or concentrations of

radioactive material in a restricted area in excess of any other applicable limit of the license

- F. Levels of radiation or concentrations of radioactive material (whether or not it involved an excessive exposure to any individual) in an unrestricted area in excess of ten times of any applicable limit of 10 CFR 20, corresponding Agreement State requirements or the Prime license
- G. Incidents or equipment malfunctions involving connector disconnects, an inability to retract and secure the source assembly, or failure of any component (critical to safe operation of the device) to properly perform its intended function

809. Emergency Telephone Contacts

In the event of an emergency, a telephone contact list can be found at the end of this chapter.

REPORTING REQUIREMENTS

In accordance with 10 CFR 34.101, we are required to report the following:

- I. Unintentional disconnection of the source assembly from the control cable
- II. Inability to retract the source assembly to its fully shielded position and secure it in this position
- III. Failure of any component (critical to the safe operation of the device) to properly perform its intended function

The following information must be submitted to the RSO so he can make a formal report to the N.R.C.

1. A description of the equipment problem
2. Cause of the incident, if known
3. Manufacturer and model number of the equipment involved in the incident
4. Place, time and date of the incident
5. Action taken to establish normal operations
6. Corrective actions taken or planned to prevent recurrence
7. Qualifications of personnel involved in the incident

In addition, please submit exposure information on all people involved.

SUBMITTED BY: _____ DATE: _____

NOTICE

IN CASE OF ACCIDENT, WHEREIN THIS
VEHICLE IS INVOLVED, EMERGENCY
NOTIFICATION IS REQUIRED.

PLEASE CALL NEAREST LOCATION COLLECT:

PRIME NDT SERVICES, INC.

OFFICE

WHITEHALL, PA (24 HR.SERVICE) (800)819-9195

(610)262-4954

NIGHTS AND HOLIDAYS

| | | |
|------------|-----------------------------|------|
| [REDACTED] |DON B. SHUMWAY JR..... | HOME |
| [REDACTED] | | CELL |
| [REDACTED] |ROBERT K. SHUMWAY..... | HOME |
| [REDACTED] |DON B. SHUMWAY SR..... | HOME |
| [REDACTED] |KARL R. COSS..... | HOME |
| [REDACTED] | | CELL |

PERSONAL INFORMATION WAS REMOVED
BY NRC. NO COPY OF THIS INFORMATION
WAS RETAINED BY THE NRC.

RADIATION SAFETY MANUAL

CHAPTER 9

MAINTENANCE, INSPECTION, CALIBRATION AND LEAK TESTS

Section

- 901. General
- 902. Daily Inspection and Maintenance of Radiography Equipment and Facilities
- 903. Periodic Inspection and Maintenance and Radiography Equipment and Facilities
- 904. Source Installation and Replacement
- 905. Survey Meters
- 906. Pocket Dosimeters
- 907. Sealed Source Leak Tests
- 908. Alarm Ratemeters

RADIATION SAFETY MANUAL

CHAPTER 9

MAINTENANCE, INSPECTION, CALIBRATION AND LEAK TEST

901. General

- I. This chapter describes the program conducted by Prime for the maintenance, inspection and calibration of equipment used for industrial radiography. It covers radiographic exposure devices and equipment, shielded facilities, survey meters and pocket dosimeter calibration, and leak testing of sealed radiography.
- II. This chapter establishes the requirements for the periodic inspection and maintenance of equipment important to the safe operation of the radiography program.
- III. The requirements of this chapter apply to equipment used in radiographic operations conducted under the radioactive material license held by Prime. Equipment shall be inspected in accordance with the instructions of this chapter.
- IV. Personnel shall use only equipment and/or services that are approved and/or supplied by the Radiation Safety Officer. The actual inspection may be done by any certified radiographer. Under no circumstances shall maintenance work be done on exposure or storage devices or radiography sources unless this work is specifically authorized in a radioactive material license (i.e., repair of a ruptured source or any work of that nature is not permitted).

902. Daily Inspection and Maintenance of Radiography Equipment and Facilities

- I. Any equipment or material important to the safe operation of the radiography program shall be inspected for proper operation and the absence of damage prior to use each day. This inspection shall be done by the licensed radiographer in charge of the source. A daily inspection of items to be checked shall be recorded on Form RS-4-4. Any damage or malfunction to the equipment shall be recorded on the Daily Checklist. If the equipment does not pass all checks, it shall be removed from service and tagged to indicate the problem or discrepancy.

Maintenance shall be done in accordance with the Operation and Service Manual for that equipment. After the equipment has been checked and deemed to be acceptable, the radiographer shall note on the Form RS-4-4 that the inspections were acceptable.

II. The daily inspection and maintenance of equipment shall include, but not necessarily be limited to, the following:

- A. Inspect cables for cuts, breaks, and broken fittings.
- B. Inspect source tubes for cuts, broken fittings, and dirt. Rub tubes by hand to detect crimps or other potential physical problems that might prevent smooth operation of exposure devices or source changers.
- C. Check survey meter for operability.
- D. Survey equipment for excessive radiation levels to ensure proper positioning of source inside shield.
- E. Inspect equipment for damages to fittings, locks, fasteners, and labels. Ensure proper operation of locking mechanism.
- F. Inspect crank for damage, loose hardware.
- G. Check operation of cable connection.
- H. Check operation of control for freedom of source movement.

III. If daily operations are conducted at the permanent shielded facility, the audible/visible alarm system shall be checked for operability. Specifically, the visible alarm should be activated by radiation and the audible alarm should be activated when an attempt is made to enter the installation while the source is exposed. If the alarm is malfunctioning, it must be repaired or replaced within 7 days.

903. Periodic Inspection and Maintenance of Radiography Equipment and Facilities

- I. A detailed periodic inspection of the equipment and facilities shall be made by the Radiation Safety Officer or designated radiographer to determine the adequacy of facility and equipment operations and whether operation of a device or facility has been affected by wear, corrosion, or physical abuse.
- II. Such inspections shall be made at intervals not to exceed three months or whenever the device appears to be impaired through abuse or wear. The device shall also be inspected if it has been subjected to unusually severe stress, e.g., dropping or submersion in water. The inspection results shall be recorded on Form RS-7-1 which can be found in Appendix B. An inventory of the equipment covered by the inspection shall also be noted on the inspection checklist.
- III. If the equipment does not pass all the checks, it shall be removed from service and tagged to indicate the problem or discrepancy. Any corrective action taken to resolve the problem shall be recorded on the form. All preventative maintenance and repair shall be done in accordance with the Operation and Service Manual for that equipment, and shall not include any work not specifically authorized in the radioactive material license. After the equipment has been checked and deemed to be acceptable, the Radiation Safety Officer or designated radiographer shall sign the form that the inspections were acceptable. This form shall then be reviewed by the Radiation Safety Officer and kept on file.
- IV. The quarterly inspection and maintenance of equipment shall include, but not necessarily be limited to, the following:
 - A. Inspect cables for cuts, breaks, and broken fittings.
 - B. Inspect source tubes for cuts, crushed areas, and broken fittings.
 - C. Survey equipment for excessive radiation levels to ensure proper positioning of source inside shield.

- D. Inspect equipment for damage to fittings, lock, fasteners, and labels. Ensure proper operation of locking mechanism.
 - E. Inspect crank for damage or loose hardware.
 - F. Check operation of cable connection.
 - G. Check operation of control for freedom of source movement. Lubricate equipment as needed with materials authorized by the equipment manufacturer and/or the Office of Radiation Safety.
 - H. Inspect source connections for wear with the appropriate gage.
 - I. Check for dirt at all connections and tubes.
 - J. Check to ensure storage facilities meet all requirements of radiation levels and labeling.
 - K. Check to ensure all daily checks were completed in accordance with the procedure.
 - L. Review exposure device labeling to ensure that it is identified with a "Caution - Radioactive Materials" sign, source serial number, and curie content.
- V. Permanent shielded facilities for gamma or x-ray radiography shall be checked on a quarterly basis to include the following:
- A. Check door interlocks.
 - B. Check equipment interlocks.
 - C. Test the audible and visible alarms.
 - D. Inspect the access door.
 - E. Evaluate shielding integrity by direct physical radiation surveys using a radiation source with appropriate scattering media.

Record the information on and forward the results to the Radiation Safety Officer. Note any items that are nonfunctional, malfunctioning, or do not meet the requirements of the radioactive material license or the Prime Radiation Safety Program. All items must be repaired and/or replaced within seven (7) days.

VI. X-Ray Equipment

- A. All x-ray equipment shall be maintained in accordance with manufacturers' recommendations.
- B. All x-ray equipment control panels shall be labeled with "Caution X-Rays - This Equipment Produces X-Rays When Energized" with the radiation symbol (magenta on a yellow background).
- C. Daily inspections will be conducted by the radiographer per the instructions of Form RS-4-4.
- D. Quarterly inspection shall be conducted by the Radiation Safety Officer, his Assistant, or designated radiographer, at the end of each calendar quarter.
 - 1. Inspection shall be conducted on the following items:
 - a. X-Ray Tube
 - b. Control Panel
 - c. Control Cable
 - d. Power Cable
 - e. Interlocks
 - f. Visual and Audible Alarms
 - 2. Items found to be defective and/or inoperable shall be repaired or replaced before being returned to service.
 - 3. Inoperable and/or defective items, unable to be repaired or replaced, shall have a rejection tag affixed and shall be removed from service.
 - 4. Equipment tagged "Out of Service" (or similar words) shall be returned to the appropriate equipment manufacturer for maintenance and/or overhaul as required.
- E. Quarterly inventory will be conducted by the Radiation Safety Officer, his Assistant, or designated radiographer.

VII. Other Radiography Equipment

The following radiography shall also be checked periodically to ensure its proper operation:

| | |
|------------------|------------------------------|
| Source Holder | Dosimeter |
| Clamps | Dosimeter Chargers |
| Positioners | Warning Signs and Lights |
| Storage Facility | Radiation Survey Instruments |
| Alarm Ratemeters | |

904. Source Installation and Replacement

- I. Maintenance and required overhaul will be performed prior to initial source installation or replacement. This will be done by a licensed vendor authorized by the NRC/Agreement State to supply such services.
- II. Exposure devices containing sealed sources may be overhauled or exchanged by the Radiation Safety Officer or an individual qualified by the Radiation Safety Officer. If a source is to be exchanged, it will be done using the instructions in Appendix J.

905. Survey Meters

- I. Survey meters shall be checked daily in accordance with Appendix H instructions.
- II. Survey meters shall be calibrated at least every 90 days and after each adjustment or repair of the meter by a commercial vendor authorized by the NRC/Agreement State to supply such services. Meters may also be calibrated in accordance with procedures outlined in Appendix K.

If the survey meter is done by Appendix K procedures, then the Radiation Safety Officer, or an individual qualified by the Radiation Safety Officer, shall perform the calibration.

- III. Survey meters found to be non-operational are to be removed from service. If the cause is determined to be dead batteries, the batteries may be replaced and, if functional checks are okay, the meter may be placed back into service. Otherwise, the meter is to be sent for repair by a commercial service supplier.

- IV. Survey meters out of the current calibration period must be tagged as such, removed from service, and sent for calibration.
- V. Survey meters, when not in use, are to be stored in an area that is not subject to environmental conditions, such as extreme heat, freezing temperatures, or moisture.

906. Pocket Dosimeters

- I. Pocket dosimeters are to be used and worn in accordance with instructions in Chapter 3 and Appendix E.
- II. Only pocket dosimeters that are in the current calibration period are to be used.
- III. Pocket dosimeters that cannot be rezeroed are not to be used. They are to be removed from service and sent for repair.
- IV. Pocket dosimeters shall be stored with assigned film badges when not in use.
- V. Pocket dosimeters are to be leak tested and calibrated in accordance with Appendix L instructions.

907. Sealed Source Leak Tests

- I. Sealed sources shall be tested for leakage at intervals not to exceed six months. Each exposure device using depleted uranium (DU) shielding and an "S" tube configuration must be tested for DU contamination yearly.
- II. Every sealed source transferred to Prime must be accompanied by a current certificate of leak test from the supplier or company transferring the source to Prime. Sealed sources transferred from Prime shall be accompanied by the current certificate of leak test. A certificate of leak test should contain the following information:
 - A. Nuclide
 - B. Source Serial Number
 - C. Activity
 - D. Date of Sample Collection
 - E. Date of analysis
 - F. Leak Test Result in Microcurie units

- III. Any sealed source showing a leak test result greater than 0.005 microcuries shall be removed from service. Upon the instructions given by the Radiation Safety Officer, the source may be leak tested again to verify the original results.
- IV. Only leak test kits supplied by a commercial service authorized by the NRC/Agreement State shall be used in performing each leak test. Leak test assay shall be performed only by a commercial service authorized by the NRC/Agreement State to provide such services.
- V. Leak test sampling and collection shall be done by the Radiation Safety Officer or an individual qualified by the Radiation Safety Officer in accordance with the instructions given in Appendix M.

908. Alarm Ratemeters

- I. Alarm Ratemeters are to be used and worn in accordance with the instructions in Chapter 3 and Appendix E.
- II. Only Alarm Ratemeters that are in current calibration period are to be used.
- III. Before entering a radiation field, the test button should be depressed. The audio signal indicates that the instrument is functioning.
- IV. Alarm Ratemeters are to be calibrated in accordance with Appendix L instructions.

RADIATION SAFETY MANUAL

CHAPTER 10

CONTROL AND ACCOUNTABILITY OF RADIOACTIVE SOURCES

Section

- 1001. General
- 1002. Radioactive Material Definition
- 1003. Labeling for Containers of Licensed Radioactive Materials
- 1004. Radioactive Materials Area
- 1005. Receipt of Radioactive Materials
- 1006. Radioactive Material Accountability
- 1007. Radioactive Material Storage

RADIATION SAFETY MANUAL**CONTROL AND ACCOUNTABILITY OF RADIOACTIVE SOURCES****1001. General**

Licensed radioactive materials (i.e., radiography sources and devices) must be controlled to minimize the exposure of personnel to these sources of radiation and to prevent the unauthorized use or theft of these materials. Radiography sources and devices are controlled by the application of: personnel access control; monitoring and records; adequate packaging; appropriate labeling and marking; material handling procedures supportive of ALARA; receipt control; storage control; and proper disposal means.

1002. Radioactive Material Definition

- I. Licensed byproduct and source materials are defined in Appendix A.
- II. For the purposes of transportation, radioactive materials are any materials in excess of 0.002 uCi per gram.
- III. Radiography sources (Ir-192, Co-60), calibration sources (Cs-137, Co-60), and depleted uranium (DU) used as shielding in exposure devices are, by definition, radioactive materials and must be licensed accordingly.

1003. Labels for Containers of Radioactive Materials

- I. All exposure devices, source changers containing radiography sources, and calibration sources must bear a durable, clearly visible label identifying the radioactive contents. This label shall contain, as a minimum, the radiation caution symbol and the words:

"CAUTION"
"RADIOACTIVE MATERIAL"

- II. The label shall also provide information on:
 - A. Radionuclide identification (Ir-192, Co-60, Cs-137)
 - B. Source activity as of a specific date
 - C. Source serial and model numbers

- D. Date of leak test
 - E. Device serial number and model number
 - F. Licensee's name, address, and telephone number.
- III. Exposure devices and source changers containing depleted uranium (DU) will be labeled as such.
- IV. Exemptions to Labeling
- A. While 10 CFR 20 and corresponding Agreement State regulations contain a number of exemptions to labeling of radioactive material, licensed material coming under the control of Prime will always be labeled in accordance with Sections 2 and 3 above except when the material is packaged and labeled for transportation in accordance with the provision of 49 CFR.
- V. Remove Labeling
- A. Before disposing or transferring of an empty uncontaminated container or package to unrestricted areas, all radioactive material labels must be removed or defaced, or otherwise marked to indicate that the container no longer contains radioactive material.

1004. Radioactive Materials Area

I. Definition

- A. Any area in which licensed material is used or stored and which contains any radioactive material in an amount in excess of 10 times the quantity of such material specified in Appendix C of 10 CFR 20 or corresponding Agreement State regulation shall be classified as a "Radioactive Materials Area".
- B. Any area classified as a radioactive materials area shall be conspicuously posted with a sign that bears the radiation symbol and the words:

"CAUTION"

"RADIOACTIVE MATERIAL(S)"

This applies to all storage facilities whether they are temporary or permanent locations.

II. Access Control

All radioactive material areas shall be maintained as restricted areas and access controlled accordingly. This applies to storage facilities or vehicles on which radiography equipment and sources are stored.

III. Exceptions to Radioactive Materials Areas

The Radiation Safety Officer may exempt radioactive material area posting requirements for the following areas:

- A. An area containing a sealed source need not be posted and controlled as a radioactive materials area, provided the dose rate at twelve inches from the source container does not exceed 5 mrem per hour.
- B. Radioactive Material signs are not required at areas containing radioactive materials for periods of less than eight hours, provided the material is constantly attended by a company qualified individual who will apply positive controls to ensure that no individual is exposed to radiation and radioactive materials in excess of limits prescribed in this manual. This applies to field radiography operations lasting less than the specified time.
- C. An area is not required to be posted as a "Radioactive Materials Area", for any area which is a "High Radiation Area" solely by the presence of radioactive materials packaged and labeled for transportation in accordance with DOT regulations.

1005. Receipt of Radioactive Materials

- I. Requests for purchase of or transfer of radioactive materials must be reviewed and approved by the Radiation Safety Officer or his Assistant to ensure license possession limits are not exceeded, and to properly arrange for receipt of the material.
 - A. For the receipt of licensed material by Prime, the following must be performed:
 - 1. If the package will be delivered by the carrier, arrangements are made to receive the package from the carrier at the time of arrival.

2. If the package is to be picked up at the carrier's terminal, arrangements are made to receive notification by the Radiation Safety Officer or his designate from the carrier at the time of arrival at the carrier's terminal. The package shall be picked up as expeditiously as possible upon notification by the carrier of its arrival (within three hours, if practical).
- II. All incoming packages of radioactive material shall only be handled by the Radiation Safety Officer, his Assistant, a licensed radiographer, or an assistant radiographer working under the direct supervision of the radiographer.
 - III. All incoming packages containing radioactive materials must be surveyed.
 - A. If the dose rate external to the package on the surface exceeds 200 mrem/hour, or 10 mrem/hour at 39 inches, the Radiation Safety Officer shall be informed.
 - B. The survey must be performed within three hours of receipt during working hours, and within 18 hours of receipt outside normal working hours or no later than 3 hours from the beginning of the next work day if it is received after working hours.
 - IV. All survey information shall be recorded on Radioactive Material Source History Record (Form RS-7-2). The form can be found in Appendix B. The information will be kept on file with the Radiation Safety Officer.

1006. Radioactive Material Accountability

- I. The following primary methods are used by Prime for accountability of all radioactive sources under licensed control to assure that such material is not stolen, lost, transferred, or used without proper radiological controls.
 - A. Document, by use of Form RS-7-3 (Inspection Report), all receipt and transfers of radioactive sources. These records will be maintained by the Radiation Safety Officer. The information will be entered indicating the radionuclide, source activity, source model number, and the source container identity.

- B. Conduction of a quarterly physical inventory review by the Radiation Safety Officer or his Assistant, of all radioactive sources received and under Prime control at the end of each calendar quarter.
- C. Periodic review of the utilization log for each source by the Radiation Safety Officer or his Assistant to ensure adequate control on an ongoing basis.

1007. Radioactive Material Storage

- I. Unless under the direct surveillance of the radiographer or assistant radiographer, the exposure device shall be located in its designated storage location to prevent tampering or removal by unauthorized persons.
- II. The designated storage location (see Appendix 0) shall be capable of being locked and shall be locked at all times, except when in use by or under the supervision of authorized persons. The dose rate at the perimeter should not exceed 2 mR/hr.
- III. The designated storage shall be posted as required in section 1004.
- IV. Keys to the storage area shall be controlled by the Radiation Safety Officer.
- V. Prior to removing a source from the storage area proper entries must be made on the Utilization Log RS 4-2.
- VI. When sources are assigned to field use, locked storage container on vehicles or inside the locked vehicles may be employed as approved temporary storage locations. The dose rate in the passenger compartment or at any exterior surface shall not exceed 2 mR/hr. If vehicle storage time is expected to be in excess of 50 hours, the dose rate shall be reduced to 0.6 mR/hr.
- VII. Where storage containers are used, they shall be secured against unauthorized removal. They should be bolted, chained, or placed in a locked room or area.
- VIII. It is unacceptable to leave a device unattended even if chained or secured to a post. The device must be under surveillance or locked in designated storage facilities.

RADIATION SAFETY MANUAL

CHAPTER 11

DISPOSAL OF RADIOGRAPHY SOURCES

Section

1101. Radioactive Waste Disposal

1102. Shipment of Radioactive Waste

RADIATION PROTECTION MANUAL
DISPOSAL OF RADIOGRAPHY SOURCES

1101. Radioactive Waste Disposal

I. Sealed Sources

Transfer of licensed sealed sources for disposal may only be made to a recipient authorized by the NRC/Agreement State to receive these materials for disposal. This is the only method Prime will use for disposal of radiography sources.

II. Other Miscellaneous Waste

Waste resulting from the contamination of equipment from operations within a nuclear utility will be handled on a case-by-case basis. The Radiation Safety Officer will arrange for disposal. Liquid or dry radioactive waste resulting from any other source within the scope of Prime operations will be packaged and disposed of in accordance with burial site criteria for a facility authorized to receive such waste.

1102. Shipment of Radioactive Waste

- I. Radioactive waste must be shipped in accordance with the provisions of Chapter XII of this manual and applicable radiation protection procedures.

RADIATION SAFETY MANUAL

CHAPTER 12

Transportation of Radioactive Material

Section

1201.General

1202.Shipment of Radiography Sources

1203.Shipment of Empty Depleted Uranium Shielded Containers

1204.Shipment of Empty Packages which Previously Contained
Radioactive Material

1205.Air Shipment

1206.Transporting Radioactive Materials in Company Vehicles
on Public Highways

1207.Shipping Papers and Forms

1208.Hazardous Materials Transportation Training

RADIATION SAFETY MANUAL

TRANSPORTATION OF RADIOACTIVE MATERIAL

1201. General

- I. The shipment of licensed by-product materials shall meet the requirements of this chapter. This applies to by-product and source material for which the U. S. Nuclear Regulatory Commission has issued a specific by-product license authorizing Prime to receive, possess, store, use, and transfer. Specifically, the program shall meet the requirements of:
 - A. 49 CFR 171 through 49 CFR 178, Hazardous Material Regulations, Department of Transportation, and
 - B. 10 CFR 71, Packaging of Radioactive Material for Transport, USNRC,
 - C. Any other provisions which are applicable to the transportation of radioactive material.
- II. The company must have an NRC approved Quality Assurance Program for Type B containers, and shall be registered as user in accordance with 10 CFR 71.12 before the first use of NRC-approved transport packages s employed for the shipment of radiography sources. The program may be found in Appendix Q.
- III. Major provisions of the radiation safety instructions applicable to the transportation of radioactive material include the following:
 - A. Containers used to package radioactive materials must meet all requirements of the package specification, or the certificate of compliance, and be proper for the material being packaged. Only packages having a current certificate of compliance will be used in situations that require that type of packaging.
 - B. The estimation of the curie content of a package of radioactive material should be based on the use of calibration information supplied by the source manufacturer.

- C. Radiation and contamination surveys must be performed according to radiation protection procedures. In the event of damage to the package where integrity of the package has been violated, contamination surveys will be performed.
- D. Before authorizing the transport of any licensed radioactive material to any individual or organization, the Radiation Safety Officer must verify that the consignee is authorized to receive the shipment by appropriate review of the consignee's license.
- E. All packages must be properly labeled, marked, and the transport vehicle properly placarded in accordance with DOT regulations.
- F. All shipments of radioactive material must be documented.
- G. All shipments of radioactive materials shall be made by the Radiation Safety Officer, his Assistant, or a radiographer qualified by the Radiation Safety Officer to make such shipments.

1202. Shipment of Radiographic Sources

- I. Ensure that the source is secured in the proper shielded storage position in the shipping container. Inspect the container per Prime's NRC approved Quality Assurance Program.
- II. Attach a security seal with an identification mark to the package closure. (49 CFR 173.412 (a))
- III. If the shipping package is to be placed inside a crate or other outer packaging, the outer packaging must be strong enough to withstand the normal conditions of transport, and must not reduce the safety of the package. The shipping package must be placed in the outer package with sufficient blocking to prevent shifting during transportation.
(49 CFR 173.25)
- IV. Survey the package at the surface and at one meter from the surface to determine the proper radioactive shipping labels to be applied to the package. Use the criteria shown in Table 12-1 at the end of this chapter. (49 CFR 172.403)

NOTE: If a vehicle is transporting a package bearing a "RADIOACTIVE YELLOW III" label, the vehicle shall be placarded on all four sides with a "RADIOACTIVE" placard. The driver has the responsibility of placarding the transporting vehicle prior to the shipment leaving the site. If the driver does not have the proper placards, the radiographer is responsible for providing them. (49 CFR 172.506; 49 CFR 172.507)

- V. Properly complete two shipping labels indicating the contents (Iridium 192, Cobalt 60, etc.), the activity of the source (in becquerels or multiples of becquerels, eg Giga becquerels (GBq)) and the transport index. The transport index is the dimensionless number, rounded up to the first decimal place expressing the maximum radiation level in millirem per hour, at one meter from the package surface. The transport index is used only on Yellow II and Yellow III labels.
(49 CFR 172.403(g); 49 CFR 173.403)
- VI. Assure that any old shipping labels have been removed from the package. Apply two properly completed shipping labels to two opposite sides of the package.
(49 CFR 172.403(f))
- VII. Mark the outside of the outer package with the proper shipping name, Radioactive Material, Special Form N.O.S. and identification number UN 2916 if not already marked. Place the letters RQ (stands for Reportable Quantity) next to the proper shipping name when shipping more than 10 curies of Ir-192, Se-75, Co-60, Yb-169, or 1 curie of Cs-137. (49 CFR 172.300)
- VIII. If package is inside a crate or other outer packaging, mark the outside package "INSIDE PACKAGE COMPLIES WITH PRESCRIBED SPECIFICATIONS" and list the appropriate DOT specification number or USNRC Type B number and the words "Type A" or "Type B" if applicable. Prior to using a Type B container, the shipper must be an authorized user and listed on the certificate of compliance. (49 CFR 172.310; 49 CFR 173.471; 49 CFR 173.25)
- IX. If the package also used depleted uranium as shielding material, a notice must be enclosed in or on the package, included with the packing list or otherwise forwarded with the package. This notice must include the name of the consignor or consignee and the statement:

"THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.426 FOR RADIOACTIVE MATERIAL EXCEPTED PACKAGE - ARTICLES MANUFACTURED FROM DEPLETED URANIUM, UN 2910". (49 CFR 173.422(a)(3))

- X. Coordinate the shipment with the consignee when the shipment is to another jurisdiction other than Prime NDT.
- XI. Properly complete the shipping papers (Straight Bill of Lading). An example is included at the end of this chapter. Indicate the following:
 - A. Proper shipping name (i.e., Radioactive Material, Special Form, n.o.s.), United Nations Class Number "7", and identification number (UN 2916). Place the letters RQ next to the proper shipping name, if there is 10 Curies or more of Iridium 192 or Cobalt 60, or 1 or more Curies of Cesium 137. Under that amount "RQ" is not required.
 - B. Name of Radionuclides (i.e., Iridium 192, Cobalt 60)
 - C. Activity of the source in becquerels (or other appropriate multiples of becquerels) on the DOT label and the shipping papers. Note: Number of curies X 37 = Number of Gigabecquerels (GBq).
 - D. Category of Label applied (i.e., Radioactive Yellow II)
 - E. Transport Index
 - F. USNRC Identification Number or DOT Specification Number (i.e., USNRC: USA/9269/B(U)-XX or DOT-7A, for XX enter either 85 or 96 according to the package certification).
 - G. For export shipments, IAEA Identification Number (i.e., IAEA USA/9269/B(U)-XX, for XX enter either 85 or 96 according to the package certification). For Canadian shipments, include the Canadian Endorsement Number for the package.

H. Shipper's Certification:

"This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transport according to the applicable regulations of the Department of Transportation." (49 CFR 172.204(a))

I. Radiographer's name (printed or typed) and signature. (49 CFR 172.204(d))

J. The shipping paper must indicate an emergency 24-hour phone number. Beepers, pagers and callbacks are not acceptable.

XII. After the carrier has taken receipt of the radioactive source, the Radiation Safety Officer, his Assistant, or a qualified radiographer shall finish completing Form RS-7-3. The source being transferred shall be removed from the inventory log.

XIII. A copy of the shipping bill shall be filed along with Form RS-7-3.

XIV. A receipt will be obtained from the commercial authorized service to whom the source was transferred stating that the source was received, and this will be filed along with Form RS-7-2 (Radioactive Material Source History Record). It shall indicate that this has been done by signing the proper space on Form RS-7-3 (Inspection Report) and filed with the completed form.

1203. Shipment of Empty Depleted Uranium Shielded Containers

I. When empty, depleted uranium shielded shipping containers (source changers, etc.), are to be returned to the commercial authorized service, the following procedure is to be followed:

A. Assure that the package does not contain a radioactive source.

- B. If the package is to be placed inside a crate or other outer packaging, the outer packaging must be strong enough to withstand the normal conditions of transportation. The shipping package must be placed in the outer package with sufficient blocking to prevent shifting during transportation. (49 CFR 173.25)
- C. Assure that removable radioactive contamination on the exterior surface of the outer package does not exceed 0.00001 microcurie per square centimeter. (49 CFR 173.443)
- D. Survey the package at the surface and at one meter from the surface to determine the proper radioactive shipping labels to be applied to the package.
- E. If the surface radiation level is less than 0.5 millirem per hour, and there is no measurable radiation level at one meter from the surface, DOT labels are not required. Mark the outside of the package with the proper shipping name (Radioactive Material Excepted Package - articles manufactured from depleting uranium), the identification number (UN2910), and the statement:

"Exempt from specification packaging, shipping paper and certification, marking and labeling, and exempt from the requirements of 49 CFR Parts 171-178 Except requirements within those parts relating to the reporting of Incidents and decontamination, the training requirements of Subpart H of Part 172 and the shipping paper requirement of Subpart C of Part 172. This exemption is Authorized per 49 CFR 173.426."

Additionally, a notice must be enclosed in or on the package, including the name of the consignor or consignee and the statement:

"This package conforms to the conditions and limitations specified in 49 CFR 173.426 for Radioactive Material Excepted Packages-Articles Manufactured from Depleted Uranium, UN2910."
(49 CFR 173.426; 49 CFR 173.422)

- F. If the surface radiation level exceeds 0.5 millirem per hour, or if there is a measurable radiation level at one meter from the surface, use the criteria of Table 12-1 to determine the proper radioactive shipping labels to be applied to the package. Mark the outside of the outer package with the proper shipping name (RADIOACTIVE MATERIAL, LSA, n.o.s.), and the Identification Number (UN2912). If the container is packaged inside a crate or other outer packaging, mark the outer package with the statement: "Inside Package Complies with the Prescribed Specifications." (49 CFR 172.300)

II. Properly complete the shipping papers indicating:

- A. Proper shipping name (Radioactive Material- LSA-1, n.o.s.) and identification number (UN2912)
- B. Name of Radionuclide (Depleted Uranium)
- C. Physical and Chemical Form (Solid Metal)
- D. Activity (in becquerels or other appropriate multiples of becquerels, or pounds of depleted uranium).
- E. Transport Index (Maximum radiation level at one meter from surface of package)
- F. For Export Shipments, IAEA Identification Number (i.e., IAEA USA/9185/B(U)). (49 CFR 172.203(d)(9))
- G. Shipper's Certification
- "This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transport according to the applicable regulations of the Department of Transportation." (49 CFR 172.204(a))
- H. Radiographer's name (printed or typed) and signature. (49 CFR 172.204(d))
- I. The shipping paper must indicate an emergency 24-hour phone number. Beepers, pagers and callbacks are not acceptable.

- J. The weight per package including the unit of measurement of the hazardous material covered by the description(e.g.,100 lbs.).

1204.Shipment of Empty packages which Previously Contained Radioactive Material

- I. Assure that the package does not contain a radioactive source.
- II. If the package is to be placed inside a crate or other outer packaging, the outer packaging must be strong enough to withstand the normal conditions of transportation. The shipping package must be placed in the outer package with sufficient blocking to prevent shifting during transportation. (49 CFR 173.25)
- III. Assure that the package internals are securely closed or contain no radioactive contamination. (49 CFR 173.29(c))
- IV. Assure that the levels of removable contamination on the outside surface of the shipping package does not exceed 0.001 microcuries per 100 square centimeters. (49 CFR 173.428; 49 CFR 173.443)
- V. Survey the external surface of the container to assure that the radiation levels do not exceed 0.5 millirems per hour. (49 CFR 173.443)
- VI. Assure that any old shipping labels have been removed from the package. Attach an "EMPTY" label to the package. (49 CFR 173.29(e); 49 CFR 173.428(d)).
- VII. Mark the outside of the package with the statement:
"Exempt from specification packaging, shipping paper and certification, marking and labeling, and exempt from the requirements of 49 CFR Parts 171-178 Except requirements within those parts relating to the reporting of Incidents and decontamination, the training requirements of Subpart H of Part 172 and the shipping paper requirement of Subpart C of Part 172. This exemption is Authorized per 49 CFR 173.428."
Additionally, a notice must be enclosed in or on the package, included with the packaging list or otherwise forwarded with the package. The notice must include the name of the consignor or consignee and the

statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.428 for Excepted Radioactive Material, Empty Packages, UN 2908" 49 CFR 173.422; 49CFR 173.428

- VIII. The shipping paper must indicate an emergency 24-hour phone number. Beepers, pagers and callbacks are not acceptable.

1205. Air Shipments

For air shipments, the shipping papers must meet the requirements specified in IATA for a Shipper's Declaration for Dangerous Goods. In addition to the information listed in section 1202 of this chapter, the following information needs to be specified:

- I. Shipper's Certification:
"I hereby certify that the contents of this consignment are fully and accurately described by proper shipping name and are classified, packed, marked and labeled and are in proper condition for carriage by air according to applicable national governmental regulations."
- II. Air Waybill Number: Enter the number of the air waybill to which the declaration form will be attached. (This may be amended by the carrier).
- III. For air shipments, the package must be labeled with a "CARGO AIRCRAFT ONLY" label, and the shipping papers must state:
- IV. Airport of Departure: Enter the full name of the airport of city of departure, which may be amended by the Carrier.
- V. Airport of Destination: Enter the full name of the airport or city of destination, which may be amended by the Carrier.
- VI. Shipment type: Specify the shipment type as "Radioactive."
- VII. Under Nature and Quantity of Dangerous Goods, specify the number of packages (of same type and content), their type of package and activity in becquerels or multiples thereof (units used must be clearly indicated) in each package, including packages in overpacks.

(If relevant) Indication of use of overpack and dimensions of the overpack (including dimensional units). When an overpack is used, the wording "overpack used" must be inserted on the declaration form immediately after all the relevant entries relating to the packages within the overpack. In such cases, packages within overpacks must be listed first. Dimension units must be in multiples of meters.

- VIII. The radiographer shall complete three (3) copies of the Shipper's Certificate for Radioactive Materials from Official Air Transport Restrictive Articles Tariff 6-D, included at the end of this chapter. These shall be attached to the shipping invoice. If the sources are to be shipped by surface transportation, these forms are not required.

1206. Transporting Radioactive Material in Company Vehicles on Public Highways

- I. Assure that the vehicle used is in sound mechanical Condition and carries the normal complement of safety equipment including Radiation Area signs, a length of rope, spare tire, fire extinguisher, a set of vehicle tools and a set of flares. Assure that the glove compartment contains the vehicle registration certification and an operatable flashlight. The vehicle used is required to carry two calibrated and operable survey meters. Additionally, the radiographer is required to wear a film badge, and a direct reading pocket dosimeter.
- II. A radiographer or assistant radiographer shall be in constant attendance during transit. The Radiation Safety Officer may authorize non-radiographers to transport packages to and from commercial carriers and temporary job sites.
- III. Assure that the shipping package is properly packaged, marked, and labeled, and the proper shipping papers are completed in accordance with the instructions of Section 1202 of this chapter.
- IV. Place the radioactive material package in the vehicle. Secure the package against movement in the vehicle.
(49 CFR 177.834)

V. Survey the driver's compartment to insure that the radiation level does not exceed two (2) millirems per hour. (49 CFR 177.842(g))

VI. If the vehicle is transporting a package bearing a "RADIOACTIVE YELLOW III" label, the vehicle must be placarded on all four sides with a "RADIOACTIVE" placard. (49 CFR 172.504)

Note: Operation of a vehicle that is required to be placarded requires compliance with the Federal Motor Carrier Safety Regulations (49 CFR 390.397) and Highway Routing and Driver Training requirements (49 CFR 177.816)

VII. Any vehicle that is required to be placarded must bear the carrier's name on both sides, i.e., Prime N.D.T. Services, Inc. (49 CFR 394.21)

VIII. Complete the Operations Report (Form RS-4-4)

IX. If the vehicle becomes disabled on the road, do not leave the vehicle unguarded when going for help. A message for help may be sent by a passing motorist or the police may be enlisted to guard the vehicle.

X. Should any kind of accident occur, make an immediate radiation survey to see where, if at all, the radiation levels are higher than normal. If any abnormal radiation areas exist, keep all persons out of them and get police assistance, if possible. If radioactive sources have escaped from their packaging, notify the Radiation Safety Officer. Do not leave the scene without assuring that someone responsible (such as police) will keep people away from radiation area.

XI. Collect information and names of persons potentially exposed to radiation in excess of the guidelines. Call the Radiation Safety Officer promptly, giving him as much information as possible about the condition of the radioactive sources.

XII. If a source should escape from its packaging, the vehicle operator should make no attempt to restore the source by himself, but he should wait for assistance from the Radiation Safety Officer.

- XIII. If the vehicle is going to be used for storage of radioactive material at a temporary job site:
- a) the vehicle must be posted with, "Caution Radioactive Material" signs.
 - b) The vehicle must be secured/locked so that there is no unauthorized access.
 - c) Radiation levels must be below 2 mR/hr outside the vehicle to meet unrestricted area requirements.

1207. Shipping Forms and Papers




Transporting a source in a company vehicle will be documented on the Operation's Report RS-4-4.

1208. Hazardous Materials Transportation Training

Prime N.D.T. Services, Inc. will train and certify all employees for hazardous materials transportation in accordance with the NRC DOT joint agreement on hazardous materials transportation in accordance with the NRC Information Notice # 92-72, dated Oct. 28, 1992, and 49 CFR Part 172, Subpart H, Sections 172.700 - 172.704, and 172.800, 10 CFR 30 on how to recognize and respond to security threats.

TABLE 12-1
GUIDELINES - DOT WARNING LABELS

Transport Labels with Maximum Radiation Levels

| | Maximum Radiation Level at Surface | Maximum Radiation Level at 1 Meter |
|---|---|---|
| <p>Radioactive White I</p>  | <p>0.5 mRem/hr (0.005 mSv/hr)</p> | <p>None</p> |
| <p>Radioactive Yellow II</p>  | <p>50 mRem/hr (0.5 mSv/hr)</p> | <p>1.0 mRem/hr (0.01 mSv/hr)</p> |
| <p>Radioactive Yellow III</p>  | <p>200 mRem/hr (2 mSv/hr)</p> | <p>10 mRem/hr (0.1 mSv/hr)</p> |

RADIATION SAFETY MANUAL

CHAPTER 13

QUALITY CONTROL AND ASSURANCE

Section

1301.General

1302.Quality Control

1303.Quality Assurance

RADIATION SAFETY MANUAL
QUALITY CONTROL AND ASSURANCE

1301. General

- I. Prime provides quality control and assurance to its radiation safety program through the use of an internal inspection and audit program.
- II. This program provides continuing surveillance of safety operations to give timely information on program effectiveness. It is a measure by which Prime formulates its goals and strategic planning in administering the radiation safety program.

1302. Quality Control

- I. Prime will assure quality control of its radiographic operations through a program of personnel, facilities, and equipment audits.

A. Frequency

Personnel audits are conducted at intervals not to exceed six months, and include observation of the performance of each radiographer and assistant radiographer during actual radiographic operations with a gamma exposure device. If a radiographer or assistant radiographer has not participated in radiographic operations for more than three months since the last audit, the individual's performance must be audited the next time the individual participates in radiographic operations. Use RS-6-1 in Appendix N.

B. Personnel

Personnel audits can be conducted by the Radiation Safety Officer or his Assistant, the President, or a qualified individual appointed from an outside consulting service. The same individuals can also conduct facility and equipment reviews.

C. Findings

Each inspection point on the checklist shall be inspected to the degree necessary to assure that the requirements are being met. Any findings indicating that a requirement is not met are to be thoroughly documented. Each completed audit

is to be submitted to the Radiation Safety Officer within three working days of the completion of the audit. The Radiation Safety Officer will notify administrative management of audit results.

D. Corrective Actions

1. Negative findings must be addressed. Upon receipt of an audit report with negative findings, the responsible individual will have ten working days to respond with corrective actions. The corrective actions will address the validity of the finding(s), the action taken to correct the negative findings, and actions that will be taken to prevent the recurrence. Alternatively, the Radiation Safety Officer or his Assistant will provide refresher training as a corrective actions measure.
2. Corrective actions on any finding will be verified at the next scheduled audit. The auditor will evaluate and document the adequacy of any actions taken. The Radiation Safety Officer may, at his discretion, direct special audits to verify that appropriate corrective action measures are in progress.

E. Scheduling

Audits will be scheduled by the Radiation Safety Officer under the direction/approval of the Program Director. Where audits are to be performed by a member of administrative management, these inspections will be coordinated through the Office of Radiation Safety.

1303. Quality Assurance

- I. Prime will provide quality assurance of radiographic operations through a comprehensive program evaluation performed at the direction of the President, Prime N.D.T. Services, Inc. The President will provide direction on the areas to be reviewed with specific emphasis on program element concerns that have surfaced during internal inspections conducted under Quality Control activities discussed in Section 1302.

A. Frequency

The comprehensive review will be conducted on at least an annual basis. Alternatively, the review may be performed in segments over a twelve-month period, with all areas being completed by the end of a twelve-month cycle.

B. Personnel

The review will be performed by the Radiation Safety Officer and/or a member of administrative management from the Vice-President level or above. Prime may also contract a qualified outside consulting service to perform any or all elements of the program review.

C. Findings

A written report on the comprehensive evaluation findings will be completed and submitted to the President within thirty days of completion of the review. The report will document all positive and negative findings, observations, recommendations, and comments formulated as a result of the review.

D. Corrective Actions

1. Any negative findings attributable to a specific project will be corrected. The corrective actions will address the validity of the finding(s), the actions taken to correct the item, and the actions taken to prevent a reoccurrence.
2. Any negative findings that are generic in nature will be addressed in a written reply from the Radiation Safety Officer to the President, Prime N.D.T. Services, Inc.

E. Scheduling

The comprehensive evaluation will be scheduled by the President, Prime N.D.T. Services, Inc., at the advice of the Radiation Safety Officer.

RADIATION SAFETY MANUAL

CHAPTER 14

Manual Transmittal and Revision

Section

1401.General

1402.Manual Transmittal and Revision

1403.Implementation

RADIATION SAFETY MANUAL

MANUAL TRANSMITTAL AND REVISION

1401. General

- I. A Manual Transmittal and Revision (MTR) provides a mechanism for Prime to implement operational changes in the Radiation Safety Program as a result of regulatory or management changes, directives, or inquiries. The MTR may also result from comments or suggestions made from field operations personnel. The MTR supplies specific information addressing the needed or directed changes in Prime operations. The MTR is only a change in operational approach. It does not relax or diminish regulatory requirements or commitments made in the Radiation Safety Program.

1402. Manual Transmittal and Revision Authorization

A MTR shall only be initiated by the Radiation Safety Officer with the approval of the President. The issued MTR shall be signed by the Radiation Safety Officer. No other changes should be considered or implemented outside of this mechanism. Any changes made as a result of field operational experience must be made through the MTR system.

1403. Implementation

- I. The Radiation Safety Officer is responsible for implementing an issued MTR within the program. Any issues or problems that may result from a MTR are to be resolved with the Radiation Safety Officer.
- II. The Office of Radiation Safety will evaluate the effectiveness of MTR implementation during the next scheduled audit of the affected item.
- III. These changes are documented through use of the Manual Transmittal and Revision Receipt Form. This form can be found in Appendix B.

APPENDIX A
GLOSSARY OF TERMS
AND ABBREVIATIONS

"DEFINITIONS"

| | |
|---------------------------|---|
| ACTIVITY..... | The rate of disintegration or decay of radioactive material. The units of activity are the curie (Ci) and the Becquerel (Bq). |
| AGREEMENT STATE..... | A State which has accepted regulatory authority over by-product material from the USNRC. |
| ALARA..... | Acronym for "As Low As Reasonably Achievable" means making every reasonable effort to maintain exposures as far below the dose limits as practical. |
| ALPHA PARTICLE..... | A positively charged particle emitted by certain radioactive materials. It is made up of two (2) neutrons and two (2) protons, hence it is identical to the nucleus of a helium atom. |
| ATOM..... | A particle of matter indivisible by chemical means. It is the fundamental building block of chemical elements. |
| ATOMIC NUMBER..... | Denotes the number of protons in the nucleus, the number of positive charges in the nucleus, and the number of orbiting electrons. |
| AUTHORIZED PERSONNEL..... | As used in this part - means personnel qualified as Radiographers and Radiographer Assistants in accordance with USNRC - 10-CFR - Part 34 or applicable licensed state regulations. |

DEFINITIONS: (continued)

| | |
|-------------------------------|---|
| BACKSCATTER..... | Radiation scattered from the floor, walls, equipment, and other items in the area of a radiation source. |
| BACKGROUND RADIATION..... | Radiation from cosmic sources: naturally occurring radioactive materials, including Radon gas. |
| BETA PARTICLE (BETA RAY)..... | An elementary particle emitted from a nucleus during radioactive decay. It has a single electrical charge and a mass equal to 1/1840 that of a proton. Beta particles are easily stopped by a thin sheet of metal. A negatively charged beta particle is physically identical to the electron. If the beta particle is positively charged, it is called a positron. Beta radiation may cause skin burns and beta emitters are harmful if inhaled or ingested. |
| BY-PRODUCT MATERIAL..... | In atomic energy law, any radioactive material (except source or fissionable material obtained in the process of producing or using source or fissionable material. Includes fission products and many other radioisotopes produced in nuclear reactors. |
| CALIBRATION..... | As used in this part - means to check the accuracy of radiation measuring instruments against a known standard and correct as required. |
| CESIUM-137..... | A radioisotope of the element Cesium. |
| COBALT-60..... | A radioisotope of the element Cobalt. |

DEFINITIONS: (continued)

COLLIMATOR.....A radiation shield that is placed on the end of the guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

COMPTON SCATTERING.....A process in which a photon transfers a portion of its energy to an orbital electron in matter and a lower energy photon is scattered at an angle to the original photon path.

CONTAMINATION.....The presence of unwanted radioactive matter, or the "soiling" of objects or materials with "radioactive dirt".

CONTROLLED AREA.....An area outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason.

CURIE.....The basic unit used to describe the intensity of radioactivity in a sample of material. One (1) curie equals 37 billion disintegrations per second, or approximately the radioactivity of one (1) gram of Radium.

DECAY.....The spontaneous radioactive transformation of one (1) nuclide into a different energy state of the same nuclide. Every decay process has a definite half-life. (see half-life)

DEFINITIONS: (continued)

| | |
|--------------------------------|---|
| DECLARED PREGNANT WOMAN..... | A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. |
| DECONTAMINATION..... | The removal of radioactive contaminants from surface, as by cleaning and washing with chemicals. |
| DOSE..... | A generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent. |
| DOSE EQUIVALENT..... | The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv). |
| DOSE RATE..... | The radiation dose delivered per unit time and measured, for instance, in rems per hour. (see dose) |
| DOSIMETER..... | A device that measures radiation dose. It contains an ionization chamber. |
| DOSIMETER CHARGER..... | A device used to charge a dosimeter. |
| ELECTROMAGNETIC RADIATION..... | Radiation consisting of electric and magnetic waves that travel at the speed of light. e.g. light, radio waves, gamma-rays, x-rays. All can be transmitted through a vacuum. |

DEFINITIONS: (continued)

| | |
|-------------------------------|---|
| ELECTRON..... | An elementary particle with a unit negative electric charge and a mass 1/1840 that of the proton. Electrons surround the atom's positively charged nucleus and determine the atom's chemical properties. |
| ELEMENT..... | One of the 104 known chemical substances that cannot be divided into simpler substances by chemical means. e.g. hydrogen, lead, uranium. |
| EMERGENCY PROCEDURE..... | Procedure to be followed by radiographers and radiographer assistants in the event of an accident, equipment malfunction, or uncontrolled conditions existing while engaging in radiographic activities. |
| ENCAPSULATION..... | The process of sealing radioactive materials to prevent contamination. |
| ENTRANCE OR ACCESS POINT..... | Any location through which an individual could gain access to radiation areas or radioactive materials. |
| EXPOSURE..... | Being exposed to ionizing radiation or to radioactive material. |
| FILM BADGE..... | A package of photographic film worn like a badge by workers in the nuclear industry to measure exposure to ionizing radiation. The absorbed dose can be calculated by the degree of film darkening caused by the irradiation. |

DEFINITIONS: (continued)

- GAMMA-RAYS.....High energy short wavelength electromagnetic radiation emitted by a nucleus. Energies of gamma-rays are usually between 0.010 and 10 MF. X-rays also occur in this energy range, but are not of nuclear origin. Gamma-radiation usually accompanies alpha and beta emissions and always accompanies fission. Gamma-rays are very penetrating and are best attenuated by dense materials like lead and depleted uranium.
- GEIGER COUNTER.....A radiation detection and measuring instrument. It contains a gas-filled tube which discharges electrically when ionizing radiation passes through it. Discharges are counted to measure the radiation's intensity.
- GENETIC EFFECTS OF RADIATION.....Effects that produce changes in those cells of organisms which give rise to egg or sperm cells and therefore affect offspring of the exposed individuals.
- GOVERNMENT AGENCY.....Means any executive department, commission, independent establishment, corporation, wholly or partly owned by the United States of America, which is an instrumentality of the United States, or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the Government.
- GRAY.....The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 Joule/Kilogram (100 rads.)

DEFINITIONS: (continued)

HALF-LIFE.....The time in which half the atoms in a radioactive substance disintegrate. Half-lives vary from millionths of a second to billions of years.

HALF-LIFE - BIOLOGICAL.....The time required for a biological system, such as a man or an animal, to eliminate by natural processes, half the amount of a substance which has entered into it.

HALF-VALUE LAYER.....Is that thickness of material required to absorb one-half of the impinging radiation.

HIGH RADIATION AREA.....Means any area, accessible to personnel, in which there exists radiation originating in whole or in part within licensed material at such levels that a major portion of the body could receive in any one (1) hour a dose in excess of 100 millirem.

HOT CELLS.....A heavily shielded enclosure in which radioactive materials can be handled remotely through the use of manipulators and viewed through shielded windows so that there is no danger to personnel.

INDUCED RADIOACTIVITY.....Radioactivity that is created by bombarding a substance with neutrons in a reactor or with charged particles produced by particle accelerators.

INVERSE SQUARE LAW.....(at a distance from a point source) The intensity of radiation received varies as the inverse square of the distance of the source.

DEFINITIONS: (continued)

| | |
|-------------------------|--|
| ION..... | An atom or molecule that has lost or gained one or more electrons. By such "ionization" it becomes electrically charged. |
| IONIZATION..... | The process of adding electrons to, or knocking electrons from, atoms or molecules, thereby creating ions. High temperatures, electrical discharges, and nuclear radiation can cause ionization. |
| IONIZATION CHAMBER..... | An instrument that detects and measures ionizing radiation by observing the electrical current created when radiation ionizes gas in the chamber, making it a conductor of electricity. |
| IRIDIUM 192..... | A radioisotope of the element Iridium. |
| ISOTOPE..... | Atoms with the same atomic number (same chemical element) but different atomic weights. An equivalent statement is that the nuclei have the same number of protons but different numbers of neutrons. Thus, 6^{c12} , 6^{c13} , and 6^{c14} are isotopes of the element carbon, the subscripts denoting their common atomic numbers, the superscripts denoting the varying atomic weights. |
| LEAK TEST..... | A test on sealed sources to assure that radioactive material is not being released. |
| LICENSED MATERIAL..... | Source material, special nuclear material, or by-product material received, possessed, used, or transferred under a general or specific license issued by the Nuclear Regulatory Commission. |

DEFINITIONS: (continued)

LICENSEE.....The holder of the license.

LIMITS.....(DOSE LIMITS) The permissible upper bounds of radiation doses.

LOST OR MISSING LICENSED MATERIAL..Licensed material who's location is unknown. It includes material that has been shipped but has not reached it's destination and whose location cannot be readily traced in the transportation system.

MEV.....Million electric volts.

MILLI.....A prefix that divides a basic unit by one thousand.

NEUTRON.....An uncharged elementary particle with a mass nearly equal to that of the proton. The isolated neutron is unstable and decays with a half-life of about 13 minutes into an electron, proton, and neutrino. Neutrons sustain the fission chain reaction in a nuclear reactor.

NONDESTRUCTIVE TESTING.....Testing to detect internal and concealed defects in materials using techniques that do not damage or destroy the items being tested.

NUCLEAR REACTOR.....A device by means of which a fission chain reaction can be initiated, maintained, and controlled. Its essential component is a core with a fissionable fuel. It usually has a moderator, a reflector,

DEFINITIONS: (continued)

shielding, and control mechanisms.

NUCLEUS.....The small, positively charged core of an atom. It is only about 1/10,000 the diameter of the atom, but contains nearly all the mass. Except for ordinary hydrogen, all nuclei contain both protons and neutrons.

OCCUPATIONAL DOSE.....Includes exposure of an individual to radiation (1) in a Restricted Area; or (2) in the course of employment in which the individuals' duties involved exposure to radiation; provided that "Occupational Dose" shall not be deemed to include any exposure of an individual to radiation for the purpose of medical diagnosis or medical therapy of such individual.

OPERATING PROCEDURE(S).....As used in this part - instructions to be "STRICTLY" followed for radiographic activities.

PERSON.....Means (1) any individual, corporation, partnership, firm, association, trust, estate, government agency other than the commission, and state, any foreign government or nation or any political subdivision of any such government or nations, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.

DEFINITIONS: (continued)

PERSONNEL MONITORING EQUIPMENT.....Means device designed to be worn or carried by an individual for the purpose of measuring the dose received. e.g. film badges, pocket chambers, pocket dosimeters, film rings, etc.

PHOTOELECTRIC EFFECT.....A process by which electromagnetic radiation imparts energy to matter.

PHOTON.....A discrete quantity of electromagnetic energy. Photons have momentum but no mass or electrical charge.

PLANNED SPECIAL EXPOSURE.....An infrequent exposure to radiation. Separate from and in addition to the annual dose limits.

PROJECTOR.....As used in this part - a radiographic exposure device containing a licensed radioactive isotope for industrial radiography applications.

PROTON.....An elementary particle with a single positive electrical charge and a mass approximately 1840 times that of the electron. The atomic number of an atom is equal to the number of protons in its nucleus.

RAD.....Radiation absorbed dose. The special unit of absorbed dose of ionizing radiation. One rad is equal to the absorption of 100 ergs of radiation energy per gram of matter.

RADIATION.....(ionizing radiation) means alpha particles, beta particles, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing

DEFINITIONS: (continued)

ions. Radiation, as used in this part, does not include non-ionizing radiation, such as radio- or microwaves, or visible, infrared, or ultraviolet light.

RADIATION AREA.....Means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.0005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

RADIATION SAFETY OFFICER (R.S.O.)..An individual with the responsibility for the overall radiation safety program on behalf of the licensee and who meets the requirements of 10 CFR 34.42.

RADIATION SAFETY.....The process of using an instrument (survey meter) to measure the presence of ionizing radiation.

RADIATION SURVEY METER.....An instrument that instantly measures radiation rate or intensity. Used for monitoring Radiation Area.

RADIOACTIVE.....Atoms which are energetically unstable and decay to a stable condition by emitting radiation are said to be radioactive.

RADIOGRAPHER.....Means any individual who performs or who, in attendance at the site where the sealed source or sources are being used, personally supervises industrial radiographic operations and who is responsible to the licensee for assuring compliance with the requirements of the

DEFINITIONS: (continued)

Commission's regulations and
the conditions of the license.

RADIOGRAPHER'S ASSISTANT.....Means any individual who, under
the personal supervision of a
radiographer, uses radiographic
exposure devices, sealed sources
or related handling tools, or
survey instruments in
radiography.

RADIOGRAPHIC EXPOSURE DEVICE.....(also called a camera, or a
projector) Means any instrument
containing a sealed source
fastened or contained therein,
in which the sealed source or
shielding thereof may be
moved, or other-wise changed,
from a shielded to unshielded
position for purposes of making
a radiographic exposure.

RADIOGRAPHY.....Means the examination of the
structure of materials by
nondestructive methods utilizing
sealed sources of by-product
material and other sources of
ionizing radiation.

RADIOISOTOPE.....An unstable isotope of an
element that decays or disinte-
grates spontaneously, emitting
radiation. More than 1300
natural and artificial radio-
isotopes have been identified.

REDUCTION FACTOR.....Dose rate without a shield
divided by the dose rate with
a shield interposed between
source and a point at which
radiation is measured.

REGISTRATION STATES.....States that "do not" have
jurisdictional licensing control
of radioactive material but are
governed by the USNRC regulatory
requirements. However, these
states require that radiation

DEFINITIONS: (continued)

producing devices used within
their state be registered.

RELATIVE BIOLOGICAL
EFFECTIVENESS (RBE).....

The relative effectiveness of
a given kind of ionizing
radiation in producing a bio-
logical response as compared
with 250,000 electron volt
gamma-rays.

REM.....Roentgen equivalent man. A
special unit of absorbed
radiation dose in biological
matter. It is equal to the
absorbed dose in rads
multiplied by the relative
biological effectiveness of the
radiation.

RESTRICTED AREA.....A area where access is limited
by the licensee for the purpose
of protecting individuals
against undue risks from
exposure to radiation and
radioactive materials.
Restricted area does not
include areas used as
residential quarters, but
separate rooms in a residential
building may be set apart as a
restricted area.

ROENTGEN.....A unit of exposure dose of
ionizing radiation. It is that
amount of gamma or x-rays
required to produce ions
carrying one (1) electrostatic
unit of electrical charge in
one(1) cubic centimeter of dry
air under standard conditions.

SCATTERING.....A process that changes a
particle's or photon's
trajectory. Scattering is
caused by collisions with
atoms, nuclei, and other
particles. If the scattered

DEFINITIONS: (continued)

particles' energy is unchanged by the collision, elastic scattering prevails; if there is a change in energy, the process is called inelastic scattering.

SEALED SOURCE.....Means any by-product material that is encased in a capsule designed to prevent leakage or escape of the by-product material.

SIEVERT.....The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rems).

SHIELD.....A layer or mass of material used to reduce the passage of ionizing radiation.

SOURCE PIPE POSITIONER.....A source positioning device for making single wall exposures on piping by means of a radiographic access hole or opening.

STABLE ISOTOPE.....A nuclide that does not undergo radioactive decay.

STORAGE CONTAINER.....Means a device in which sealed sources are transported or stored.

SURVEY.....Means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and

DEFINITIONS: (continued)

| | |
|-------------------------------|--|
| | measurements of levels of radiation. |
| SURVEY METER..... | A portable instrument which measures dose rate of exposure or radiation intensity. |
| UNRESTRICTED AREA..... | An area where access to is neither limited nor controlled by the licensee. |
| U.S.N.R.C..... | United States Nuclear Regulatory Commission. |
| VERY HIGH RADIATION AREA..... | An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from the radiation source. |
| WASTE, RADIOACTIVE..... | Equipment and materials (from nuclear operations) which are radioactive and for which there is no further use. |
| X-RAY..... | Penetrating electromagnetic radiation emitted when the inner orbital electrons of an atom are excited and release energy. Thus, the radiation is not nuclear in origin and is generated in practice by bombarding a metallic target with high-speed electrons. |
| YEAR..... | The period of time beginning in January used to determine compliance with the provisions of this part. |

Abbreviations

| | |
|---------------|---|
| ALARA..... | As low as reasonably achievable |
| Bq..... | Becquerel |
| BPR..... | Business Process Redesign |
| CFR..... | Code of Federal Regulations |
| cm..... | centimeter |
| COC..... | Certificate of Compliance |
| DOE..... | U.S. Department of Energy |
| DOT..... | U.S. Department of Transportation |
| DU..... | depleted uranium |
| GPO..... | Government Printing Office |
| hr..... | hour |
| IN..... | Information Notice |
| mrem..... | millirem |
| mSv..... | millisievert |
| NARM..... | Naturally-occurring and Accelerator- produced Radioactive Material |
| NIST..... | National Institute of Standards and Technology |
| NMSS..... | Office of Nuclear Materials Safety and Safeguards |
| NRC..... | U.S. Nuclear Regulatory Commission |
| NVLAP..... | National Voluntary Laboratory Accreditation Program |
| OC..... | Office of the Controller |
| OCR..... | optical character reader |
| OMB..... | Office of Management and Budget |
| RQ..... | reportable quantities |
| RSO..... | Radiation Safety Officer |
| SI..... | International System of Units (abbreviated SI from the French Le Système Internationale d'Unités) |
| SS&D BBS..... | Sealed Source and Devices Bulletin Board System |
| SSD..... | Sealed Source and Device |
| Sv..... | Sievert |
| TEDE..... | Total effective dose equivalent |
| TI..... | Transportation Index |
| TLD..... | Thermoluminescent dosimeters |
| URL..... | Uniform Resource Locator |

Prime NDT Services, Inc.

APPENDIX B

COMPANY RECORDS FORMS

FORM INDEX

TABLE 4-J: CALCULATIONS FOR BOUNDARIES EXCEEDING 2 MR/HR

FILM BADGE TRANSMITTAL/RECEIPT FORM

FORM RS-4-1: DOSIMETER RADIATION RECORD

FORM RS-4-2: UTILIZATION LOG

FORM RS-4-4: RADIOGRAPHIC OPERATIONS REPORT

FORM RS-10-1: SHIPPING/CERTIFICATION DOCUMENT FOR RADIOACTIVE
MATERIALS

FORM RS-6-1: RADIOGRAPHER'S PERFORMANCE REVIEW

FORM RS-7-1: QUARTERLY INSPECTION AND MAINTENANCE OF
IRIDIUM-192/COBALT-60 PROJECTOR TYPE EXPOSURE
DEVICES

FORM RS-7-1A: YEARLY INSPECTION AND MAINTENANCE OF
IRIDIUM-192/COBALT-60 PROJECTOR TYPE EXPOSURE
DEVICES

FORM RS-7-2: RADIOACTIVE MATERIAL SOURCE HISTORY RECORD

FORM RS-7-3: INSPECTION REPORT

FORM RS-8-1: LEAK TEST RECORD

MANUAL TRANSMITTAL AND REVISION RECEIPT FORM

RADIATION SAFETY RELATED INCIDENT DATA REPORT

RADIATION SAFETY REPORTING REQUIREMENTS 10 CFR 34.101

RADIOACTIVE LEAK TEST PROCEDURE QUALIFICATION

RADIOACTIVE SOURCE CHANGE QUALIFICATION

FORM RS-5-1A: RECORD OF PERSONNEL CERTIFICATION

FORM RS-5-2A: RADIOGRAPHER'S PERIODIC REFRESHER TRAINING

FORM RS-5-2B: CERTIFICATE OF UNDERSTANDING

19.11 POSTING OF NOTICES TO WORKERS

"SUPPLEMENTAL TABLE"

[illegible]

| <u>EXPOSURE TIME</u> <u>IN ANY HOUR</u> | <u>RADIATION LEVEL</u> <u>AT BOUNDARY</u> |
|--|--|
| 60 Minutes | 2 MR/HR |
| 30 Minutes | 4 MR/HR |
| 20 Minutes | 6 MR/HR |

| <u>EXPOSURE TIME</u> <u>IN ANY HOUR</u> | <u>RADIATION LEVEL</u> <u>AT BOUNDARY</u> |
|--|--|
| 5 Minutes | 24 MR/HR |
| 2 Minutes | 60 MR/HR |
| 1 Minute | 120 MR/HR |

Prime NDT Services, Inc.

"FILM BADGE TRANSMITTAL/RECEIPT FORM"

ATTACHED HEREWITH IS YOUR PERSONAL DOSIMETRY REPORT FOR THE MONTH
BEGINNING THE 20TH DAY OF _____ TO AND
INCLUDING THE 19TH DAY OF _____.

ATTACHED IS YOUR MONTHLY FILM BADGE NO. _____
COINCIDING WITH THE ABOVE DATE.

PLEASE ACKNOWLEDGE RECEIPT OF THIS TRANSMITTAL BY YOUR SIGNATURE
AND DATE OF RECEIPT. RETURN YOUR PREVIOUS DOSIMETRY REPORT AND
FILM BADGE ATTACHED TO THIS FORM - WITHIN 2 DAYS AFTER YOU ARE IN
RECEIPT OF THIS FORM.

DATE RECEIVED: _____ RETURN DATE: _____

RECEIVED BY: _____
(SIGNATURE)

COMMENTS:

FORM RS-4-1
Rev. 0

DOSIMETER RADIATION RECORD

FOR OFFICE USE ONLY:

Total ALL mR _____

Period From _____ To _____

NAME:

SOCIAL SECURITY NO.:

TOTAL mR X-RAY:

MONTH:

YEAR:

JOB LOCATION:

TOTAL mR GAMMA:

Dosimeters must be recharged at the beginning of each day/shift and at any time they approach 75% of full scale.

Readings MUST be recorded DAILY. For any day not worked place N/A or Draw a line in that blank, on days worked place the difference of your two (2) readings in the appropriate space.

| DATE | NAME (SIGNATURE) | DOSIMETER | CAL. DUE | AMOUNT OF | | ALARM | CAL. DUE | FILM BADGE |
|------|---------------------|-----------|----------|--------------------|-------|-------|----------|---------------|
| | | S/N | DATE: | RADIATION RECEIVED | | METER | DATE: | |
| | | | | X-RAY | GAMMA | SN# | | |
| 20 | | START | END | mR | mR | CK | CK | |
| 21 | | START | END | mR | mR | CK | CK | |
| 22 | | START | END | mR | mR | CK | CK | |
| 23 | | START | END | mR | mR | CK | CK | |
| 24 | | START | END | mR | mR | CK | CK | |
| 25 | | START | END | mR | mR | CK | CK | |
| 26 | | START | END | mR | mR | CK | CK | |
| 27 | | START | END | mR | mR | CK | CK | |
| 28 | | START | END | mR | mR | CK | CK | |
| 29 | | START | END | mR | mR | CK | CK | |
| 30 | | START | END | mR | mR | CK | CK | |
| 31 | | START | END | mR | mR | CK | CK | |
| 1 | | START | END | mR | mR | CK | CK | |
| 2 | | START | END | mR | mR | CK | CK | |
| 3 | | START | END | mR | mR | CK | CK | |
| 4 | | START | END | mR | mR | CK | CK | |
| 5 | | START | END | mR | mR | CK | CK | |
| 6 | | START | END | mR | mR | CK | CK | |
| 7 | | START | END | mR | mR | CK | CK | |
| 8 | | START | END | mR | mR | CK | CK | |
| 9 | | START | END | mR | mR | CK | CK | |
| 10 | | START | END | mR | mR | CK | CK | |
| 11 | | START | END | mR | mR | CK | CK | |
| 12 | | START | END | mR | mR | CK | CK | |
| 13 | | START | END | mR | mR | CK | CK | |
| 14 | | START | END | mR | mR | CK | CK | |
| 15 | | START | END | mR | mR | CK | CK | |
| 16 | | START | END | mR | mR | CK | CK | |
| 17 | | START | END | mR | mR | CK | CK | |
| 18 | | START | END | mR | mR | CK | CK | |
| 19 | | START | END | mR | mR | CK | CK | |

This Utilization Log will be maintained for sealed sources and their exposure devices, X-ray machines, and survey meter Calibration devices removed from the permanent storage facility at Prime, Whitehall, PA. This Log will remain at the storage vault and the following information must be maintained:

[illegible]

This Utilization Log must be kept up-to-date and available for review by the Company R.S.O. at all times.

PRIME N.D.T. SERVICES, INC.

RADIOGRAPHIC OPERATIONS REPORT

FORM: RS-4-4

24 HR EMERGENCY NO. 610-262-1100

Rev. 1

PART A: WARNING: Intentional Failure to Record Information Accurately on this Form may Result in a Fine and/or Disciplinary Action.

Location of source: City _____ State _____ Date _____

Customer _____ Project _____

PART B: "Source of Radiation"

Ir _____ Co _____ X-ray _____

Model _____ Serial No. _____

Activity _____ curies

KV _____ MA _____

"Projector"

Model No. _____ Ser. No. _____

In Storage _____

Storage Dates _____
(1 wk. Maximum)

"Survey Instrument"

Model No. _____

Serial No. _____

Cal. Due _____

Back-up S/N _____

PART C: Transport to:

Truck/Vehicle No. _____ (Complete Applicable Column)

1.) Placing Projector in vehicle
_____ mr/hr surface transport container

Transport Index (0.1 - 10.0)

Label: Class I II III

NRC Package Approval No. Attached

2.) Projector remaining in vehicle
from previous transport

Transport Index

Label: Class I II III

3.) _____ Not transported (✓)

(Column 1 or 2): Vehicle Placarded _____ Yes _____ No _____ mr/hr @ 1 ft. from vehicle surface _____ mr/hr. @ Driver

PART D: Radiographic Operations:

Daily Equipment Inspection Check List

(✓) OK (NA) Not Applicable (*) See Remarks

- _____ A. Survey Projector for Excessive Radiation Levels
- _____ B. Projector inspected for damage to fittings, locks, and labels
- _____ C. Control Cable and Fittings checked for cuts, breaks or looseness
- _____ D. Crank inspected for looseness
- _____ E. Control checked for freedom of cable movement
- _____ F. Guide tube inspected for cuts, crushing, and broken or loose fittings
- _____ G. Collimator (if used) checked for secure attachment
- _____ H. 550 Connector Gage (Amersham)

Maintenance inspection performed or witnessed by Radiographer signed below (Pt. G)

Personnel Informed _____

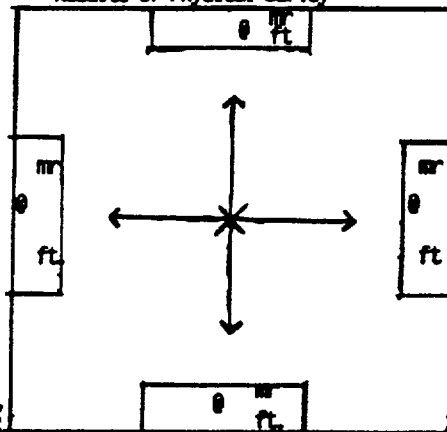
PART E: Securing Radiographic Operations:

Record of Physical Survey made to determine source is in shielded position
when securing exposure device

_____ mr/hr @ surface of exposure device

Survey Performed or witnessed by Radiographer signed below (Part G)

Results of Physical Survey

_____ Signs _____ Rope
Constant Surveillance

Length of Exposures _____

Number of Exposures _____

Total Exposure Time _____ hr _____ min

PART F: Transport From/Return:

Truck/Vehicle No. _____ (✓) if same as Part C (Complete the applicable column)

Destination: City _____ State _____ Location _____

1) Returning Projector to vehicle
_____ mr/hr surface transport container

Transport Index (0.1 - 10.0)

Label Class: I II III

NRC Package Approval No. Attached

(Column 1 or 2) VEHICLE PLACARDED _____ Yes _____ No _____ mr/hr @ 1 ft. from vehicle surface _____ mr/hr. @ Driver

2) _____ Projector not removed from
vehicle ()

3) _____ Not Transported (✓)

PART G: The below signed individual(s) herein verify that the above listed information (Part A thru Part F) is accurate and has been completed in accordance with PRIME NDT SERVICES, INC.'s License Procedures and State and Federal Regulators.

In addition, the above named materials have been properly classified, described, packaged, marked, and labeled, and are in proper condition for transport according to the applicable regulations of the Department of Transportation.

Radiographer: _____ Radiographer's Assistant _____

Remarks: _____

INSTRUCTIONS FOR USE OF RS-4-4

THIS RECORD MUST BE FILLED OUT DAILY WHENEVER UTILIZING
RADIOGRAPHIC EQUIPMENT

Keep this book with you at all times and retain book copies
(Blue) as your permanent record.

Employee Name _____

Follow these instructions for filling out logs:

1. Fold the back flap under set before printing.
2. Print in all required information sequentially as required during daily operations. Please bear down to make good copies.
3. When the report is completed at the end of the day, remove top two copies from the set and insert into projector log book.
4. The technician assigned projector(s) at the end of the Company week (thru Saturday) shall be responsible for removing ALL completed copies from the projector log book and IMMEDIATELY forwarding them to the Branch or Division Office (white & canary).
5. A log must be completed for each day a projector is in your possession and/or for each project (job) assignment.
6. Technician Time Sheets will not be processed until all operations reports have been received and are correct.

NOTE: Order a new book at least one (1) week in advance before using last set.

RADIOGRAPHIC OPERATIONS REPORT

RS-4-4 Rev. 0

- PART A:
1. Should be completed first thing every day (before leaving for job location) or once for each continuous storage.
 2. City, State should reflect location work is to be performed.
- PART B:
1. Should be completed immediately after Part A (before leaving for job location).
 2. Column I (Source of Radiation)
 - a) Model and S/N may be found on source I.D. tag on projector or on decay curve.
(Projector Log Book)
 - b) Activity - should be determined from decay curve in Projector Log Book.
 3. Column 2 (Projector)
 - a) X for storage (not used for entire day) NA when projector used or transported.
 - b) Storage Dates - when projector is stored for more than one day (continuous), additional storage dates may be added for one week maximum (Monday thru Saturday).
 4. Column 3 (Survey Instrument)
 - a) Indicate back-up meter S/N whenever having possession of more than one meter.
- PART C:
1. Should be completed when preparing for transport.
 2. Column I
 - a) mR/hr surface - surface of transport container (maximum contact reading) metal box, barrel, etc. 200 mR/hr legal maximum.
 - b) Transport Index reading at 1 meter from transport container in mR/hr (maximum) from any accessible side recorded to next highest tenth (Do Not Log Units e.g. mR/hr).

c) Label Class:

- I Whenever <0.5 at surface and 0 a 1 meter.
- II Whenever 0.5 - 50.0 at surface and 0.1 - 1.0 at 1 meter.
- III Whenever >50.0 - 200 at surface and/or >1.0 - 10.0 at 1 meter.

Requires two (2) labels on transport container properly completed.

d) NRC Approval No. - verify marking on outside of transport container corresponds with package approval number and indicate with X.

3. Column 1 or 2 - Placards required whenever transporting Class III material, not permitted when Class II, I, or empty. Surface of vehicle and driver must be < 2 mR/hr.

PART D: 1. To be completed during radiographic set-up operations.

2. Personnel Informed Blank - intended for notification of managers whenever maintenance disclosures require corrective action.

PART E: 1. To be completed at conclusion of radiographic operations.

2. mR/hr storage survey, maximum of 200 mR/hr legal limit at surface or 10 mR at 1 meter.

PART F: 1. To be completed when preparing to leave job site at completion of radiographic activities.

2. Location should indicate known location or street address (e.g. Bethlehem, PA "Proper Customer Name", etc.)

PART G: 1. To be signed by Radiographer at completion of part C of RS-4-4

SIGN - DO NOT PRINT

2. Remarks - relating to maintenance inspection or any pertinent data.

"SHIPPING/CERTIFICATION DOCUMENT FOR RADIOACTIVE MATERIAL"

SHIPPED TO: _____

CARRIER: _____
WEIGHT: _____

PROPER SHIPPING NAME

☐ RADIOACTIVE MATERIAL RQ
SPECIAL FORM N.O.S.

☐ RADIOACTIVE MATERIAL
L.S.A., N.O.S.

UN2916

| EXPOSURE DEVICE | SERIAL NO. | SOURCE NO. | NRC CERT. OF COMP. | TYPE OF PACKAGE |
|--------------------|------------|------------|--------------------|-------------------|
| AMERTEST 660B | | | USA/9283/B(U)-85 | TYPE B (OVERPACK) |
| AMERTEST 741 | | | USA/9027/B(U) | |
| MASTERMINDER 1 & 2 | | | USA/DOT/7A | TYPE A |
| AMERTEST 680 | | | USA/9035/B(U) | |
| AMERTEST 773 | | | USA/DOT/7A | TYPE A |
| SPEC 150 | | | USA/9263/B(U) | |
| AEA 880 | | | USA/9269/B(U)-96 | TYPE B |
| | | | | |

| SOURCE CHANGE | SERIAL NO. | SOURCE NO. | NRC CERT. OF COMP. | TYPE OF PACKAGE |
|---------------|------------|------------|--------------------|-------------------|
| AMERTEST 650L | | | USA/9269/B(U)-85 | |
| AMERTEST 850 | | | | |
| AMERTEST 771 | | | | |
| SPEC C-1 | | | USA/9036/B(U) | TYPE B (OVERPACK) |
| IR 50 | | | USA/9156/B(U) | TYPE B (OVERPACK) |
| | | | | |
| | | | | |
| | | | | |

| RADIONUCLIDE | FORM | ACTIVITY IN BECQUERELS |
|-------------------------|--------------|------------------------|
| IRIDIUM 192 | SPECIAL FORM | |
| COBALT 60 | SPECIAL FORM | |
| CESIUM 137 | SPECIAL FORM | |
| DEPLETED U238 | SPECIAL FORM | |
| _____ LB. AT .15 MCI/LB | | |

| SHIPPING LABEL | TRANSPORT INDEX |
|------------------------|-----------------|
| RADIOACTIVE WHITE I | |
| RADIOACTIVE YELLOW II | |
| RADIOACTIVE YELLOW III | |
| | |
| | |

SHIPPERS CERTIFICATION

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled; and are in proper condition for transportation according to the applicable regulations of the DEPARTMENT OF TRANSPORTATION (D.O.T.)

TRANSPORTATION BY AIR

This shipment is within the limitations prescribed for cargo aircraft ONLY.

24 HOUR EMERGENCY TELEPHONE NO. 800-819-9195

PRIME NDT SERVICES, INC.

DATE

PRIME NDT SERVICES, INC.

5260 West Coplay Rd.

Whitehall, PA 18052

Phone 610-262-4954

Fax 610-262-1516

dshumway@primendt.com

EMERGENCY RESPONSE INFORMATION

This emergency response information is a guide for initial action to be taken to protect yourself and the general public from exposure to radiation in the event of an accident. This information applies to the following shipping descriptions:

RQ RADIOACTIVE MATERIAL, SPECIAL FORM N.O.S. UN2916

POTENTIAL HAZARDS

HEALTH HAZARDS

External radiation from unshielded radioactive material.

Internal radiation from inhalation, ingestion, or skin absorption.

Radioactive material; degree of hazard will vary greatly depending on type and quantity of radioactive material.

Materials in Special Form or in Type B packaging are not expected to cause contamination in accidents.

Runoff from fire control may cause pollution.

FIRE OR EXPLOSION

These materials may burn, but none ignite readily.

EMERGENCY ACTION

Keep unnecessary people at least 150 feet upwind - greater distances may be necessary if advised by qualified Radiation Authority.

Isolate hazard area and deny entry.

Enter area only to save life; limit entry to shortest possible time.

Self-contained breathing apparatus (SCBA) and structural fire fighter's protective clothing will provide limited protection for short-term exposure to these materials.

Detain uninjured persons and equipment exposed to radioactive material until instructed by Radiation Authority.

Delay clean up until instructed by Radiation Authority.

CALL 800-819-9195 FOR EMERGENCY ASSISTANCE

If water pollution occurs, notify the appropriate authorities.

FIRE

Do not move damaged containers. Move undamaged containers out of fire zone.

Small Fires: Dry chemical, CO₂, Halon, water spray, or standard foam.

Large Fires: Water spray, fog (flooding amounts).

For massive fire in cargo area, use unmanned hose holder or monitor nozzles.

Fight fire from maximum distance.

SPILL OR LEAK

Do not touch damaged containers or spilled material.

Damage to outer container may not affect primary inner container.

FIRST AID

Call for emergency medical care.

Advise medical care personnel that injured persons may be contaminated with radioactive material.

Use first aid treatment according to the nature of the injury.

If not affecting injury, remove and isolate contaminated clothing and shoes. Wrap victim in blanket before transporting.

If uninjured, remove and isolate contaminated clothing and shoes. Shower victim with soap and water.

MAKE IN TRIPLICATE

UNANNOUNCED ()
ANNOUNCED ()

"RADIOGRAPHER'S PERFORMANCE REVIEW"

RADIOGRAPHER _____ S.S. NO. _____ DATE AND TIME _____

JOB LOCATION _____

U.S.N.R.C. REGION: I II III IV V STATE: _____

RSO OR JOB RADIOGRAPHER _____ ASST. RADIOGRAPHER _____

PROJECTOR MODEL AND SERIAL NUMBER _____ RADIOACTIVE CONTENT _____

SOURCE SERIAL NUMBER _____ CURIES _____

SURVEY METER SERIAL NUMBER _____ CALIBRATION DUE DATE _____

SURVEY METER SERIAL NUMBER _____ CALIBRATION DUE DATE _____

1. Was the Radiographer wearing a film badge? _____ YES _____ NO
Film Badge Number _____ Exposure Period _____
Where was film badge worn? _____
2. Was the Assistant Radiographer wearing a film badge? _____ YES _____ NO
Film Badge Number _____ Exposure Period _____
Where was film badge worn? _____
3. Was the Radiographer wearing a dosimeter? _____ YES _____ NO
Dosimeter Number _____ Calibration Due Date _____
Where was the dosimeter worn? _____
Reading at the time of inspection _____
4. Was the Assistant Radiographer wearing a dosimeter? _____ YES _____ NO
Dosimeter Number _____ Calibration Due Date _____
Where was the dosimeter worn? _____
Reading at the time of inspection _____
5. Was the Radiographer wearing his alarm meter?
_____ YES _____ NO Meter No _____ Cal. Due _____
6. Was the assistant wearing his alarm meter?
_____ YES _____ NO Meter No _____ Cal. Due _____
7. Was there an operable dosimeter charger in the lab? _____ YES _____ NO

Prime NDT Services, Inc.

8. Was the Restricted Area posted with "Caution (or Danger) Radiation Area" signs? _____ YES _____ NO
9. What were the physical readings at the signs? _____ MR
10. Was the High Radiation Area posted with "Caution (or Danger) High Radiation Area" signs? _____ YES _____ NO
11. Was the approximate distance calculated properly? _____ YES _____ NO
12. Was the Restricted Area properly controlled to prevent unauthorized entry? _____ YES _____ NO
13. Was the Radiographer or Assistant properly surveying the projector and source tube and locking the camera after each exposure? _____ YES _____ NO
14. Was the survey report current with the activity? _____ YES _____ NO
15. Was there evidence that the daily equipment maintenance check had been done? _____ YES _____ NO
16. Were all labels and tags on the projector legible? _____ YES _____ NO
17. Were copies of U.S.N.R.C. Form #3 and/or applicable State forms properly posted? _____ YES _____ NO
18. Was there a copy of the Radiographic Operations Manual with all the required information available? _____ YES _____ NO Manual # _____
19. When not in use, was the projector stored properly and kept locked to prevent unauthorized removal? _____ YES _____ NO
20. When in storage, was the storage area posted with "Caution (or Danger) Radioactive Material" signs? _____ YES _____ NO
21. After watching the Radiographer and/or Assistant, and during the oral review, was it your opinion that they had sufficient knowledge of safety rules? _____ YES _____ NO
22. Did the Radiographer and Assistant have their Radiation Safety Cards?
Radiographer _____ YES _____ NO Assistant Radiographer _____ YES _____ NO
23. If there was any area of noncompliance or concern, please list, by item number, below in more detail:

REMARKS:

PRIME RADIATION SAFETY OFFICER

RADIOGRAPHER'S ACKNOWLEDGEMENT

**Quarterly Inspection and Maintenance
of Iridium/Cobalt/Cesium Exposure Devices**

Date Inspected _____ Next Inspection Due _____

Manufacturer _____ Model No. _____ Serial No. _____

Type of Isotope _____ Source No. _____ Curie Strength _____

Inspected By _____ Title _____

Modification of any exposure devices and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes, would not compromise the design safety feature of the system. When performing maintenance, please refer to the manufacturer requirements located in your source book.

| | | | Corrective Action Taken |
|----|---|---------------|-------------------------------|
| 1. | <u>Source Projector</u> | <u>Accept</u> | <u>Reject</u> |
| | A. Safety caps | _____ | _____ |
| | B. Lock | _____ | _____ |
| | C. Handle | _____ | _____ |
| | D. Labels | _____ | _____ |
| | E. Plug-nipple and threads | _____ | _____ |
| | F. Manufacturer's checks | _____ | _____ |
| | G. Abnormal Surface Levels | _____ | _____ |
| | H. "S" Tube Aligned | _____ | _____ |
| | I. Selector Ring | _____ | _____ |
| | J. Port Cover | _____ | _____ |
| 2. | <u>Pigtail Connector</u> | | |
| | A. Snug fit | _____ | _____ |
| | B. Straightness | _____ | _____ |
| | C. Wear | _____ | _____ |
| | D. Pull test | _____ | _____ |
| | E. Manufacturer's checks | _____ | _____ |
| 3. | <u>Source Positioner (cranks)</u> | | |
| | A. Handle | _____ | _____ |
| | B. Gear box | _____ | _____ |
| | C. Screws | _____ | _____ |
| | D. Foot meter | _____ | _____ |
| | E. Connections to cable | _____ | _____ |
| | F. Cable and cable flexibility | _____ | _____ |
| | G. Straightness | _____ | _____ |
| | H. Wear (Use No Go Gage) | _____ | _____ |
| | I. Manufacturer's check | _____ | _____ |
| | J. Change in operating Characteristics | _____ | _____ |

| | <u>Accept</u> | <u>Reject</u> | <u>Corrective Action Taken</u> |
|---|---------------|---------------|--|
| 4. <u>Source Tubes</u> | | | |
| A. Physical damage | _____ | _____ | _____ |
| B. End cap and tip | _____ | _____ | _____ |
| C. Kinks/crimps | _____ | _____ | _____ |
| D. Threads | _____ | _____ | _____ |
| E. Foreign material | _____ | _____ | _____ |
| F. Manufacturer's check | _____ | _____ | _____ |
| Comments: _____ | | | |
| 5. Exposure Device is acceptable for use. | _____ | | |
| | (Signature) | | |
| 6. <u>Storage Container (in vehicle)</u> | <u>Accept</u> | <u>Reject</u> | <u>Corrective Action Taken</u> |
| A. Labels | _____ | _____ | _____ |
| B. Lock | _____ | _____ | _____ |
| C. Blocking | _____ | _____ | _____ |
| D. Bolting to darkroom | _____ | _____ | _____ |
| 7. <u>Storage Container (at facility)</u> | | | |
| A. Labels | _____ | _____ | _____ |
| B. Case | _____ | _____ | _____ |
| C. Circuit breaker | _____ | _____ | _____ |
| D. Lock | _____ | _____ | _____ |
| 8. <u>Source Log Book</u> | | | |
| A. Shipping Label | _____ | _____ | _____ |
| B. Requisition RS 7-3 | _____ | _____ | _____ |
| C. Source History RS 7-2 | _____ | _____ | _____ |
| D. Leak Test Record 8-1 | _____ | _____ | _____ |
| E. Quarterly Inspection | _____ | _____ | _____ |
| F. Decay Chart | _____ | _____ | _____ |
| G. 10 CFR 34.30 Reporting Form | _____ | _____ | _____ |
| H. Incident Data Report | _____ | _____ | _____ |
| I. RS 4-4 Supplement | _____ | _____ | _____ |
| J. 2 MR/HR Calculations Form | _____ | _____ | _____ |
| K. Operating and Maintenance | _____ | _____ | _____ |
| L. Certificate of Compliance | _____ | _____ | _____ |
| 9. Final RSO Approval _____ | | | |
| Date: _____ | | | |

Prime NDT Services, Inc.

FORM: RS-7-1-A
REV. 0 (2-97)

YEARLY INSPECTION AND MAINTENANCE
OF IRIIDIUM AND COBALT TYPE
EXPOSURE DEVICES

Date Inspected ____/____/____

Next Inspection Due ____/____/____

Manufacture _____ Model No. _____ Serial No. _____

Inspected By _____ Title _____

| A. <u>EXPOSURE DEVICE</u> | <u>ACCEPT</u> | <u>REJECT</u> | <u>REMARKS</u> |
|---------------------------------|---------------|---------------|----------------|
| <u>LOCK</u> | | | |
| 1. Lock Screws | _____ | _____ | _____ |
| 2. Lock | _____ | _____ | _____ |
| 3. Lock Retainer | _____ | _____ | _____ |
| 4. Lock Springs | _____ | _____ | _____ |
| <u>SELECTOR & INTERNALS</u> | | | |
| 1. Selector Body | _____ | _____ | _____ |
| 2. Locking Slide | _____ | _____ | _____ |
| 3. Slide Spring | _____ | _____ | _____ |
| 4. Selector Ring Retainer | _____ | _____ | _____ |
| 5. Selector Ring | _____ | _____ | _____ |
| 6. Compression Spring | _____ | _____ | _____ |
| 7. Sleeve | _____ | _____ | _____ |
| 8. Anti Rotation Lugs | _____ | _____ | _____ |
| 9. Lug Springs | _____ | _____ | _____ |
| 10. Selector Retaining Screws | _____ | _____ | _____ |
| 11. Lock Washers | _____ | _____ | _____ |
| 12. Flat Head Phillips Screws | _____ | _____ | _____ |
| 13. S Tube Inspection | _____ | _____ | _____ |
| <u>FRONT OF CAMERA</u> | | | |
| 1. Retaining Ring | _____ | _____ | _____ |
| 2. Guide Tube Connector Nut | _____ | _____ | _____ |
| 3. Flat Head Phillips Screws | _____ | _____ | _____ |
| <u>BACK OF CAMERA</u> | | | |
| 1. Source I.D. Plate | _____ | _____ | _____ |
| 2. I.D. Screws | _____ | _____ | _____ |
| 3. Binder Head Screw | _____ | _____ | _____ |
| 4. Binder Cable | _____ | _____ | _____ |
| 5. Selector Cover | _____ | _____ | _____ |
| 6. Protective Bumpers | _____ | _____ | _____ |
| 7. Bumper Screws | _____ | _____ | _____ |

Prime NDT Services, Inc.

| <u>SIDES OF CAMERA</u> | <u>ACCEPT</u> | <u>REJECT</u> | <u>REMARKS</u> |
|------------------------|---------------|---------------|----------------|
| 1. Radioactive Signs | _____ | _____ | _____ |
| 2. Camera Owner Plate | _____ | _____ | _____ |
| 3. Amersham Plate | _____ | _____ | _____ |

APPROVED FOR USE

_____ DATE _____

FINAL R.S.O. APPROVAL

_____ DATE _____

RADIOACTIVE MATERIAL SOURCE HISTORY RECORD (FORM RS-7-2)

Source Serial Number _____ Type Material _____

I. Receiving Summary Record

Date/Time _____ Carrier Received From _____
 Ordered From _____
 Received in Container S/N _____ Model _____
 Container Surface Maximum Reading _____ mR/hr.
 Location (maximum 1 meter away) _____ mR/hr.
 Decay Curve Received _____ Leak Test Received _____
 Transferred to Camera S/N _____ Model _____

II. Quarterly Inventory Summary Record

| Date | Material | Curies | S/N of Camera | Location | By |
|-------|----------|--------|---------------|----------|-------|
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |

III. Leak Test Summary Record

| Date | Wipe By | Analysis By | Certificate Date | Don't Use After |
|-------|---------|-------------|------------------|-----------------|
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

IV. Source Transfer from Camera to another Camera (if applicable)

| Date | Original Camera S/N | Other Camera S/N | Transferred By |
|-------|---------------------|------------------|----------------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

V. Disposal Summary Record (i.e., Returned to Supplier)

Date Returned _____ Carrier Name _____
 Shipped To _____
 Curies _____ Shipped in Container S/N _____
 Survey (surface) _____ mR/hr. Survey (1 meter) _____ mR/hr.
 Isotope Receipt Date _____
 Shipping Papers/Placard Sent:

| | |
|----------|----------|
| 1. _____ | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | 6. _____ |

Container Labeled "Special Form N.O.S.-Iridium 192 (sealed source) _____
 (Yellow Label) Class II Type B Packaging (2) Affixed _____ yes or no
 Transport Index 1 Marked _____ yes or no
 This is to certify that the above named article is properly
 classified, labeled and described for transportation to the applicable
 rules of the Department of Transportation-DOT-7A.

INSPECTION REPORT (FORM RS-7-3)

(To be completed when Requisitioning, Receiving,
Transferring and/or disposing items.)

REQUISITION - Part 1

Requested By _____ Date Ordered _____
Type of Isotope: IR 192 _____ CO 60 _____ No. Curies Ordered _____
Type of Exposure Device _____ Model No. _____
Ordered From _____ Shipped Via _____

RECEIVING - Part 1

Date _____ Time _____ AM/PM Received By _____
Curies Received _____ Serial No. _____
In shipping Container Model No. _____ Shipping Container Serial No. _____
In Camera _____ Model No. _____ Camera Serial No. _____
Decay Curve Received _____
Survey: Date _____ Time _____ AM/PM Item Correctly Labeled and Packaged _____
Reading at Surface _____ mR/hr. Reading at 1 meter _____ mR/hr.

TRANSFERS AND/OR DISPOSALS - Part 3

1. Transfer Date _____ Source No. _____ Curie Strength _____
Transferred from Shp/Con No. _____ to Camera Model _____ Serial No. _____
Reading at surface _____ mR/hr. Reading at 1 meter _____ mR/hr.
Transferred from Camera Model Number _____ Serial No. _____
To Camera Model Number _____ Serial No. _____
Reading at surface _____ mR/hr. Reading at 1 meter _____ mR/hr.
Items Properly Labeled and Packaged _____
2. Disposal Date _____ Items Labeled and Packaged Correct _____
For Disposal To _____
Source No. _____ Transferred to Shipping Cont. No. _____
Survey of Shipping Container Surface _____ mR/hr. 1 meter _____ mR/hr.

"LEAK TEST RECORD"

"PLACE N/A IN ALL BLANKS NOT APPLICABLE"

1. SOURCE NO. _____ CURIES _____ MATERIAL _____
2. DATE RECEIVED _____ RECEIVED FROM _____
3. RECEIVED IN CONTAINER S/N _____ MODEL _____ TYPE _____
4. DATE MANUFACTURER PERFORMED "LEAK TEST" _____
(see decay curve)
5. NEXT "LEAK TEST" DUE DATE _____ DATE OF DISPOSAL _____
6. CURIES ON DATE OF DISPOSAL _____ WIPE TEST DATE _____
WIPE SURVEY RESULTS _____

7. RESULTS OF "LEAK TEST" _____

(OR WAS SOURCE RETURNED PRIOR TO "LEAK TEST" DUE DATE) _____ YES _____ NO
8. "LEAK TEST" PERFORMED BY _____
9. PROCEDURE NAME OR NUMBER USED _____
10. SOURCE SHIPPED TO _____
IN CONTAINER NO. _____
11. COMMENTS _____

MANUAL TRANSMITTAL AND REVISION RECEIPT FORM

MANUAL NO. _____ DATE _____ MANUAL TYPE RSO - _____

RADIOGRAPHY OPERATIONS MANUAL

MANUAL HOLDER _____

"MANUAL CHANGES"

1. REMOVE AND DISPOSE OF THE FOLLOWING: _____

2. INSERT THE FOLLOWING REVISIONS: _____

"RECEIPT OF MANUAL TRANSMITTAL OR REVISION STATEMENT"

THE REVISIONS LISTED IN ITEM "2" HAVE BEEN INSERTED IN MANUAL NO. _____

ASSIGNED TO ME, AND THE SUPERSEDED REVISIONS LISTED IN ITEM "1" HAVE BEEN
REMOVED AND DESTROYED.

SIGNED BY PRIME RADIOGRAPHER OR ASST. _____

COMPANY _____ TITLE _____ DATE _____

SIGN AND RETURN TO PRIME'S TECHNICAL DIRECTOR

"RADIATION SAFETY RELATED INCIDENT DATA REPORT"

THIS REPORT IS TO BE COMPLETED WITHIN 24 HOURS IN THE EVENT THAT:

- A. Your dosimeter is discharged beyond 200 mR due to unknown circumstances in which the possibility of an excessive exposure to radiation exists.
- B. Your film badge becomes wet? mutilated or lost.
- C. You have reason to believe that your film badge may indicate an excessive exposure that you may not have received.
- D. Other. (Explain on reverse side of this sheet)

FORWARD THIS REPORT TO YOUR R.S.O. IMMEDIATELY AFTER COMPLETION

SECTION 1 (complete all items)

- 1. Name (print) _____ Signature _____
- 2. Work Location _____
Lab - Customer - Site - City - State
- 3. Did you stop radiographic operations immediately? Yes _____ No. _____
- 4. Did you notify your Radiation Safety Officer (R.S.O.)? Yes _____ No. _____
- 5. When? Date: _____ Time: _____
- 6. Which of the items occurred?
 - A. _____ (complete Section 2)
 - B. _____ (complete Section 3)
 - C. _____ (complete Section 4)
 - D. _____ (use reverse side)

SECTION 2 (To be completed in the event that "A" above occurred.)

- 1. When were you aware that your dosimeter went off-scale?
Date _____ Time _____
- 2. Did a possible over-exposure occur? Yes _____ No _____ At what distance were you from the source: _____ feet For what length of time: _____ min/hrs.
- 3. Projector device used - Make and Model _____ Serial No. _____
- 4. Source Type: IR-192 _____ CO-60 _____ Source S/N _____ No. of curies _____
- 5. Survey Meter: Model _____ Serial No. _____ Date calibrated _____
- 6. Explain in detail exactly everything that occurred. (Use reverse side of sheet.)

SECTION 3 (To be completed in the event that "B" above occurred.)

- 1. Explain in detail how your film badge became wet, lost, etc.
(Use reverse side.)

SECTION 4 (To be completed in the event that "C" above occurred.)

- 1. Where was your film badge located when you believe it was exposed to radiation? _____
- 2. How much radiation do you calculate your film badge received? _____ mR.
Unknown _____
- 3. Were you wearing your film badge? Yes _____ No _____ If no, explain: _____
- 4. Explain exactly everything that occurred. (Use reverse side of sheet.)
- 5. On the reverse side include any other information which you feel is pertinent.

SECTION 5 (To be completed in the event that "D" above occurred)

- 1. Explain in detail exactly everything that occurred. (Use reverse side.)

REPORTING REQUIREMENTS

In accordance with 10 CFR 34.101, we are required to report the following:

1. Unintentional disconnection of the source assembly from the control cable.
2. Inability to retract the source assembly to its fully shielded position and secure it in this position.
3. Failure of any component (critical to safe operation of the device) to properly perform its intended function.

"RADIOACTIVE LEAK TEST PROCEDURE QUALIFICATIONS"

THIS IS TO CERTIFY THAT:

NAME: _____ POSITION: _____

WAS GIVEN A DEMONSTRATION TO PERFORM A LEAK TEST USING:

() Model 1, LEAK TEST KIT, SOURCE PRODUCTION

() SENTINEL 518 LEAK TEST KIT, AEA

() CIS MODEL 818 LEAK TEST KIT

THIS TEST IS TO BE PERFORMED USING THE INSTRUCTIONS SUPPLIED BY THE
MANUFACTURER WITH THE LEAK TEST KIT AND SHALL COMPLY WITH THE
PROVISIONS OF PRIME N.D.T. SERVICES, INC.'S LICENSE.

THE ABOVE TEST HAS BEEN DEMONSTRATED TO THE SATISFACTION OF THE
RADIATION SAFETY OFFICER (R.S.O.)

WITNESSED BY R.S.O. (PRIME) _____

APPROVED BY TECHNICAL DIRECTOR (PRIME) _____

DATE: _____

COPY OF CERTIFICATION TO THE EMPLOYEE'S RADIATION SAFETY QUALIFICATION
FILE.

"RADIOACTIVE SOURCE CHANGE QUALIFICATION"

THIS IS TO CERTIFY THAT:

NAME: _____ POSITION: _____

WAS GIVEN A DEMONSTRATION OF SOURCE CHANGES USING THE FOLLOWING
AUTHORIZED SOURCE CHANGERS:

- () INDUSTRIAL NUCLEAR MODEL 50, CAPACITY 120 CURIES
- () SPEC MODEL C-1, CAPACITY 150 CURIES IR-192
- () AMERSHAM MODEL 820,855, & 650L, CAPACITY 240 CURIES IR-192

THE ABOVE RADIOGRAPHER HAS DEMONSTRATED COMPETENCE IN CHANGING OF
THE SOURCE(S) USING THE MANUFACTURER'S SOURCE CHANGE PROCEDURE.
THIS CHANGE WAS DEMONSTRATED AND SUPERVISED BY THE COMPANY'S RADIATION
SAFETY OFFICER AND/OR MANUFACTURER'S QUALIFIED REPRESENTATIVE.

APPROVED BY RSO (PRIME) _____

DATE: _____

COPY OF CERTIFICATION TO THE EMPLOYEE'S RADIATION SAFETY QUALIFICATION
FILE.

Form: RS-5-1A
Rev 0 - 2/97

"RECORD OF PERSONNEL CERTIFICATION"

RADIOGRAPHER-RADIOGRAPHER'S ASSISTANT

EMPLOYEE _____ S.S. # _____

ADDRESS _____ CITY _____

STATE _____ ZIP _____

I. EDUCATION (1) SCHOOL _____
BACKGROUND (2) SCHOOL _____
(3) SCHOOL _____

II. TECHNICAL (1) SCHOOL _____
TRAINING (2) SCHOOL _____
(3) SCHOOL _____

III. PREVIOUS (1) COMPANY _____ DATE _____
CERTIFICATION (2) COMPANY _____ DATE _____
(3) COMPANY _____ DATE _____
(4) COMPANY _____ DATE _____

IV. WORK EXPERIENCE _____

VISION TEST - DATE _____ TYPE _____
METHOD
OF EXAMINATION: GENERAL () SPECIFIC () PRACTICAL () OTHER _____
EXAMINATION
GRADES: GENERAL () SPECIFIC () PRACTICAL () OTHER _____

CERTIFICATION: I certify that the information contained in I thru IV above is true and accurate. I understand that the presentation of false information concerning my qualifications as Radiographer or Radiographer Assistant will cause immediate termination of my employment for reasons of falsifying individual personal qualification documents.

RADIOGRAPHER DATE ASSISTANT RADIOGRAPHER DATE

RADIATION SAFETY OFFICER (RSO) DATE

Form RS-5-2A
Rev 0 - 2/97

RADIOGRAPHER'S PERIODIC REFRESHER TRAINING

As required by CFR, Part 34, Paragraph 34.11, Sub-paragraph (b)(2) and in Prime's Radiation Safety Manual Chapter 5 Par 506.

I. RADIOGRAPHER'S NAME _____ S.S. # _____

II. Date of Original Radiographer's Certification by Prime _____

III. SUBJECT(S) REVIEWED _____ TYPE REVIEW: Oral _____ Written _____ Demo _____

1. Review changes or proposed changes to Parts 19, 20, 21, 34 of 10CFR.
2. Review HAZ-MAT transportation requirements.
3. Review ALARA Program and personnel exposure to radiation.
4. Review changes to Prime procedures and NRC and State license conditions.
5. Review critical operating and emergency procedures.
6. Training for qualification in: source changing, leak testing, and calibrating.
7. Review Radiographer's Performance Review since last training

IV. Time allotted to Subjects 1.____ 2.____ 3.____ 4.____ 5.____ 6.____ 7.____

V. Radiation Safety Officer's review and comments:

Comments: _____

VI. STATEMENT OF UNDERSTANDING

I _____ do herewith express understanding and the purpose of subjects contained in III. Items 1 thru 7.

VII. CERTIFICATION

I certify that the foregoing review was conducted by me. An interview was entertained with the Radiographer to further his understanding of Prime's RSO Program.

Signed _____ Date _____

Next Review Required _____

Form RS-5-2B
Rev 0 - 2/97

"CERTIFICATE OF UNDERSTANDING"

SUBJECT: PRIME NDT - RADIOGRAPHER OPERATIONS MANUAL

PERSONAL DATA:

RADIOGRAPHER'S NAME _____

DATE OF BIRTH _____

SOCIAL SECURITY NO. _____

DATE OF EMPLOYMENT _____

I. The above named individual has received a copy of subject manual containing:

- A. Operating and Emergency Procedures
- B. U.S.N.R.C. License No. 37-23370-01
- C. U.S.N.R.C. Title 10 CFR Parts 19, 20, 21, & 34
- D. Applicable State Rules and Regulations

and has demonstrated understanding of the above I-a, I-b, I-c, and I-d; and further has passed a radiographer's written examination consisting of fifty (50) questions covering the above documents.

TEST SCORE : _____ DATE: _____

II. CERTIFICATION:

I hereby certify the above information is correct and that I understand the Operating and Emergency Procedures contained in Part 4 of my Radiography Operations Manual (RSO).

SIGNATURE OF RADIOGRAPHER

DATE

SIGNATURE OF R.S.O.

DATE

PRIME NDT SERVICES, INC.

5260 West Coplay Road
Whitehall, PA 18052
(610) 262-4954

UNITED STATES NUCLEAR REGULATORY COMMISSION

TITLE 10 CHAPTER 1

CODE OF FEDERAL REGULATIONS

19.11 POSTING OF NOTICES TO WORKERS

THE REGULATIONS IN 10 CFR 19-20-21-34; THE LICENSE; LICENSE CONDITIONS OR DOCUMENTS INCORPORATED INTO A LICENSE BY REFERENCE, AND AMENDMENTS THERETO: THE OPERATING PROCEDURES APPLICABLE TO LICENSED ACTIVITIES; AND ANY NOTICE OF VIOLATION INVOLVING RADIOLOGICAL WORKING CONDITIONS, PROPOSED IMPOSITION OF CIVIL PENALTY, OR ORDER ISSUED PURSUANT TO SUBPART B OF PART 2 OF THIS CHAPTER, AND ANY RESPONSE FROM THE LICENSEE.

THE AFOREMENTIONED MATERIAL MAY BE REVIEWED AT THE CORPORATE OFFICE LOCATED AT 5260 WEST COPLAY ROAD, WHITEHALL, PA 18052.

APPENDIX C
TRAINING COURSE MATERIALS

I. Purpose

All employees engaged in radiographic operations will be instructed in the use of personnel monitoring systems; familiarized with radiation caution signs and controlled areas; shown a "non-radioactive" source assembly and given procedures to follow should one be observed; provided methods to minimize exposures; and informed that only radiographers or assistant radiographers may operate radiography exposure devices or perform required surveys.

II Training

All training will be conducted in accordance with 10 CFR Part 34.43. The following reference material will be used in the training program.

- A. 10 CFR Part 19 - Notices, Instruction, and Reports to Workers.
- B. 10 CFR Part 20 - Standards for Protection Against Radiation.
- C. 10 CFR Part 21 - Reporting of Defects and Non-compliances.
- D. 10 CFR Part 30 - Rules of General Applicability to Domestic Licensing.
- E. 10 CFR Part 34 - Radiation Safety Requirements for Radiographic Operations.
- F. 10 CFR Part 71 - Packaging and Transportation.
- G. Regulatory Guide 8.10 ALARA Program
- H. Regulatory Guide 8.13 Pre-natal Radiation Exposure.
- I. Regulatory Guide 8.36 Radiation Dose to Embryo/Fetus.
- J. Regulatory Guide 8.29 Instruction Concerning Risks.
- K. Working Safely in Gamma Radiation (USNRC)
- L. Non-destructive Testing Handbook-Second Edition-Vol. 3 (ASNT)
- M. Prime NDT Services, Inc. - Operating and Emergency Procedures
- N. Prime NDT Services, Inc. - NRC/State license Conditions
- O. Agreement State Regulations as Required.

III. Examinations

A. General Test

For an individual to be certified as an assistant radiographer, he/she must successfully complete a 50-question test taken from the questions listed in Appendix C-1. The minimum passing grade is 70%. For an assistant to be elevated to radiographer, he/she must pass a 100-question test given by an approved certifying entity such as ASNT. The certifying entity will give, proctor, and grade the test. The minimum passing grade is 70% and the certification is good for five (5) years.

B. Specific Test

To be certified as an assistant or radiographer, the individual must successfully pass a 25-question test that covers Prime NDT's operating and emergency procedures. These questions will be taken from the questions listed in Appendix C-2. A minimum grade of 70% is required. The certification is good for five (5) years unless there is a break in service of six (6) months or more. If there is a break in service of six (6) months, this test must be retaken.

C. Practical Test

This test will be given to both the assistant and radiographer. It shall consist of oral questions about safe use of all equipment and a demonstration in the use of radiographic and safety related equipment in accordance with Prime NDT's operating and emergency procedures. It will also cover the completion of all paperwork as required in our procedures. A minimum acceptable grade of 70% is required. This test, along with the General and Specific tests, is good for five (5) years except for the exception as noted in part B. Specific Test. With a break in service of six (6) months or more the Practical will be retaken.

IV. Periodic Refresher Training

- A. Each radiographer and assistant radiographer must attend at least eight hours of formalized training annually.
- B. Program content:
 - 1. Review and critique of internal radiography experiences
 - 2. Discussion of available radiography experiences
 - 3. Review and discuss personnel doses and reduction
 - 4. New procedures and regulations
 - 5. Review critical operating and emergency procedures
 - 6. Review at least one fundamental radiation topic

V. Records

Results of written examinations and a brief summary of the examinee's practical performance will be maintained on file.

APPENDIX D

PERSONNEL DOSIMETRY INSTRUCTIONS

PERSONNEL DOSIMETRY INSTRUCTIONS

1.0 General Dosimetry Logistics Instructions

- I. When an individual is added to the payroll, the Radiation Safety Officer will issue a film badge to the individual after appropriate training has been given.
- II. Assure that the film badge is exchanged at the interval specified by the Radiation Safety Officer. Use the Film Badge Transmittal/Receipt Form to document the transaction.
- III. In the event that a film badge is lost, damaged, or an individual leaves without turning in the badge, notify the Radiation Safety Officer.
- IV. If a person terminates or is reassigned, collect his dosimeters and submit his/her badge for processing.

2.0 Instruction for Initial Receipt, Distribution, Storage Control, and Return of Film Badge/TLD

- I. Check the supplied badge against the packing slip to verify proper identification and quantity.
- II. Check the badges for any apparent damage.
- III. Issue the appropriate badge to each individual using the transmittal form.
- IV. Retain control badges and other unissued badges in a designated low-radiation background storage area. This area must also be free from excessive heat or moisture, and not exposed to direct sunlight.
- V. Issued badges shall, when practical, be stored during non-working hours in the same manner as stated above.
- VI. Returned badges shall be turned in using the transmittal form.
- VII. Inventory the returned badges and note any missing badges. Verify that all badges are accounted for, note any instructions or comments for the supplier, and return them to the supplier for processing.

PERSONNEL DOSIMETRY INSTRUCTIONS (continued)

3.0 Instructions for Lost Film Badges

- I. Film badges lost or not returned shall be investigated by the Radiation Safety Officer. A report shall be made as to the reason for the badge not being returned, and corrective action shall be taken to prevent recurrence. If the badge cannot be found, then the individual's pocket dosimeter readings for the period of use will be taken from the form RS-4-1 and totaled. This total, as approved by the Radiation Safety Officer, will be forwarded to the film badge processor to be included in the individual's exposure record for the period.

APPENDIX E
POCKET DOSIMETERS, ALARM RATE METERS
AND CHARGERS

**OPERATING INSTRUCTIONS FOR USE OF POCKET DOSIMETERS,
ALARM RATE METERS, AND DOSIMETER CHARGERS**

I. Dosimeters

- A. All radiographers and assistant radiographers shall wear a pocket dosimeter when engaged in radiographic operations, including inventories of exposure devices, shipping containers, and during the use of survey meter calibration sources.
- B. At least one self-reading pocket dosimeter with a minimum range of 0-200 MR shall be used. A high-range dosimeter may be used in conjunction with the low-range dosimeter when desired.
- C. Dosimeters are delicate devices and shall be treated as such. Jarring or dropping the instrument may cause a high reading. If damage to your dosimeter is suspected, notify your supervisor immediately.
- D. If a dosimeter should go off-scale as a result of radiographic work, stop work and notify your supervisor immediately.
- E. All dosimeters shall be charged daily at the start of each shift. Dosimeters shall be read frequently (preferably after each exposure). At the end of each shift, the dosimeter reading shall be recorded on Form RS-4-1 (Dosimeter Radiation Record).

II. Operating Instructions for Dosimeter Chargers

- A. Insert dosimeter into charging socket.
- B. Hold dosimeter in contact (pressure required against spring).
- C. Turn large knob to adjust dosimeter to zero.
- D. Remove dosimeter from charger and check hairline position by looking through dosimeter at a source of light.

III. Operating Instructions for Alarm Rate Meters

A. Operating a TAN 317B

1. Before entering a radiation field, the test button should be depressed. When the test is activated, the Alarm Rate meter will produce a steady tone. The signal indicates that the instrument is functioning and the battery is satisfactory.
2. When the test function fails to work, replace the battery.
3. Retesting is required at the end of each shift and noted on the RS4-1.

B. Operating an RA-500

1. Before entering a radiation field, slide the on/off switch to the on position. Check the battery and audio tone by pressing the push button at the arrow, using a small diameter object such as a paper clip or a jeweler's screwdriver. The red battery light will light if the battery is OK and the alarm will sound.
2. Replace battery if indicated. Do not use if either test fails.
3. Retesting is required at the end of each shift and noted on the RS4-1.

IV. Calibration

Pocket Dosimeter and Alarm Rate meter calibration will be performed by procedures outlined in Appendix L of this manual.

Prime NDT Services, Inc.

APPENDIX F

RADIOACTIVE MATERIALS LICENSE

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

| | |
|--|---|
| <p>Licensee</p> <p>1. Prime NDT Services, Inc.</p> <p>2. 5260 West Coplay Road Whitehall, Pennsylvania 18052</p> | <p>In accordance with the application dated April 30, 2004,</p> <p>3. License number 37-23370-01 is amended in its entirety to read as follows:</p> <p>4. Expiration date January 31, 2005</p> <p>5. Docket No. 030-20982 Reference No. _____</p> |
|--|---|

6. Byproduct, source, and/or special nuclear material

- A. Iridium 192
- B. Cobalt 60
- C. Selenium 75
- D. Cesium 137

E. Cesium 137

F. Cesium 137

G. Depleted Uranium

7. Chemical and/or physical form

- A. Sealed sources
- B. Sealed sources
- C. Sealed sources
- D. Sealed sources
(Amersham/Technical Operations Model 77302)
- E. Sealed sources
(Amersham/Technical Operations Model VD-HP)
- F. Sealed sources
(Amersham/Technical Operations Model VD-HD)
- G. Shielding material

8. Maximum amount that licensee may possess at any one time under this license

- A. See Condition 10
- B. See Condition 10
- C. See Condition 10
- D. 225 millicuries per source
- E. 225 millicuries per source
- F. 125 millicuries per source
- G. 999 kilograms

MATERIALS LICENSE SUPPLEMENTARY SHEET

License Number

37-23370-01

Docket or Reference Number

030-20982

Amendment No. 13

9. Authorized use:

- A. through C. For use in industrial radiography and replacement of sources.
 D. For use in Technical Operations Model 773 Calibrator for the calibration of licensee's survey instruments and dosimetry equipment required by 10 CFR 34.
 E. For use in Amersham/Gamma Industries Models Master Mind 1 and 2.
 F. For use in Amersham/Gamma Industries Model Tattle Tale.
 G. For use as shielding in radiographic equipment.

CONDITIONS

10. Sealed sources, exposure devices, and source changers authorized for use are as follows:

| <u>Isotope</u> | <u>Manufacturer & Model No. of Source Assemblies</u> | <u>Maximum Activity per Source</u> | <u>Manufacturer & Model No. of Exposure Devices</u> | <u>Manufacturer & Model No. of Source Changers</u> |
|----------------|--|------------------------------------|--|--|
| A. Ir-192 | CIS-US, Inc. Model 702 | 120 curies | AEA Model 660 System and Models 660A, 660AE, 660B or 660BE | AEA Model 650L, SPEC Model C-1 and IN Model IR-50 |
| B. Ir-192 | AEA Models A424-9 or A424-24, SPEC Model T-5 or T-5F, IN Model 7 | 140 curies | AEA Model 660 System and Models 660A, 660AE, 660B or 660BE | AEA Models 650L, 820, or 855, SPEC Model C-1, IN Model IR-50 |
| C. Ir-192 | AEA Model A424-9 | 240 curies | AEA Models 741A, 741AE, 741B or 741BE | AEA Models 650L, 820, or 855 |
| D. Ir-192 | AEA Model A424-20 | 240 curies | AEA Models 684A, 684AE, 684B or 684BE | AEA Models 820 or 771 |
| E. Ir-192 | IN Model 32, AEA Models 87703 or 89916, SPEC Models G-40F or G-40T | 120 curies | IN Model IR-100 | IN Model Ir-50, AEA Models 650L, 820, or 855, SPEC Model C-1 |
| F. Ir-192 | SPEC Model G-60 | 150 curies | SPEC Model 150 | SPEC Model C-1 |
| G. Co-60 | AEA Model A424-18 | 33 curies | AEA Models 741A, 741AE, 741B or 741BE | AEA Models 770 or 771 |
| H. Co-60 | AEA Models A424-14 or 943 | 110 curies | AEA Models 680A, 680AE, 680B or 680BE | AEA Models 770 or 771 |
| I. Co-60 | AEA Model A424-15 | 11 curies | AEA Models 684A, 684AE, 684B or 684BE | AEA Models 770 or 771 |
| J. Co-60 | AEA Model A424-13 | 330 curies | AEA Model 676A, 676AE, 676B or 676BE | AEA Model 770 |

MATERIALS LICENSE SUPPLEMENTARY SHEET

License Number

37-23370-01

Docket or Reference Number

030-20982

Amendment No. 13

| <u>Isotope</u> | <u>Manufacturer & Model No. of Source Assemblies</u> | <u>Maximum Activity per Source</u> | <u>Manufacturer & Model No. of Exposure Devices</u> | <u>Manufacturer & Model No. of Source Changers</u> |
|----------------|--|--|--|--|
| K. Se-75 | AEA Models A424-19 or A424-25W | 81 curies | AEA Model 660 System and Models 660A, 660AE, 660B or 660BE | AEA Models 414 or 650L |
| L. Ir-192 | AEA Model A429-9 | 50 | AEA Model 880 Elite Sentinel | AEA Model 650L |
| M. Ir-192 | AEA Model A429-9 | 130 | AEA Model 880 Sigma Sentinel | AEA Model 650L |
| N. Ir-192 | AEA Model A429-9 | 150 | AEA Model 880 Delta Sentinel | AEA Model 650L |

ABBREVIATIONS USED IN LICENSE:

AEA Technology/QSA Inc. (AEA), Source Production and Equipment Co. (SPEC) and Industrial Nuclear (IN)

11. Licensed material may be used or stored at the following:

- (i) Permanent radiographic installations located at 5260 West Coplay Road, Whitehall, Pennsylvania.
- (ii) Temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material, including areas of exclusive federal jurisdiction within Agreement States.

If the jurisdiction status of a federal facility within an Agreement State is unknown, the licensee should contact the federal agency controlling the job site in question to determine whether the proposed job site is an area of exclusive federal jurisdiction. Authorization for use of licensed materials at job sites in Agreement States not under exclusive federal jurisdiction shall be obtained from the appropriate Agreement State regulatory agency.

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**License Number
37-23370-01Docket or Reference Number
030-20982

Amendment No. 13

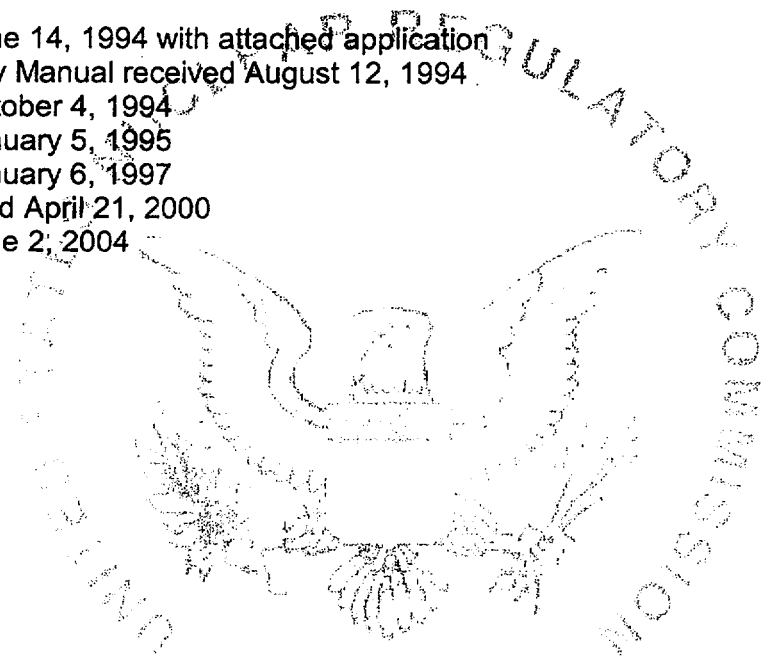
12. Licensed material shall be used by, or under the supervision and in the physical presence of individuals who have been designated in writing by the Radiation Safety Officer and have been trained:
- A. As specified in the letters dated June 14, 1994 and October 4, 1994 with attachments; and
 - B. In accordance with the provisions of 10 CFR 34.43.
13. The Radiation Safety Officer for this license is Don B. Shumway, Jr.
14. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material to quantities below the minimum limit specified in 10 CFR 30.35(d) and 40.36(b) for establishing financial assurance for decommissioning.
15. Notwithstanding the periodic leak test required by 10 CFR 34.27(c)(1) and (e), the requirement does not apply to radiography sources that are stored and not being used. The sources excepted from this test shall be tested for leakage before use or transfer to another person. No sealed source or device shall be stored for a period of more than 3 years without being tested for leakage and/or contamination.
- Sealed sources containing licensed material shall not be opened or sources removed from source holders by the licensee.
17. The licensee is authorized to conduct source retrieval activities in accordance with Appendix R of the Radiation Safety Manual received August 12, 1994 and the letter dated October 4, 1994.
18. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**License Number
37-23370-01Docket or Reference Number
030-20982

Amendment No. 13

19. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

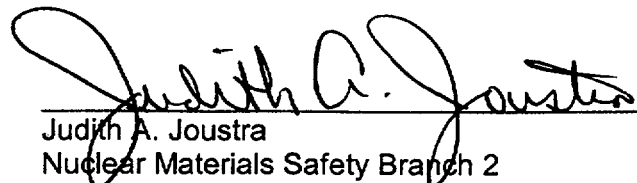
- A. Letter dated June 14, 1994 with attached application
- B. Radiation Safety Manual received August 12, 1994
- C. Letter dated October 4, 1994
- D. Letter dated January 5, 1995
- E. Letter dated January 6, 1997
- F. Application dated April 21, 2000
- G. Letter dated June 2, 2004



For the U.S. Nuclear Regulatory Commission

Date June 18, 2004

By


Judith A. Joustra
Nuclear Materials Safety Branch 2
Region I

King of Prussia, Pennsylvania 19406

74938312



STATE OF NEW YORK - DEPARTMENT OF LABOR
DIVISION OF SAFETY AND HEALTH

RADIOACTIVE MATERIALS LICENSE

D 4-055

Page 1 of 5 Pages

PURSUANT TO THE LABOR LAW AND INDUSTRIAL CODE RULE 38, AND IN RELIANCE ON STATEMENTS AND REPRESENTATIONS HERETOFORE MADE BY THE LICENSEE DESIGNATED BELOW, A LICENSE IS HEREBY ISSUED AUTHORIZING SUCH LICENSEE TO RECEIVE, POSSESS, USE AND TRANSFER RADIOACTIVE MATERIALS(S) DESIGNATED BELOW; AND TO USE SUCH RADIOACTIVE MATERIALS FOR THE PURPOSE(S) AND AT THE PLACE(S) DESIGNATED BELOW. THIS LICENSE IS SUBJECT TO ALL APPLICABLE RULES, REGULATIONS, AND ORDERS NOW OR HEREAFTER IN EFFECT OF ALL APPROPRIATE REGULATORY AGENCIES AND TO ANY CONDITIONS SPECIFIED BELOW.

| | | | |
|---|----------------------------------|---|---------------------------|
| 1. NAME OF LICENSEE Prime NDT Services, Inc. FEIN:23-2865040 PHONE:(610)262-4954 | | 3. LICENSE NUMBER 2998-4232 | |
| 2. ADDRESS OF LICENSEE 5260 West Coplay Road Whitehall, Pennsylvania 18052 | | 4. EXPIRATION DATE May 31, 2005 | |
| | | 5a. REFERENCE NO. 1 | b. AMENDMENT NO. 2 |
| 6. Radioactive materials (element in mass number) | 7. Chemical and/or physical form | 8. Maximum quantity licensee may possess at any one time | |
| A. Cobalt 60 | A. through E. Sealed Sources | A. through E. (See Condition 9.) | |
| B. Selenium 75 | | | |
| C. Cesium 137 | | | |
| D. Ytterbium 169 | | | |
| E. Thulium 170 | | | |
| F. Iridium 192 | | | |
| G. Uranium, depleted | F. Shielding | F. 999 kilograms total | |

9. Authorized use:
Conditions 6.A. through 6.F.:

- A. The licensee is authorized to use any sealed source, radiographic exposure device or source exchanger which has been manufactured and distributed in accordance with a specific license issued by an Agreement State or the United States Nuclear Regulatory Commission for the performance of industrial radiography, and which meets the requirements of paragraphs 38.34(b) and 38.34(c) of 12NYCRR Part 38. Combinations of sources, source exchangers, and/or exposure devices must be compatible for use as stated in a Sealed Source and Device Registration Certificate (i.e. stated in the registration certificate for the source, source exchanger, or exposure device).



RADIOACTIVE MATERIALS LICENSE

Page 2 of 5 Pages

3. License Number 2998-4232

5a. Ref. No. -1-

b. Amend. No. -2-

(Condition 9 continued)

- B. No single source may exceed the maximum activity specified for that nuclide in the Sealed Source and Device Registration Certificate for any source exchanger or exposure device in which the source is to be used.
- C. The licensee is authorized to receive, possess, and use sealed sources of Cobalt 60 or Iridium 192 where the radioactivity exceeds the maximum amount of radioactivity specified in Condition 9.B. of this license provided:
 - (i) such possession does not exceed the quantity per source specified in Condition 9.B. by more than 10% for Cobalt 60 or 20% for Iridium 192;
 - (ii) records of the licensee show that no more than the maximum amount of Radioactivity per source specified in Condition 9.B. of the license was ordered from the supplier or transferor of the radioactive material; and
 - (iii) the levels of radiation for radiographic exposure devices and storage containers do not exceed those specified in paragraph 38.34(c) of 12 NYCRR Part 38.
- D. Notwithstanding paragraph 1. of this condition, and the requirements of paragraph 38.34(b) of 12 NYCRR Part 38, equipment used in industrial radiographic operations need not comply with section 8.9.2(c) of the Endurance Test in American National Standards Institute N432-1980, if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment can realistically exert on the lever or crankshaft of the drive mechanism.
- E. In addition to the possession limits in paragraphs 2. and 3. of this condition, the licensee shall further restrict the possession of licensed material to quantities below the limits specified in section 38.7 of 12 NYCRR Part 38.

Condition 6.G.:

As shielding in radiographic exposure devices, source exchangers and storage containers.

- 10. A. The Radiation Safety Officer for this license is Don B. Shumway, Jr. (RSO).
- B. Licensed material shall be used by persons who have been certified through a radiographer certification program by an Independent Certifying Organization.



RADIOACTIVE MATERIALS LICENSE

3 License Number 2998-4232

5a. Ref. No. 1

b. Amend. No. -2-

(Condition 10 continued)

- C. (i) Retrieval of disconnected sources or sources that cannot be retracted to the shielded position by normal means, may be performed by or under the direct supervision and in the physical presence of Don Shumway, Jr.
- (ii) Retrieval procedures submitted with Prime NDT Services, Inc. Radiation Safety Program and Operating and Emergency Procedures Manual shall be followed, and all staff engaged in source retrieval operations shall wear whole body and hand personnel monitoring badges.
- (iii) Unshielded radiation sources shall only be moved or manipulated by the use of remote handling tongs or tools in lengths sufficient to provide the operator as much protection as possible.
- (iv) Licensed staff involved in a source retrieval operation shall make records and record data as necessary to document the retrieval and calculate radiation exposures.
11. A. This license does not authorize possession of radioactive material at the address in Condition 2 or at any permanent storage location in New York State. This license only authorizes the storage, use, and transportation incident to use, of licensed materials at temporary job sites in New York State, where the Department of Labor exercises jurisdiction for regulating the use of radioactive material. Such use is permitted as long as this license and your license for storage and use of the authorized materials in another State remain in effect and without restriction.
- B. Overnight storage at other locations shall be in accordance with statements referenced in Condition 19 of the license, providing that such storage may not be in a residence, or in an attached garage except within a vehicle. Any vehicle used for storage shall be driven only for purposes associated with use or transport of the contained radioactive material. Only persons qualified to use the material shall drive the vehicle, and no passengers shall be carried unless they are also involved in work under this license. Vehicular storage shall only be allowed if no other storage is possible and shall not exceed five (5) consecutive nights unless authorization to exceed this limit is obtained from the Department.
- C. Whenever radiography will be performed outside of a permanent radiographic installation the radiographer must be accompanied by another qualified radiographer, or an individual with at least the qualifications of a radiographer's assistant.
- D. The licensee is not authorized to perform source exchanges in New York State.



RADIOACTIVE MATERIALS LICENSE

3. License Number 2998-42325a. Ref. No. 1b. Amend. No. -2-

12. The licensee shall not authorize any radiographer to use any model of a radiographic exposure device, related handling tool, or radiation survey instrument until the radiographer has been trained in the use of such equipment, and has demonstrated competence in its use. For each radiographer, the licensee shall maintain the following records available for inspection:
- A. Training received by the radiographer in the use of such equipment, including dates, duration, and name of instructor.
 - B. Each radiographic exposure device that the radiographer has demonstrated competence in using, including the date of demonstration of competence.
13. Current copies of the following documents shall be maintained at temporary job sites for Department inspection:
- A. operating and emergency procedures; and
 - B. evidence of latest calibration of the radiation survey instruments in use at the site; and
 - C. the latest records of the survey of the radiographic exposure device and source guide tube after the last exposure of the work day, after any source exchange and whenever a device is placed in a storage area; and
 - D. the shipping papers for the transportation of radioactive materials.
14. The licensee must ensure that all persons authorized to use radiography exposure devices comply with safe use and maintenance procedures and that they do not leave a device unattended or unsecured at any time, even for a few minutes.
15. In the event that a theft, loss, inability to retract a source or other serious incident does occur, the Department must be notified immediately by telephone and subsequent information acquired by the licensee must be reported as it is received. All radiography personnel must carry the Department's current telephone number in their emergency procedures along with the after-hours telephone number for the New York State Warning Point.
16. A. The licensee is not authorized to repair, modify or affect any changes in the radiographic exposure devices or associated equipment.
- B. The licensee shall ensure that all radiographic exposure devices and associated equipment, have all required labels, and that labels are legible and clearly visible.



RADIOACTIVE MATERIALS LICENSE

License Number 2998-42325a. Ref. No. 1b. Amend. No. -2-

17. A. Leak tests of sealed sources shall be performed every six (6) months in accordance with Sections 38.22(f) and 38.34(h)(3) of Code Rule 38. Off-site analysis of leak test samples shall be performed by persons specifically authorized by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.
- B. Upon detection of 0.005 microcuries or more of removable contamination, the licensee shall immediately remove such Sealed source from use and take action to prevent the spread of contamination. A report shall be filed within five (5) days with the State of New York, Department of Labor, Radiological Health Unit, specifying the source involved, the tests results and corrective action taken.
18. The licensee shall instruct persons who engage in work under the license, in accordance with section 38.27(c) of Code Rule 38. Such instruction shall include the licensee's operating and emergency procedures, and other information contained in documents incorporated in Condition 19.
19. Except as specifically provided otherwise in this License, the licensee shall conduct its program in accordance with the statements, representations and procedures contained in the documents, including any enclosures, listed below. The Department's regulations shall govern, unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Industrial radiography license number 37-23370-01 issued by the U.S. Nuclear Regulatory Commission
- B. License Application dated January 30, 2001, signed by Don B. Shumway, Sr., with attachments.
- C. Letter dated June 4, 2002, signed by Don B. Shumway, Sr., with attachments.
- D. Letter dated January 20, 2004, signed by Don B. Shumway, Sr., with attachments.

Linda Angello
COMMISSIONER OF LABOR

by: Clayton J. Bradt, CHP
Principal Radiophysicist

DATE:
WTV:msw

OHIO DEPARTMENT OF HEALTH

LICENSE FOR RADIOACTIVE MATERIAL

Pursuant to Chapter 3748 of the Ohio Revised Code, and in reliance on statements and representations made by the licensee, a license is hereby issued authorizing the licensee named herein to receive, acquire, possess, and transfer radioactive material as designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the applications of Chapter 3748 of the Ohio Revised Code and all rules promulgated thereunder. This license shall be deemed to contain the conditions specified in rules 3701-38-021 and 3701-39-021 of the Ohio Administrative Code and is subject to all applicable rules, regulations and orders of the Ohio Department of Health now or hereinafter in effect and to any conditions specified below.

| LICENSEE | | LICENSE NUMBER | |
|----------|--------------------------|----------------------|---------------|
| 1. | Prime NDT Services, Inc. | 3. | 03320 99 0003 |
| 2. | | EXPIRATION DATE | |
| | | 4. | April 1, 2005 |
| | | BUREAU DOCKET NUMBER | |
| | | 5. | SJ05-02-00 |

| 6. RADIOACTIVE MATERIAL | 7. CHEMICAL AND/OR PHYSICAL FORM | 8. MAXIMUM QUANTITY THAT LICENSEE MAY POSSESS AT ANY ONE TIME UNDER THIS LICENSE |
|------------------------------------|---|--|
| A. COBALT-60 | A. Sealed radiography sources as contained in a source assembly registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation. | A. NO SINGLE SOURCE TO EXCEED THE MAXIMUM ACTIVITY SPECIFIED IN THE CERTIFICATE OF REGISTRATION ISSUED BY USNRC, AN AGREEMENT STATE, OR NARM LICENSING STATE (SEE CONDITION 16). |
| B. IRIIDIUM-192 | B. Sealed radiography sources as contained in a source assembly registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation. | B. NO SINGLE SOURCE TO EXCEED THE MAXIMUM ACTIVITY SPECIFIED IN THE CERTIFICATE OF REGISTRATION ISSUED BY USNRC, AN AGREEMENT STATE, OR NARM LICENSING STATE (SEE CONDITION 16). |
| C. CESIUM-137 | C. SEALED SOURCE (AMERSHAM / TECHNICAL OPERATIONS MODEL VD-HP) | C. NO SINGLE SOURCE TO EXCEED 8.325 GBq. |
| D. CESIUM-137 | D. SEALED SOURCE (AMERSHAM / TECHNICAL OPERATIONS MODEL VD-HD) | D. NO SINGLE SOURCE TO EXCEED 4.625GBq. |
| E. URANIUM DEPLETED IN URANIUM-235 | E. SOLID METAL | E. NOT TO EXCEED 999 KILOGRAMS TOTAL POSSESSION LIMIT. |

9. Authorized Use:

- A. and B. For use in a compatible gamma radiography exposure device registered pursuant to USNRC Regulations 10 CFR 32.210 or 32.210, as delineated in OAC 3701-39-021, or an equivalent Agreement State Regulation for performing industrial radiography and if applicable, in a compatible source changer (shipping container) registered pursuant to USNRC Regulation 10 CFR 32.210, or 32.210, as delineated in OAC 3701-39-021, or an equivalent Agreement State Regulation for source storage and exchange.
- C. To be used in Amersham/Gamma industries Master Minder Models 1 and 2 for controlling the movement of Automatic X-ray Crawlers within pipelines during industrial radiographic operations. Source exchange shall be performed by the device manufacturer or other persons specifically authorized to perform such services.
- D. To be used in Amersham/Gamma industries Model Tattle Tale 1 for controlling the movement of Automatic X-ray Crawlers within pipelines during industrial radiographic operations. Source exchange shall be performed by the device manufacturer or other persons specifically authorized to perform such services.
- E. Shielding in exposure devices and source changers.

| | |
|---|----------------------------------|
| <p style="text-align: center;">OHIO DEPARTMENT OF HEALTH</p> <p style="text-align: center;">LICENSE FOR RADIOACTIVE MATERIALS</p> <p style="text-align: center;">SUPPLEMENTARY SHEET</p> | Page 2 of 3 |
| | License Number: 03320 99 0003 |
| | Bureau Docket Number: SJ05-02-00 |
| | Amendment No: INITIAL |

CONDITIONS

10. Licensed material may only be used at the licensee's facilities located at:
 - A. Temporary jobsites in the State of Ohio.

11. Licensed material may only be stored at the licensee's facilities located at:

1882 Old Drum Road NE
Bolivar, OH 44612

and

1408 Piper Court NW
Canton, OH 44703

12. The Radiation Safety Officer for this license is Don B. Shumway, Sr.

13. Licensed material shall be used by, or under the supervision of Don B. Shumway, Sr. or individuals who have been trained in accordance with the provisions of 10 CFR 34.43 as delineated in OAC 3701-39-021 and have been designated in writing by the Radiation Safety Officer.

14. All sealed sources that are used or obtained shall have been evaluated and approved by the U.S. Nuclear Regulatory Commission under the provisions of 32.210 of 10 CFR 32, as delineated in OAC 3701-39-021 or an equivalent Agreement State or NARM Licensing State regulation

15. In addition to the possession limits in item 8, the licensee shall further restrict the possession of sealed source licensed materials to quantities below the minimum limit specified in 10 CFR 30.35(d) as delineated in OAC 3701-39-021 for establishing decommissioning financial assurance.

16. The licensee is authorized to receive, possess, and use sealed sources of Iridium-192 or Cobalt-60 where the quantity of radioactivity exceeds the maximum amount of radioactivity specified in this license provided:
 - A. Such possession does not exceed the quantity per source specified in Item 8 by more than 20% for Iridium-192 or 10% for Cobalt-60.
 - B. Records of the licensee show that no more than the maximum amount of radioactivity per source specified in this license was ordered from the supplier or transferor of the byproduct material: and
 - C. The levels of radiation for radiographic exposure devices and storage containers do not exceed those specified in Section 34.21 of 10 CFR as delineated in OAC 3701-29-021.

17. The licensee is authorized to transport radioactive materials only in accordance with the provisions of 10 CFR 71, as delineated in OAC 3701-39-021, "Packaging and transportation of radioactive material."

18. Sealed sources containing licensed material shall not be opened by the licensee.

19. Sealed sources authorized for use other than radiography shall be leak tested and inventoried in accordance with 10 CFR 34.27 and 10 CFR 34.29 as delineated in OAC 3701-29-021.

LICENSE FOR RADIOACTIVE MATERIALS

SUPPLEMENTARY SHEET

License Number: 03320 99 0003

Bureau Docket Number: SJ05-02-00

Amendment No: INITIAL

20. Notwithstanding the periodic leak test required by 10CFR 34.27 as delineated in OAC 3701-29-021, such requirement does not apply to sources that are stored and not being used. The sources excepted from this test shall be tested for leakage before use or transfer to another person. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
21. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements representations, and procedures contained in the documents, including any enclosures, listed below. The Ohio Department of Health's statutes, rules, and orders shall govern unless statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated December 21, 1999 and
 - B. Facsimile dated February 28, 2000.

For the Ohio Department of Health

DATE: MAR 27 2000BY: 

Director, Ohio Department of Health

APPENDIX G
SAFE USE OF
SEALED SOURCES AND DEVICES

SAFE USE OF SEALED SOURCES AND DEVICES**I. General Instructions for Operating Remote Control Radiographic Devices**

- A. Each radiographic device shall be checked with a radiation survey meter before it is put into operation or moved. This is to ensure the radiographer that the source is in the device in its shielded position.
- B. No radiographic device shall be transported between exposure locations unless it is locked, and caps and plugs inserted as applicable.

II. Specific Instructions for Making an Exposure

- A. Refer to manufacturer's operating manual for specific instructions for making an exposure with a radiographic exposure device. A copy will be with the exposure device at all times.
- B. Calculate, rope off, and post radiation boundaries as outlined in Sections 708 and 710 of Chapter 7.
- C. Expose the source and survey the perimeter of the restricted area to assure that radiation levels do not exceed 2 mR/hr. or as otherwise specified in Section 710 of Chapter 7. If the radiation levels exceed the allowable limits, secure the source and reset the radiation boundaries as necessary. If the boundary dose rate does exceed 2 mR/hr. but will not exceed 2 mrem in any one hour, use the "Calculations for Boundaries Exceeding 2 mR/hr." form in Appendix B.
- D. Maintain surveillance over the restricted area, keeping all unauthorized persons from entering.
- E. After each exposure, and after returning the source to the exposure device by the remote cranking mechanism, perform a physical survey upon approaching the exposure device. You may be able to observe the green marking on the lock slide once the front of the projector has been surveyed and you are sure the source is in the locked position. Continue surveying the source guide tube to the end if one has been used.

III. Specific Instructions for Securing Exposure Devices When No Additional Exposure Are Required

- A. Refer to manufacturers operating manual for securing a radiographic device. A copy will be with the exposure device at all times.
- B. Return the source to its shielded position within the radiographic exposure device.
- C. Perform a physical survey to ensure that the source is in the device in its shielded position.
- D. Lock the exposure device and disconnect the guide tubes and control assembly and insert cap and plug as applicable.
- E. Return the exposure device to the storage area.
- F. Make a physical radiation survey at the surface of the device to ensure the source is in a safe position. Make record of this survey in the "Radiographic Operations Report" (Form RS-4-4), part E.
- G. Lock storage area.
- H. If device cannot be returned to locked storage area, or otherwise physically secured, assign a radiographer or a radiographer's assistant to establish a safe area around devices and to keep unauthorized persons from that area.

IV. Instructions For Use of Storage Devices (Source-Changers)

- A. Refer to manufacturer's operating manuals for specific instructions for operating storage devices. Device specific source changing instructions are in Appendix J. These manuals shall be maintained and readily from the radiography supervisor.
- B. See Chapter 10 for specific instructions for receipt and shipment of source changers.

V. Radiation Surveys

- A. All radiation surveys in above steps are to be performed in accordance with Section 714 of Chapter 7.

VI. Instructions for the Receipt, Inventory, and Transfer of
of Sealed Sources

- A. New sources that are received shall be logged in using the "Inspection Report" (Form RS-7-3).
- B. All sealed sources shall be inventoried once each quarter and the results entered in the log.
- C. Sources that are transferred shall be recorded in the log. Receipts from the recipient must be retained.
- D. Further instructions are provided in Chapter 10

VII. Summary of Instructions

- A. If the source holds, for any reason, fails to return to its shielded position in the device, or any emergency arises, immediately follow emergency procedures outlined in Chapter 8.
- B. Survey area during exposure using survey instrument to confirm that restricted area limits are as specified in Section 704 of Chapter 7. Allow only authorized personnel to enter this area.
- C. Put safety plugs in devices as soon as possible after an exposure if so equipped. Do not move device without safety plugs in proper position and device locked.
- D. After every exposure, survey device to ensure that source is in its shielded position.
- E. Record all sealed source receipts, inventories, transfers, and disposals on the "Inspection Report", (Form RS-7-3).
- F. Record all sealed source receipts, inventory summaries, leak test summaries, transfers and disposals, and shipments on radioactive Material Source History Record". (Form RS-7-2).
- G. Fill out the Utilization Log each time an exposure device is removed from the storage area. A copy of the "Utilization Log" is included in Appendix B.

APPENDIX H
SURVEY METER USE

SURVEY METER USE

I. General

- A. Survey meters are delicate instruments. It is essential that reasonable care be taken in their use to assure reliability.
- B. Survey meters, when transported in vehicles, shall be placed in the driver's compartment. Adequate support of the instrument will prevent damage during transit.
- C. Should a survey meter become inoperable for any reason, cease work until the meter is repaired (and/or calibrated) or obtain a replacement.

II. Preparation for Use

- A. The instruments should be checked for physical damage.
- B. The instrument should be checked to ensure that it has current calibration tag.

III. Using the Instrument

- A. Starting: Turn the switch to the battery check position. The meter should indicate within the BATT OK area.
- B. Operation Check: Place the check source in the repeatable position adjacent to a loaded radiographic exposure device. Move the switch to a range that gives an upscale reading. Note that the reading is sensitive to the position of the source. The reading may be recorded for future reference. In most cases, a reading around 40 mR/hr. at the rear plate when a 100 ci source is in use
- C. Interpretation of Indications: The meter reading must be multiplied by the scale factor to obtain the proper number. The fluctuation of the meter is normal and is caused by the random nature of radioactive decay.

IV. Storing the Instrument

- A. Upon completing operations using radioactive materials and x-ray exposure devices, turn the switch to the OFF position.
- B. Set the instrument in an area where it cannot be physically damaged or subjected to changing environmental conditions.

V. Specific Operating Instructions

Device specific operating instructions for survey instruments used by Prime NDT are attached to this appendix.

OPERATING INSTRUCTIONS

LUDLUM MEASUREMENTS, INC.

MODEL 6 GEIGER COUNTER

I. OPERATING THE INSTRUMENT

- A. REMOVE BATTERY LID AND INSTALL TWO "D" SIZE BATTERIES. NOTE (+) (-) MARKS ON INSIDE OF LID. MATCH BATTERY POLARITY TO THESE MARKS.

NOTE: CENTER POST OF FLASHLIGHT BATTERY IS POSITIVE.
REPLACE BATTERY LID.

- B. TURN INSTRUMENT RANGE SWITCH TO "BAT". THE METER SHOULD DEFLECT TO THE BATTERY CHECK PORTION OF THE METER SCALE. IF METER DOES NOT RESPOND, RECHECK THAT BATTERIES HAVE PROPER POLARITY.
- C. TURN THE RANGE SWITCH TO X1. EXPOSE THE INSTRUMENT TO A RADIATION CHECK SOURCE. THE METER SHOULD RESPOND.
- D. CHECK CALIBRATION AND PROCEED TO USE THE INSTRUMENT.

OPERATING INSTRUCTIONS

GAMMA INDUSTRIES

MODEL 250B & 252B SURVEY METERS

I. OPERATING THE INSTRUMENT:

A. INSPECTION: THE INSTRUMENT SHOULD BE VISUALLY CHECKED FOR PHYSICAL DAMAGE. NOTE CALIBRATION DATE.

B. FUNCTIONAL TEST: TURN SWITCH TO X1 POSITION MOMENTARILY AND THEN RETURN TO TEST POSITION. THE METER SHOULD INDICATE ABOVE THE BAT./CKT. POSITION.

THIS TEST INDICATES THAT SWITCH, BATTERIES, POWER SUPPLIES, GM TUBE, INTEGRATED CIRCUIT, AND METER MOVEMENT ARE IN "GOOD WORKING ORDER".

C. OPERATION CHECK: SELECT THE DESIRED RANGE. IF AVAILABLE, USE A CHECK SOURCE TO ENSURE INSTRUMENT IS OPERATING CORRECTLY.

II. READING SCALES:

THE SCALES ARE MARKED 0-10 DIV/HR WITH A MULTIPLIER AS SELECTED BY THE SELECTOR SWITCH. SIMPLY READ THE MEASUREMENT INDICATED ON THE LINEAR SCALE AND MULTIPLY BY SELECTED NUMBER.

THE GEIGER-MUELLER TUBE IS POSITIONED WITHIN THE UNIT AT THE POSITION INDICATED BELOW. FOR MOST ACCURATE RESULTS, HOLD THE INSTRUMENT LEVEL AND PERPENDICULAR TO THE SOURCE OF RADIATION.

OPERATING INSTRUCTIONS

G.E. SMITH AND NDS PRODUCTS

MODELS GS1000, GS2000, NDS2000

I. OPERATING INSTRUCTIONS

- A. TURN SWITCH TO BATT. CHECK. THE METER SHOULD READ IN THE INDICATED BATT. ZONE. REPLACE BATTERIES IF NEEDED. DO NOT USE IF BATT. CHECK IS NOT IN THE BATT. ZONE.
- B. INSPECT FOR PHYSICAL DAMAGE.
- C. CHECK CALIBRATION DUE DATE. **DO NOT USE IF PAST DUE.**
- D. USE A CHECK SOURCE OR EQUIVALENT TO ENSURE THAT THE SURVEY METER IS READING RADIATION.
- E. WHEN SECURING THE METER TOP TO BOTTOM, CLEAN THE BOTTOM GASKET TO ENSURE A PROPER SEAL. TIGHTEN THE FOUR SCREWS UNTIL THE TOP AND BOTTOM MEET SECURELY. REPLACE GASKET WHEN NECESSARY.

APPENDIX I
RESTRICTED, RADIATION, AND HIGH RADIATION AREAS
BOUNDARY TABLES

INSTRUCTIONS FOR USE OF
RESTRICTED AREA, RADIATION AREA
AND HIGH RADIATION AREA TABLES

- I. Tables for Iridium 192 and Cobalt 60 are available. Each set contains a Restricted Area Table, a Radiation Area Table, and a High Radiation Area Table.
- II. The purpose of the tables is to provide the radiographer with initial distances to establish and/or define boundaries for restricted, radiation, and high radiation areas. Since the tables are based on calculated radiation levels for an unshielded source, they provide safe and conservative distances. Attenuation and scatter of radiation by the specimen and other objects in the vicinity will produce radiation levels different from given in the tables, but the actual radiation levels will generally be lower.
- III. During the first exposure, the restricted area boundary should be checked by performing an actual physical survey and adjusting the boundaries out where required and where permissible and only if there is a need to do so.
- IV. To use the tables, select the desired Restricted Area, Radiation Area, or High Radiation Area Table for the proper isotope being used.
- V. Estimate the maximum number of radiography shots to be performed in the next hour and the maximum exposure time for each shot. From this information, determine the maximum exposure time in minutes to be performed in the next hour. In the second line of the table labeled min/hr, select the column with lowest min/hr which is not below the estimated workload (e.g. for an estimated maximum exposure time of 27 min. in the next hour, select the 30 min/hr. column.) If desired, linear interpolation may be used.

- VI. From the decay chart supplied with the radiography source, determine the activity of the isotope. Then opposite the activity of the isotope in the selected workload column above, read the distance in feet from the source to define the desired boundary (e.g. if the workload is 30 min/hr for an 80 curie Ir-192 source, then the distance from the source to establish the restricted area is 344 feet). If a collimator is used and the useful beam is directed downward, then the activity may be reduced by the attenuation of the collimator (e.g. if the collimator has three half value layers for the isotope being used, then the activity can be reduced by 23 or the 80 curie source would be considered a 10 curie source and the restricted area distance for a 30 min/hr workload would be 121 feet).
- VII. The first line labeled mR/hr gives the radiation level at the established boundary for each workload in the line below it (e.g. for a 30 min/hr workload using an Ir-192 source, a survey meter would read 4.0 mR/hr at the boundary to achieve the desired 2.0 mR/hr in any one hour required by the regulations).
- VIII. ALWAYS perform a physical radiation survey with a survey meter to determine if the estimates provided by the tables are adequate.

"TABLE 4-A"**RESTRICTED AREA**

Rev. 0 (2-97)

Number of feet from unshielded Iridium 192 source for 2 MR in any one (1) hour as a function of total exposure time in one (1) hour and activity Iridium.

| MR/HR. MIN/HR | 2.0 60 | 2.2 55 | 2.4 50 | 2.7 45 | 3.0 40 | 3.4 35 | 4.0 30 | 4.8 25 | 6.0 20 | 8.0 15 | 12.0 10 | 24.0 5 | 120 1 |
|--------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|-------------------|------------------|
| 1 | 54 | 52 | 50 | 47 | 44 | 41 | 38 | 35 | 31 | 27 | 22 | 16 | 7 |
| 5 | 121 | 116 | 111 | 105 | 99 | 93 | 86 | 78 | 70 | 61 | 50 | 35 | 16 |
| 10 | 172 | 164 | 157 | 149 | 140 | 131 | 121 | 111 | 99 | 86 | 70 | 50 | 22 |
| 15 | 210 | 201 | 192 | 182 | 172 | 161 | 149 | 146 | 121 | 105 | 86 | 61 | 27 |
| 20 | 243 | 233 | 222 | 210 | 198 | 186 | 172 | 157 | 140 | 124 | 99 | 70 | 31 |
| 25 | 272 | 260 | 298 | 235 | 222 | 207 | 192 | 175 | 157 | 136 | 111 | 78 | 35 |
| 30 | 297 | 285 | 272 | 258 | 243 | 227 | 210 | 195 | 172 | 149 | 121 | 86 | 38 |
| 35 | 321 | 308 | 294 | 278 | 262 | 245 | 227 | 207 | 186 | 161 | 131 | 93 | 41 |
| 40 | 344 | 329 | 314 | 297 | 280 | 262 | 243 | 222 | 198 | 172 | 140 | 99 | 44 |
| 45 | 364 | 349 | 333 | 316 | 297 | 278 | 258 | 235 | 210 | 182 | 149 | 105 | 47 |
| 50 | 384 | 368 | 351 | 333 | 314 | 293 | 272 | 248 | 222 | 192 | 147 | 111 | 50 |
| 55 | 408 | 386 | 368 | 349 | 329 | 308 | 285 | 260 | 233 | 201 | 164 | 116 | 51 |
| 60 | 421 | 403 | 384 | 364 | 344 | 321 | 297 | 272 | 243 | 210 | 172 | 121 | 54 |
| 65 | 438 | 419 | 400 | 379 | 358 | 334 | 310 | 283 | 253 | 219 | 179 | 126 | 57 |
| 70 | 454 | 435 | 415 | 394 | 371 | 348 | 321 | 293 | 262 | 227 | 186 | 131 | 59 |
| 75 | 470 | 450 | 429 | 407 | 384 | 359 | 333 | 304 | 272 | 235 | 192 | 136 | 61 |
| 80 | 486 | 465 | 443 | 421 | 397 | 371 | 344 | 314 | 280 | 243 | 193 | 140 | 63 |
| 85 | 501 | 479 | 457 | 434 | 409 | 382 | 354 | 323 | 289 | 250 | 204 | 145 | 65 |
| 90 | 515 | 493 | 470 | 446 | 421 | 394 | 364 | 333 | 297 | 258 | 210 | 149 | 67 |
| 95 | 529 | 506 | 483 | 458 | 432 | 404 | 374 | 342 | 306 | 265 | 216 | 153 | 68 |
| 100 | 543 | 520 | 496 | 470 | 443 | 415 | 384 | 351 | 314 | 272 | 222 | 157 | 70 |
| 105 | 556 | 533 | 500 | 482 | 454 | 425 | 394 | 359 | 321 | 276 | 227 | 161 | 72 |
| 110 | 570 | 545 | 520 | 493 | 465 | 435 | 403 | 368 | 329 | 284 | 233 | 164 | 74 |
| 115 | 583 | 558 | 532 | 504 | 476 | 445 | 412 | 376 | 336 | 291 | 238 | 168 | 75 |
| 120 | 595 | 570 | 543 | 515 | 486 | 454 | 421 | 384 | 344 | 297 | 243 | 172 | 77 |

"TABLE 4-B"**RADIATION AREA**

Rev. 0 (2-97)

Number of feet from unshielded Iridium 192 sources for 5 MR in any one (1) hour as a function of total exposure time in one (1) hour and activity of Iridium.

| MR/HR MIN/HR | 5.0 60 | 5.5 60 | 6.0 50 | 6.7 45 | 7.5 40 | 8.6 35 | 10 30 | 12 25 | 15 20 | 20 15 | 30 10 | 60 5 | 300 1 |
|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 1 | 34 | 31 | 31 | 30 | 28 | 26 | 24 | 22 | 20 | 17 | 14 | 10 | 4 |
| 5 | 77 | 74 | 70 | 67 | 63 | 59 | 54 | 50 | 44 | 38 | 31 | 22 | 10 |
| 10 | 109 | 104 | 99 | 94 | 89 | 83 | 77 | 70 | 63 | 54 | 44 | 33 | 14 |
| 15 | 133 | 127 | 121 | 115 | 109 | 102 | 94 | 86 | 77 | 67 | 54 | 38 | 17 |
| 20 | 154 | 147 | 140 | 133 | 125 | 117 | 109 | 99 | 89 | 77 | 63 | 44 | 20 |
| 25 | 172 | 164 | 157 | 149 | 140 | 131 | 121 | 111 | 99 | 86 | 70 | 50 | 22 |
| 30 | 188 | 180 | 172 | 163 | 154 | 144 | 133 | 121 | 109 | 94 | 77 | 54 | 24 |
| 35 | 203 | 195 | 186 | 176 | 166 | 155 | 144 | 131 | 117 | 102 | 88 | 59 | 28 |
| 40 | 217 | 208 | 198 | 188 | 177 | 166 | 154 | 140 | 125 | 109 | 89 | 63 | 28 |
| 45 | 230 | 221 | 210 | 200 | 183 | 176 | 163 | 149 | 133 | 115 | 94 | 67 | 30 |
| 50 | 243 | 233 | 222 | 210 | 198 | 186 | 172 | 157 | 140 | 121 | 99 | 70 | 31 |
| 55 | 255 | 244 | 233 | 221 | 208 | 195 | 180 | 164 | 147 | 127 | 104 | 74 | 33 |
| 60 | 266 | 255 | 243 | 230 | 217 | 203 | 188 | 172 | 154 | 133 | 109 | 77 | 34 |
| 65 | 277 | 265 | 253 | 240 | 226 | 212 | 196 | 179 | 160 | 138 | 113 | 80 | 36 |
| 70 | 287 | 275 | 263 | 249 | 234 | 220 | 203 | 186 | 166 | 144 | 117 | 83 | 37 |
| 75 | 297 | 285 | 272 | 258 | 243 | 227 | 210 | 192 | 172 | 149 | 121 | 86 | 38 |
| 80 | 307 | 294 | 280 | 266 | 251 | 235 | 217 | 198 | 177 | 154 | 125 | 89 | 40 |
| 85 | 317 | 303 | 289 | 274 | 259 | 241 | 224 | 204 | 183 | 158 | 129 | 91 | 41 |
| 90 | 326 | 312 | 297 | 282 | 266 | 249 | 230 | 210 | 188 | 163 | 133 | 94 | 42 |
| 95 | 335 | 321 | 306 | 290 | 273 | 256 | 237 | 216 | 193 | 167 | 137 | 97 | 43 |
| 100 | 344 | 329 | 314 | 297 | 280 | 262 | 243 | 222 | 198 | 172 | 140 | 99 | 44 |
| 105 | 352 | 337 | 321 | 304 | 287 | 269 | 249 | 227 | 203 | 176 | 144 | 102 | 45 |
| 110 | 360 | 345 | 329 | 312 | 294 | 275 | 255 | 233 | 208 | 180 | 147 | 104 | 47 |
| 115 | 368 | 353 | 336 | 319 | 310 | 281 | 260 | 238 | 213 | 184 | 150 | 106 | 48 |
| 120 | 376 | 360 | 344 | 326 | 307 | 287 | 266 | 243 | 217 | 188 | 254 | 109 | 49 |

"TABLE 4-C"**HIGH RADIATION AREA**

Rev. 0 (2-97)

Number of feet from unshielded Iridium 192 source for 100 MR in any one (1) hour as a function of total exposure time in one (1) hour and activity of Iridium.

| MR/HR MIN/HR | 100 60 | 100 55 | 120 50 | 133 45 | 150 40 | 171 35 | 200 30 | 240 24 | 300 20 | 400 15 | 600 10 | 1200 5 | 6000 1 |
|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | 8 | 7 | 7 | 7 | 6 | 6 | 5 | 5 | 4 | 4 | 3 | 2 | 1 |
| 5 | 17 | 16 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 7 | 5 | 2 |
| 10 | 24 | 23 | 22 | 21 | 20 | 19 | 17 | 16 | 14 | 12 | 10 | 7 | 3 |
| 15 | 30 | 28 | 27 | 26 | 24 | 23 | 21 | 19 | 17 | 15 | 12 | 9 | 4 |
| 20 | 34 | 33 | 31 | 30 | 28 | 26 | 24 | 23 | 20 | 17 | 14 | 10 | 4 |
| 25 | 38 | 37 | 35 | 33 | 31 | 29 | 27 | 25 | 22 | 19 | 16 | 11 | 5 |
| 30 | 42 | 40 | 38 | 36 | 34 | 32 | 30 | 27 | 24 | 21 | 17 | 12 | 5 |
| 35 | 45 | 44 | 41 | 39 | 37 | 35 | 32 | 29 | 26 | 23 | 19 | 13 | 6 |
| 40 | 49 | 47 | 44 | 42 | 40 | 37 | 34 | 31 | 28 | 24 | 20 | 14 | 6 |
| 45 | 52 | 49 | 47 | 45 | 42 | 39 | 36 | 33 | 30 | 26 | 21 | 15 | 7 |
| 50 | 54 | 52 | 50 | 47 | 44 | 41 | 38 | 35 | 31 | 27 | 22 | 16 | 7 |
| 55 | 57 | 55 | 52 | 49 | 47 | 44 | 40 | 37 | 33 | 28 | 23 | 16 | 7 |
| 60 | 59 | 57 | 54 | 52 | 49 | 45 | 42 | 38 | 34 | 30 | 24 | 17 | 8 |
| 65 | 62 | 59 | 57 | 54 | 51 | 47 | 44 | 40 | 36 | 31 | 25 | 18 | 8 |
| 70 | 64 | 62 | 59 | 56 | 52 | 49 | 45 | 41 | 37 | 32 | 26 | 19 | 8 |
| 75 | 67 | 64 | 61 | 58 | 54 | 51 | 47 | 43 | 38 | 33 | 27 | 19 | 9 |
| 80 | 69 | 66 | 63 | 59 | 56 | 52 | 49 | 44 | 40 | 34 | 28 | 20 | 9 |
| 85 | 71 | 68 | 65 | 61 | 57 | 54 | 50 | 46 | 41 | 35 | 29 | 20 | 9 |
| 90 | 73 | 70 | 67 | 63 | 59 | 56 | 52 | 47 | 42 | 36 | 30 | 21 | 9 |
| 95 | 75 | 72 | 68 | 65 | 61 | 57 | 53 | 48 | 43 | 37 | 31 | 22 | 10 |
| 100 | 77 | 74 | 70 | 67 | 63 | 59 | 54 | 50 | 44 | 38 | 31 | 22 | 10 |
| 105 | 79 | 75 | 72 | 68 | 64 | 60 | 56 | 51 | 45 | 39 | 32 | 23 | 10 |
| 110 | 81 | 77 | 74 | 70 | 66 | 62 | 57 | 52 | 47 | 40 | 33 | 23 | 10 |
| 115 | 83 | 78 | 75 | 71 | 67 | 63 | 58 | 53 | 48 | 41 | 34 | 24 | 11 |
| 120 | 84 | 81 | 77 | 73 | 69 | 64 | 59 | 54 | 49 | 42 | 34 | 24 | 11 |

"TABLE 4-D"**RESTRICTED AREA**

Rev. 0 (2-97)

Number of feet from unshielded Cobalt 60 source for 2 MR in any one (1) hour as a function of total exposure time in one (1) hour and activity of Cobalt.

| MR/HR MIN/HR | 2.0 60 | 2.2 55 | 2.4 50 | 2.7 45 | 3.0 40 | 3.4 35 | 4.0 30 | 4.8 25 | 6.0 20 | 8.0 15 | 12.0 10 | 24.0 5 | 120 1 |
|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|-------------------|------------------|
| 1 | 55 | 81 | 77 | 73 | 69 | 65 | 60 | 55 | 49 | 42 | 35 | 24 | 11 |
| 5 | 190 | 182 | 173 | 164 | 155 | 145 | 134 | 122 | 110 | 95 | 77 | 55 | 24 |
| 10 | 262 | 167 | 245 | 232 | 219 | 205 | 190 | 173 | 155 | 134 | 110 | 77 | 35 |
| 15 | 329 | 315 | 300 | 285 | 268 | 251 | 232 | 212 | 190 | 164 | 134 | 95 | 42 |
| 20 | 379 | 363 | 346 | 329 | 310 | 290 | 268 | 245 | 219 | 190 | 155 | 110 | 49 |
| 25 | 425 | 406 | 387 | 367 | 346 | 324 | 300 | 274 | 245 | 212 | 173 | 122 | 55 |
| 30 | 465 | 445 | 424 | 402 | 379 | 355 | 329 | 300 | 268 | 232 | 190 | 134 | 60 |
| 35 | 502 | 481 | 458 | 435 | 410 | 383 | 355 | 325 | 290 | 251 | 205 | 145 | 65 |
| 40 | 537 | 514 | 490 | 465 | 438 | 410 | 379 | 346 | 310 | 268 | 219 | 155 | 69 |
| 45 | 569 | 545 | 520 | 493 | 465 | 435 | 402 | 367 | 329 | 285 | 232 | 164 | 73 |
| 50 | 604 | 574 | 548 | 520 | 490 | 458 | 424 | 387 | 346 | 300 | 245 | 173 | 77 |
| 55 | 629 | 602 | 574 | 545 | 514 | 481 | 445 | 406 | 363 | 315 | 257 | 182 | 81 |
| 60 | 657 | 629 | 600 | 569 | 537 | 502 | 465 | 424 | 379 | 329 | 268 | 190 | 85 |
| 65 | 689 | 655 | 624 | 592 | 559 | 522 | 484 | 442 | 395 | 342 | 279 | 197 | 88 |
| 70 | 710 | 680 | 648 | 615 | 580 | 542 | 502 | 458 | 410 | 355 | 290 | 205 | 92 |
| 75 | 736 | 704 | 671 | 636 | 600 | 561 | 520 | 477 | 424 | 367 | 300 | 212 | 95 |
| 80 | 759 | 727 | 693 | 669 | 620 | 580 | 537 | 490 | 438 | 379 | 310 | 219 | 98 |
| 85 | 792 | 749 | 714 | 677 | 639 | 597 | 553 | 505 | 452 | 391 | 319 | 226 | 101 |
| 90 | 805 | 770 | 735 | 697 | 657 | 615 | 569 | 520 | 465 | 402 | 329 | 232 | 104 |
| 95 | 827 | 792 | 755 | 716 | 675 | 632 | 585 | 534 | 477 | 414 | 338 | 239 | 107 |
| 100 | 629 | 812 | 775 | 735 | 693 | 648 | 600 | 548 | 490 | 424 | 346 | 245 | 110 |
| 105 | 869 | 832 | 794 | 753 | 710 | 664 | 615 | 561 | 502 | 435 | 355 | 251 | 112 |
| 110 | 890 | 852 | 812 | 771 | 727 | 680 | 629 | 574 | 514 | 445 | 363 | 257 | 115 |
| 115 | 910 | 878 | 831 | 788 | 743 | 695 | 643 | 587 | 525 | 455 | 373 | 263 | 117 |
| 120 | 930 | 890 | 849 | 805 | 759 | 710 | 657 | 600 | 537 | 465 | 379 | 268 | 120 |

"TABLE 4-F"**HIGH RADIATION AREA**

Rev. 0 (2-97)

Number of feet from unshielded Cobalt 60 source for 100 MR in any one (1) hour as a function of total exposure time in one (1) hour and activity of Cobalt.

| MR/HR MIN/HR | 100 60 | 109 55 | 120 50 | 133 45 | 150 40 | 171 35 | 200 30 | 240 25 | 300 20 | 400 15 | 600 10 | 1200 5 | 6000 1 |
|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | 12 | 11 | 11 | 10 | 10 | 9 | 8 | 8 | 7 | 6 | 5 | 3 | 2 |
| 5 | 27 | 26 | 24 | 23 | 22 | 20 | 19 | 17 | 15 | 13 | 11 | 8 | 3 |
| 10 | 38 | 36 | 35 | 33 | 31 | 29 | 27 | 24 | 22 | 19 | 15 | 11 | 5 |
| 15 | 45 | 44 | 42 | 40 | 38 | 35 | 33 | 30 | 27 | 23 | 19 | 13 | 6 |
| 20 | 54 | 51 | 49 | 46 | 44 | 41 | 38 | 35 | 31 | 27 | 22 | 15 | 7 |
| 25 | 60 | 57 | 55 | 51 | 49 | 46 | 42 | 39 | 35 | 30 | 24 | 17 | 8 |
| 30 | 66 | 63 | 60 | 57 | 54 | 50 | 46 | 42 | 38 | 33 | 27 | 19 | 8 |
| 35 | 71 | 68 | 65 | 61 | 58 | 54 | 50 | 46 | 41 | 35 | 29 | 20 | 9 |
| 40 | 76 | 73 | 69 | 66 | 62 | 58 | 54 | 49 | 44 | 38 | 31 | 22 | 10 |
| 45 | 80 | 77 | 73 | 70 | 66 | 61 | 57 | 52 | 46 | 40 | 33 | 23 | 10 |
| 50 | 85 | 81 | 77 | 73 | 69 | 65 | 60 | 55 | 49 | 42 | 35 | 24 | 11 |
| 55 | 89 | 85 | 81 | 77 | 73 | 68 | 63 | 57 | 51 | 44 | 36 | 25 | 11 |
| 60 | 93 | 89 | 85 | 80 | 76 | 71 | 66 | 60 | 54 | 46 | 38 | 27 | 12 |
| 65 | 97 | 93 | 88 | 84 | 79 | 74 | 68 | 62 | 56 | 48 | 39 | 28 | 12 |
| 70 | 100 | 96 | 92 | 87 | 82 | 77 | 71 | 65 | 58 | 50 | 41 | 29 | 13 |
| 75 | 104 | 99 | 95 | 90 | 85 | 79 | 73 | 67 | 60 | 52 | 42 | 30 | 13 |
| 80 | 107 | 103 | 98 | 93 | 88 | 82 | 76 | 69 | 62 | 54 | 44 | 31 | 14 |
| 85 | 111 | 106 | 101 | 96 | 90 | 84 | 78 | 71 | 64 | 55 | 45 | 32 | 14 |
| 90 | 114 | 109 | 104 | 99 | 93 | 87 | 80 | 73 | 66 | 57 | 46 | 33 | 15 |
| 95 | 117 | 112 | 107 | 101 | 95 | 89 | 83 | 75 | 68 | 58 | 48 | 34 | 15 |
| 100 | 120 | 115 | 110 | 104 | 98 | 92 | 85 | 77 | 69 | 60 | 49 | 35 | 15 |
| 105 | 123 | 118 | 112 | 106 | 100 | 94 | 87 | 79 | 71 | 61 | 50 | 35 | 16 |
| 110 | 126 | 120 | 115 | 109 | 103 | 96 | 89 | 82 | 73 | 63 | 51 | 36 | 16 |
| 115 | 129 | 123 | 117 | 111 | 105 | 98 | 91 | 83 | 74 | 64 | 53 | 37 | 17 |
| 120 | 131 | 126 | 120 | 114 | 107 | 100 | 93 | 85 | 76 | 66 | 54 | 38 | 17 |

"TABLE 4-1"

UNRESTRICTED, RADIATION AND HIGH RADIATION AREAS

250 KV

5 MA

X-RAY UNIT

NUMBER OF FEET TO SPECIFIED BOUNDARY AS A FUNCTION
OF TOTAL EXPOSURE TIME IN ONE HOUR.

| WORK LOAD Minutes/Hour | UNRESTRICTED | | RADIATION-HIGH | | RADIATION | |
|---------------------------|--------------|---------|----------------|---------|-----------|---------|
| | Direct | Scatter | Direct | Scatter | Direct | Scatter |
| 1 | 224 | 8 | 141 | 5 | 32 | 1 |
| 5 | 500 | 16 | 316 | 10 | 71 | 3 |
| 10 | 707 | 23 | 447 | 15 | 100 | 4 |
| 15 | 866 | 28 | 548 | 18 | 122 | 4 |
| 20 | 1,000 | 32 | 632 | 20 | 141 | 5 |
| 25 | 1,118 | 36 | 707 | 23 | 158 | 5 |
| 30 | 1,224 | 39 | 775 | 25 | 173 | 6 |
| 35 | 1,323 | 42 | 837 | 27 | 187 | 6 |
| 40 | 1,414 | 45 | 894 | 29 | 200 | 7 |
| 45 | 1,500 | 48 | 949 | 30 | 212 | 7 |
| 50 | 1,581 | 50 | 1,000 | 32 | 224 | 8 |
| 55 | 1,658 | 53 | 1,049 | 34 | 235 | 8 |
| 60 | 1,732 | 55 | 1,095 | 35 | 245 | 8 |

NOTE: FOR EVERY 0.25 INCH OF STEEL IN THE DIRECT BEAM, THE DISTANCE TO THE SPECIFIED BOUNDARY IN THE DIRECT BEAM MAY BE CALCULATED BY REDUCING THE WORK LOAD BY ONE-HALF.

APPENDIX J
SOURCE EXCHANGE INSTRUCTIONS

SOURCE EXCHANGE INSTRUCTIONS

I. Safety Considerations

- A. Source changes will only be made by the Radiation Safety Officer or radiographer trained and qualified by the RSO. Qualifications will be on file.
- B. Source changes will only be made at our facility in Whitehall, PA.
- C. All operations must be monitored with an operable, currently calibrated survey meter capable of reading from 2 mR to 1 R.
- D. Personal monitoring devices must be worn during all source change operations.
- E. Pocket dosimeters shall be initially charged at the beginning of the day and should be checked periodically during the operation.

Note: All the procedures used when making radiographic exposures must be followed during a source change operation.

II. Operating Instructions - Source Exchange (Ir-192 Sources)

- A. Survey shipping container with a calibrated survey meter.

Note: If surface readings exceed 200 mR/hr., place container in a safe area and contact the Office of Radiation Safety (Emergency Procedures), and then the supplier.
- B. Locate source changer and exposure device in an area where the source may be exposed.
- C. Set up exposure device as for an exposure.
- D. Attach one end of the transfer tube to the camera in the usual manner. Remove shipping plug from changer. Remove adaptor plug from dust cap, attach it to the source changer lock body. Connect the other end of the exposure tube to the adaptor plug on the empty side of the source changer. Position the equipment in such a manner as to permit free travel of the source assembly in the tube.

- E. Position the drive crank the maximum distance from the exposure device.
- F. Quickly crank the source out of the camera and into the source changer. Survey the changer to verify the insertion of the source.
- G. Secure the source changer lock. Test pigtail to verify source is securely held by closed lock. This may be done by attempting to retract the source after the lock has been closed.
- H. Unscrew the adaptor coupling connecting the exposure tube and the source changer. Disconnect the source from the drive cable in accordance with the camera manufacturer's instructions.
- I. Remove the dust cap on the lock body with the new source tag.
- J. Install the dust cap on the lock body containing the spent source. Remove the spent source nameplate from the camera. Wire seal the spent source nameplate to the dust cap and lock body.
- K. Align the exposure device and source tube with source changer. The exposure tube should be straight and free of kinks with the end of the drive cable protruding one-half (1/2) inch from the end of the housing.
- L. Connect the new source to the drive cable in accordance with the manufacturer's instructions.
- M. Connect the source tube and adaptor coupling to the source changer lock body.
- N. Position the camera drive crank the maximum distance from the camera.
- O. Unlock the safety feature securing the new source in the source changer.
- P. Quickly crank the new source into the camera. Survey the camera to verify safe position of the source.
- Q. Lock the camera and replace the adaptor and shipping plug. Attach the new source identification plate to the exposure device.

A copy of the source changer instructions should be provided with each source shipment. Source changing should be in strict accordance with the manufacturer's instructions.

III. Example: The following has been taken from AEA Technology Model 650L Source Changer which is the only one we use at this time.

A. General

The Model 650L is used as a source changer and Type B(U)-85 transport package for authorized radiography source assemblies. A listing of authorized source assemblies are listed in Table 2. Users within Canada should contact as AEA Technology QSA, Inc. customer service center for a listing of authorized source assemblies that are authorized for use with the Model 650L within Canada.

In order to use this equipment to perform source changes within the United States, the user must be specifically licensed to do so. Application for a license should be filed with the appropriate Regional Office of the U.S. Nuclear Regulatory Commission or appropriate Agreement State Office.

Prior to initial use of this source changer as a transport package in the United States, the user must:

1. A NRC QA program is no longer required under 10 CFR 34. As applicable, amend the Materials License to use the Model 650L source changer.
2. Register as a user of the Type B package with the Transportation Branch of the U.S. Nuclear Regulatory Commission.

Transportation Branch
Division of Safeguards and Transportation
Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

3. Maintain on file a copy of the Certificate of Compliance Number USA/9269/B(U)-85, issued by the Nuclear Regulatory Commission, including copies of all applicable drawings referenced on this certificate and the operating instructions for the package.
4. Maintain on file a copy of the U.S. Department of

Transportation Certificate of Competent Authority for the special form source transported in the source changer.

5. Prepare this package for transport, as shown in the applicable drawings and as described in these Operating Instructions.

Prior to the first shipment of the source changer from the United States, the user must also register with:

Office of Hazardous Materials Technology
Research and Special Programs Administration
400 Seventh Street SW
U.S. Department of Transportation
Washington, DC 20590

The user must have in his possession a copy of the IAEA Certificate of Competent Authority Number USA/9269/B(U)-85 issued for this source changer. Users of this equipment outside the United States must comply with the regulatory, licensing, and transportation rules and regulations of their respective countries.

IV. Technical Data

A. General Description

The Model 650L source changer is a portable, depleted Uranium-238 shielded transport container used for transferring special form radiography source assemblies to and from industrial radiography exposure devices. The source changer is a Type B (U)-85 transport container that is designed to safely contain radiography assemblies during shipment and storage. The 650L source changer meets the requirements of 10CFR34 for source changers and storage containers. Additionally, the source changer permits field exchanges of depleted and new radiography source assemblies without exposing the operator to unsafe radiation levels, provided proper procedures and radiation surveys are followed. The source changer is designed with a 250 Ci (8.88 TBq) maximum capacity to contain either one or two Iridium-192 assemblies, which are secured by independent locking mechanisms.

The two locking mechanisms consist of two stainless-steel lock slides for each lock mechanism, a stainless steel lock housing, and a key-operated lock. The lock slide's function is to secure against movement and to provide a means of locking a source assembly within the source changer. The lock slides are machined to form a keyhole

consisting of a circular opening approximately 3/8 inch (9.5 mm) in diameter with an elongated slot that are mechanically joined to move in unison. When the lock slide is positioned into the "unsecured" position, the circular openings of the keyholes are moved over the source assembly and titanium source tubes. This permits the source assembly wire and stop-ball to move freely into or out of the source changer, passing through the lock slide.

When the lock slide is moved to the "secure" position, one of the narrow machined slots of the lock slide is positioned above the stop-ball of the source assembly, restricting movement of the source assembly.

A quick connect feature is also incorporated into the lock mechanism's design. Source guide tubes (projection sheaths) are attached to a detachable threaded fitting that permits a quick connect or disconnect to the locking mechanism. The threaded fitting is secured to the locking mechanism with a spring-loaded plunger. The spring-loaded plunger must be manually retracted to disconnect the source guide tube (projection sheath) from the source changer's lock mechanism.

The redesigned lock mechanism provides:

- a. The 650L source changer to be utilized with a wide range of source assemblies that are manufactured from helical wrap, aircraft, or speedometer type cables.
- b. A means of securing the source assemblies utilizing the stop-ball, taking into account the differences of source assembly length and stop-ball positions.
- c. Permits easier attachment and detachment of the source guide tube (projection sheath) to and from the lock mechanism.

B. Technical Data

Size: 8.25 in (210 mm) wide; 10 in (354 mm) long; 13.25 in (337 mm) high

Shipping Weight: 90 lbs (41 Kg) maximum

Maximum Capacity: 240 Curies (8.88 TBq) of Iridium-192 as special form *

Shielding: Depleted Uranium (U-238) 42 lbs (19 Kg)

Transport Status: Type B Package, USA/9259/B(U)-85

* Source assemblies and isotopes approved for use with the Model 650L: see Table 2

C. Shipment Data

An envelope accompanies each shipment and contains:

1. Source decay chart and leak test certification. Keep for user's records.
2. Source identification plate for attachment to user's exposure device.
3. Return shipping labels.
4. Tamper Indicator seals.
5. Operating Instructions.

V. OperationsA. General Requirements Before Use

1. Upon receipt of a source changer, survey the source changer to assure that the source is in its proper storage position. Radiation levels should be less than 200 mR/hr (2 mSv/hr) at the surface of the container and less than 10 mR/hr (100 μ Sv/hr) at one meter from the surface.

If either of these radiation levels is exceeded, place the source changer in a restricted area and notify the Radiation Safety Officer. The Radiation Safety Officer must notify the U.S. Nuclear Regulatory Commission or appropriate regulatory agency, the final delivering carrier, and AEA Technology QSA, Inc., immediately.

Visually inspect the source changer for signs of damage, and assure that the seal wire (tamper-indicator seal) has not been compromised or broken. Record any deficiencies of the visual inspection on the receiving report.

2. Locate the source changer and radiographic exposure device in a restricted area. Arrange them so that one length of guide tube (projection sheath) will fit between them without any sharp bends or kinks in the tube.

The bend radius of the source guide tube (projection sheath) during source exchanging operations should be greater than 20 inches (508 mm).

NOTE: THE SOURCE CHANGER MUST REMAIN UPRIGHT AT ALL TIMES. DO NOT LAY THE SOURCE CHANGER ON ITS SIDE.

3. Locate the remote controls (wind-outs) as far away as possible from the exposure device and the source changer, preferably behind any available shielding.

B. Operational Sequence to Transfer a Spent Radiography Source Assembly into the Model 650L Source Changer

1. Unscrew and remove the protective cap from the locking mechanism.
2. At the empty 650L tube, unlock the key-lock and push the lock slide away from the key-lock. This "unsecured" position will permit the source assembly to pass through the lock mechanism. Insert the nylon gauge into the source tube to ensure that no foreign objects or cropped sources are in the source changer's source tube. Ensure the scribed line of the gauge is level to or slightly below the top of the threaded fitting. This gauge measurement indicates the source tube is empty. If the scribed line of the gauge is displaced greater than $\frac{1}{2}$ inch (12.7 mm), there may be a foreign object inside of the source tube. This could cause displacement of a source assembly affecting proper securement of the source assembly and cause higher than normal radiation intensities. Call AEA Technology QSA, Inc. for assistance if the nylon gauge does not provide an empty indication.
3. Over the source changer's empty source tube, release the threaded fitting by manually pulling back on the spring-loaded plunger located at the side of the lock assembly.
4. Attach the threaded fitting to the source guide tube (projection sheath).
5. After confirming the source tube is empty, insert the source guide tube (projection sheath) with the threaded fitting into the lock fitting. Gently pull the source guide tube upward to ensure the spring-loaded plunger of the lock is fully engaged into the source guide tube fitting.
6. Set up the radiographic exposure device as for an exposure. Ensure the "restricted" area is cleared of all personnel and all access points are secured. Position survey meter close to the operation control point to allow continuous monitoring of the radiation intensity to which the operator is exposed.

At the exposure device's remote controls (wind-out), crank the source rapidly from the exposure device to the source changer. During movement of the source assembly, the radiation intensity will greatly increase as the source assembly exits the exposure device, decrease slightly as the source assembly is cranked from the exposure device towards the source changer and then drop down to background when the source assembly is shielded within the source changer.

Approach the exposure device with a survey meter. Survey the exposure device, survey the entire length of the source guide tube (projection sheath), and survey all sides of the source changer to assure the source assembly has been properly transferred and is in the fully shielded position. The maximum radiation level should be less than 200 mR/hr (and less than 10 mR/hr at one meter from the surface of the source changer).

7. **CRITICAL OPERATIONS FOR STEPS 7 AND 8. READ AND FOLLOW CAREFULLY:** After confirming (by survey) the transferred source assembly is in the fully shielded position, push the lock slide towards the key-lock to secure the source assembly.
8. Push down on the key-lock to engage the lock. Engagement of the plunger key-lock will secure against any movement of the lock slide. Release the source guide tube (projection sheath) with the attached threaded fitting from the lock mechanism by manual retraction of the spring-loaded plunger. Slowly pull the source guide tube (projection sheath) away from the lock mechanism while observing the survey instrument for any sudden increase in radiation intensity. It is normal for the source assembly to pull up slightly during this operation. The stop ball of any source assembly should not be visible. Pull the source guide tube back enough to expose the source and drive cable connectors.
9. Disconnect the drive cable connector from the source assembly connector. Push gently down on the source assembly's connector to verify that it is fully seated within the source changer. Remove the threaded fitting from the source guide tube (projection sheath). Screw the protective cap onto the threaded fitting, then insert the threaded fitting with the protective cap into the lock mechanism. Gently tug on the fitting to ensure that it is securely engaged in the locking mechanism. Attach the metallic source identification tag to the protective lock cap to provide a visual

location of the source assembly's position within the source changer.

C. Operational Sequence to Transfer a New Replacement Source from the Model 650L Source Changer into a Radiographic Exposure Device

1. **Without unlocking the locking mechanism**, remove the detachable threaded fitting from the lock mechanism by retracting the spring-loaded plunger. Attach the threaded fitting onto the source guide tube (projection sheath). The remote control drive cable connector must protrude beyond the threaded fitting to enable a connection.
2. **Without unlocking the locking mechanism securing the source assembly**, couple the remote control cable connector to the source assembly connector. Assure that a positive connection of the two connectors has been accomplished.
3. Insert the threaded fitting into the lock mechanism. Pull up gently on the source guide tube (projection sheath) to ensure the spring-loaded plunger of the lock mechanism is engaged into the threaded fitting.
4. Ensure the "restricted" area is cleared of all personnel and all access points are secured.
5. **To unlock:** Insert the key into the key-lock and rotate until the key-lock pops upward. Push the lock slide away from the key-lock to unlock. The source assembly is now able to pass freely through the lock mechanism

From the exposure device's remote controls (wind-out), crank the source assembly from the source changer to the exposure device as rapidly as possible. The radiation intensity will increase as the source assembly exits the source changer; then increase even higher as the source assembly travels in a direction towards the device; and then drop down to background when the source assembly is shielded within the exposure device.

From the exposure device, attempt to expose the source assembly from the exposure device to confirm if the source has been automatically secured. Approach the exposure device with a survey meter, survey all sides of the exposure device, survey the entire length of the source guide tube (projection sheath), and survey all sides of the source changer to assure the source assembly has been properly transferred and is in the

fully shielded position. The maximum radiation level should be less than 200 mR/hr on the surface and less than 10 mR/hr at one meter from the surface of the exposure device.

6. Remove the source guide tube (projection sheath) and remote controls from the exposure device. Install the shipping plug and protective caps on the exposure device, then lock the exposure device. Affix the new source identification tag to the exposure device.

Release the source guide tube (projection sheath) and threaded fitting from the source changer's lock mechanism by pulling back on the spring-loaded plunger. Remove the threaded fitting from the source guide tube and attach it to the protective cap. Insert the threaded fitting and protective cap into the locking mechanism. Gently pull on the protective cap to confirm proper engagement of the threaded fitting within the locking mechanism.

7. Screw the protective lock cap onto the threaded fitting. Pull up gently on the protective lock cap and threaded fitting to verify a secure connection.
8. Replace the shipping cover on the top of the source changer and secure by attaching the four required bolts. Attach a seal (tamper indicator) wire onto two of the cover bolts prior to shipment.

APPENDIX K
SURVEY METER CALIBRATION

SURVEY METER CALIBRATION
USE OF T/O 773 GAMMA SURVEY CALIBRATION UNIT

I. Scope

Survey meter calibrations are only done by the Radiation Safety Officer or by a radiographer trained and qualified to do calibrations by the RSO. A copy of this qualification will be in the radiographer's file.

Note: During calibration all dosimetry shall be worn and all the precautions used as when making radiographic exposures.

II. Preparation for Use

- A. Place the source shield in a restricted area so that the directional port is aimed horizontally. To minimize the effects of scattered radiation, place the unit at least 16 feet from any wall in the direction of the primary beam.
- B. Position a support horizontally from the Model 773 Instrument Calibration Device as shown in Figures 1 and 2 at the end of the Appendix.
- C. Restrict access to the area where the radiation level is in excess of 2 mR/hr. Use Figure 4 to determine this distance.

III. Operation

Note: To properly calibrate the survey instrument, it is necessary to check the instrument response at two points on each of the instrument's range. These points must be separated by at least of the full scale reading. The instrument reading should agree with the actual radiation within 10% to be in proper calibration.

The following procedure usually applies to instruments with at least three scales and a range of 0-1000 mR/hr. For instruments with a different range of scales, the procedure will be modified to calibrate the additional ranges.

- A. Zero the meter and check for proper battery level. Replace if necessary. Turn on the survey instrument, let it "warm up" for about ten minutes.
- B. Determine the activity of the source on the date of calibration from the decay chart provided with the source.
- C. Determine the distance from the source at which the radiation intensity would be 800 mR/hr. (use Figure 3).
- D. Using the tape measure attached to the Model 773, place the survey meter such that the axis of the detector is located at the proper distance from the source as determined above. The survey meter shall be located so that the center of the ion chamber, or detector, is at the correct distance, and centered on the center line of the radiation beam. The longest dimension of the ion chamber shall be at right angles to the radiation beam. Depending on the physical size and configuration of the survey meter, it may be necessary to mount the meter somewhat higher than the bottom of the 773 source shield. When proper geometry for your meter has been established, use the same physical setup consistently in future calibration operations.

Note: At short distances, using survey meters with large detector volumes, the radiation intensity will not be uniform across the detector. Consideration should be given to this effect when determining the radiation intensity to be checked.
- E. Unlock the handle of the Model 773. Remove the shipping plate. Remove all the attenuators from the radiation beam.
- F. Standing away from the radiation beam, expose the source by manually raising the source rod. Note and record the survey meter reading, then return the source to the stored position. The actual intensity is 800 mR/hr. If the reading is within $\pm 10\%$ of the actual intensity, continue checking the instrument. If the reading is not within $\pm 10\%$ of the actual intensity, the instrument must be adjusted and recalibrated. Check with the survey instrument's operation and maintenance instruction manual for specific information on instrument adjustments. If the meter cannot meet the performance specification on this range or any subsequent range, it is not to be returned to service.

CAUTION: Do not enter the area of the radiation beam while the source is exposed. The meter shall be placed so that you can read it from a distance without exposing yourself to the primary beam.

- G. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 200 mR/hr. If the reading does not agree within $\pm 10\%$, an adjustment is required.
- H. Remove the 0.25 attenuator from the beam and place a 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 80 mR/hr.
- I. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 20 mR/hr.
- J. Remove the 0.25 attenuator from the beam and place the other 0.10 attenuator in the beam. Repeat step 6; the actual intensity is 8 mR/hr.
- K. Place the 0.25 attenuator in the beam. Repeat step 6; the actual intensity is 2 mR/hr.
- L. Fasten a label to the survey meter indicating the date of calibration, next due date, and initials of person performing calibration.
- M. Fill out a survey meter calibration record for each calibration.

RADIATION DETECTION INSTRUMENTS

| <u>Manufacturer and Model</u> | <u>Radiation Detected</u> | <u>Sensitivity Ranges</u> | <u>Use</u> |
|-----------------------------------|---------------------------|-------------------------------|------------|
| Gamma Industries 250B | Gamma & X-Ray | 0-1 R/hr. | Survey |
| Gamma Industries 252B | Gamma & X-Ray | 0-1 R/hr. | Survey |
| Victoreen 492 | Gamma & X-Ray | 0-1 R/hr. | Survey |
| Victoreen 592B | Gamma & X-Ray | 0-1 R/hr. | Survey |
| G.E. Smith 1000A | Gamma & X-Ray | 0-1 R/hr. | Survey |
| G.E. Smith 2000A | Gamma & X-Ray | 0-1 R/hr. | Survey |
| Ludlum Model 6 | Gamma & X-Ray | 0-1 R/hr. | Survey |
| Eberline 130A | Gamma & X-Ray | 0-1 R/hr. | Survey |
| Eberline PIC-6A | Gamma & X-Ray | 0-1000 R/hr. | Survey |
| NDS Products | Gamma & X-Ray | 0-1 R/hr. | Survey |

INSTRUMENT CALIBRATION CERTIFICATE

NAME: _____

ADDRESS: _____ CITY: _____ STATE: _____

INSTRUMENT MODEL: _____ SER. NO: _____

CALIBRATION DATE: _____ PREVIOUS CALIBRATION DATE: _____

| <u>INSTRUMENT RANGE</u> | <u>DISTANCE*</u> | <u>EXPOSURE RATE</u> | <u>METER RESPONSE</u> |
|-------------------------|------------------|--------------------------|---------------------------|
| I _____ | _____ | MR | _____ |
| | _____ | MR | _____ |
| II _____ | _____ | MR | _____ |
| | _____ | MR | _____ |
| III _____ | _____ | MR | _____ |
| | _____ | MR | _____ |

NOTES: _____
THIS INSTRUMENT WAS CALIBRATED IN ACCORDANCE WITH NRC RULES AND
REGULATIONS USING _____ MILLICURIES OF CESIUM 137.

THE ACTUAL METER RESPONSE IS LESS THAN $\pm 10\%$ OF THE TRUE
EXPOSURE RATE AT THE CALIBRATION POINTS.

*DISTANCE REMAINS CONSTANT THROUGH THE USE OF ATTENUATORS.

CALIBRATED BY: _____

NEXT CALIBRATION DATE: _____

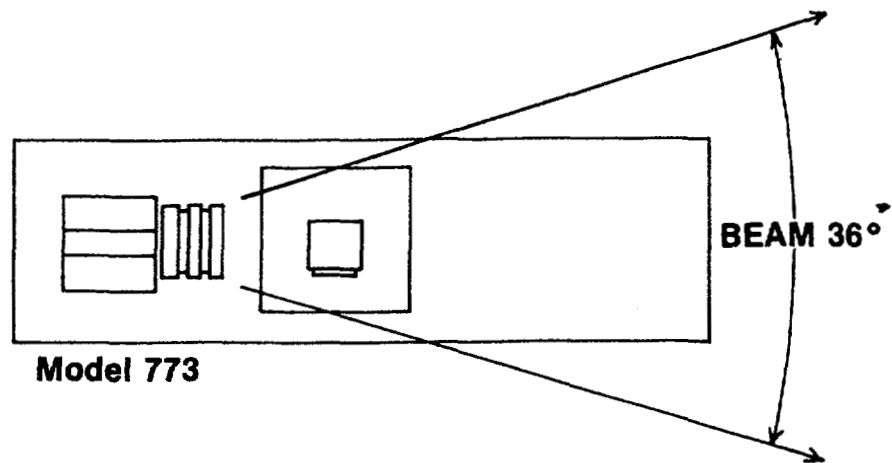


FIGURE 1

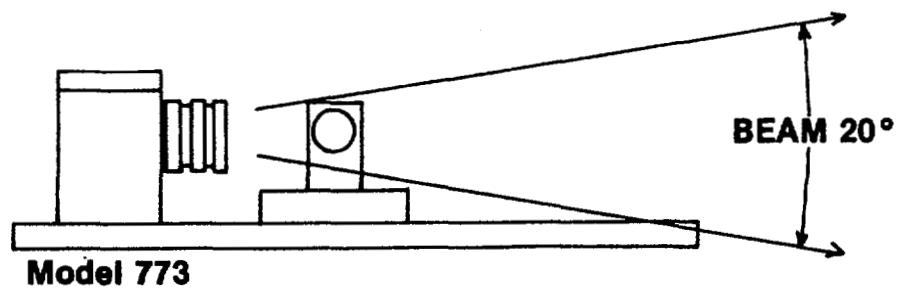
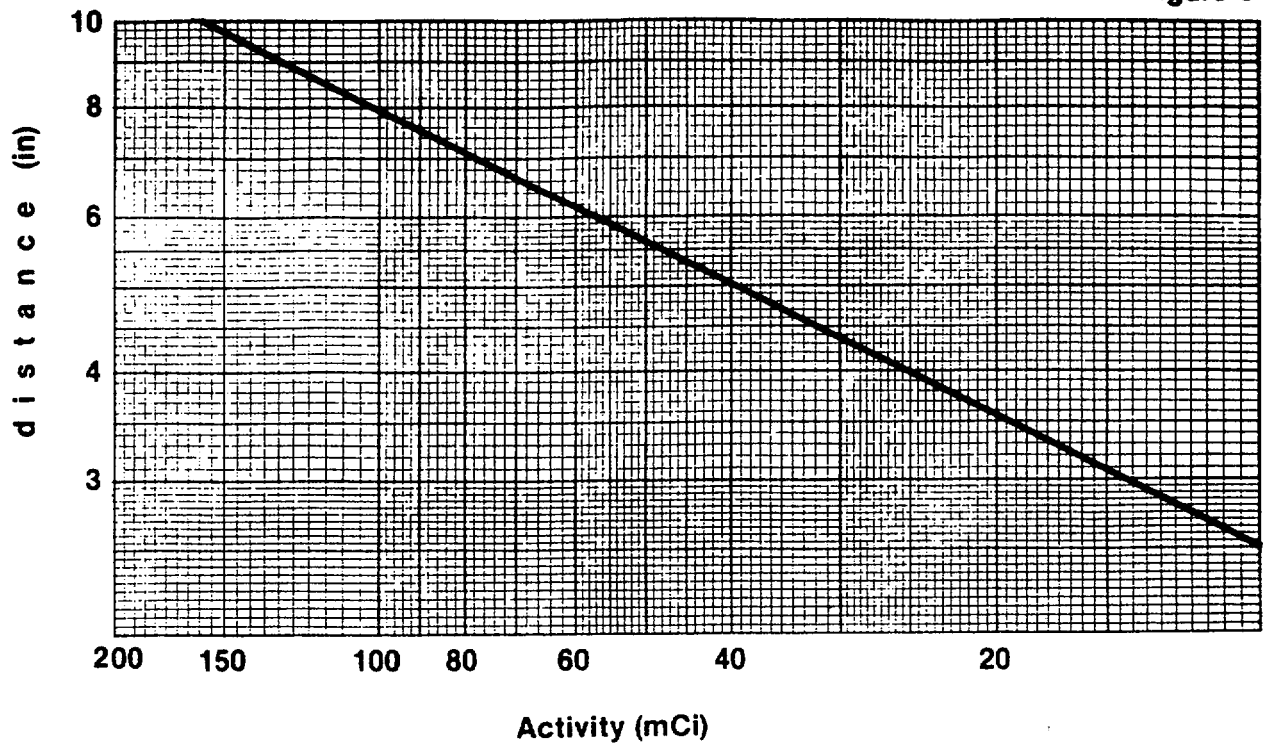


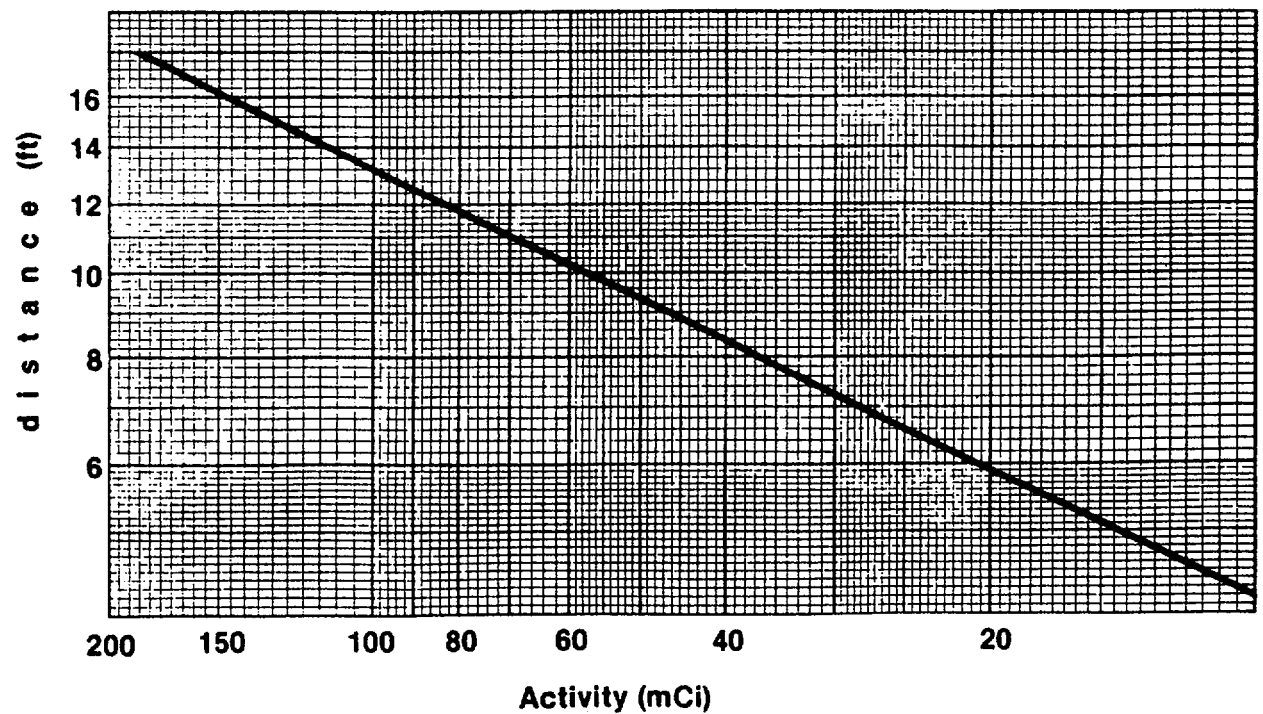
FIGURE 2

Figure 3



Distance to 800mR/hr isodose line as a Function of Activity

Figure 4



Distance to 2mR/hr isodose line as a Function of Activity

APPENDIX L

POCKET DOSIMETERS, ALARM RATE METERS,
AND GAMMA ALARMS CALIBRATION CHECKS

POCKET DOSIMETERS, ALARM RATE METERS, AND GAMMA METERS
CALIBRATION CHECKS

I. Leak Testing and Calibration Checks of Pocket Dosimeters

A. Purpose

The purpose of this procedure is to provide the requirements for leak and calibration checks for pocket dosimeters used in radiography.

B. Scope

This procedure applies to all pocket dosimeters used by radiography.

C. Procedure

1. Operating instructions for use of pocket dosimeters and dosimeter chargers shall be in accordance with Chapter 3 and Appendix E of this manual.
2. Pocket dosimeters shall be checked for proper operation by leak test and calibration checks outlined in this procedure at least annually.
3. Leak Check
 - a. Charge the dosimeter to a zero reading.
 - b. Place the charged dosimeters in a low-background area for a period of twenty-four hours.
 - c. Read the dosimeters. Readings less than five percent of full scale are considered satisfactory. Dosimeters with readings greater than five percent of full scale are considered unsatisfactory and should be repaired or replaced.
 - d. When dosimeters are out of use for lengthy periods, charge will slowly be lost and the cursor line will move down scale or off scale. Before bringing back into service, it is advisable to charge to zero and rest for 24 hours, when they should again be set to zero before use. If this operation is not carried out a portion of the initial charge

will be dissipated on the insulator (charge soak) causing excessive movement of the cursor in the first 24 hours.

4. Calibration Check

Dosimeter calibration will be done using a Model 3060 calibrator. This calibrator utilizes a Cesium 137 Source of 10 microcuries or less. The following are the steps to be taken.

- a. Place a zero charge on all dosimeters to be charged.
- b. To provide a nominal 50 MR dose, place dosimeter in inner ring for 6 hours, or in outer ring for 24 hours. Never load both rings at one time.
- c. Record the dosimeter reading, dose rate of exposure, and exposure time on a master log to be kept by the Radiation Safety Officer.
- d. Dosimeter readings that differ from calculated dose by less than or equal to 20 percent of the calculated dose are considered acceptable. A calibration sticker will be placed on these dosimeters.
- e. Dosimeters whose readings differ by more than 20% shall be replaced.

D. Records

Records of dosimeter leak and calibration checks shall be documented.

II. Calibration Checks of Alarm Rate Meters

A. Purpose

The purpose of this procedure is to provide the requirements for calibration checks for Alarm Rate Meters.

B. Scope

The procedure applies to all Rate Meters used by Radiographers.

C. Procedure

1. Operating instructions for the use of Alarm Rate Meters shall be in accordance with Chapter 3 and Appendix E of this manual.
2. Alarm Rate Meters shall be checked for proper operation by calibration as outlined in this procedure at least annually. Calibrations shall be done by a Certified Radiographer who has been trained by the Radiation Safety Officer or his assistant in the use of the Amersham Model 773 calibrator.
3. Calibration check will be done using an Amersham Model 773. This calibrator utilizes a Cesium-137 source of 136 millicuries or less. The following steps are to be taken.

The procedure for Models 317 and 367 is as follows:

- a. Determine the location of 410 mR/hr. and 525 mR/hr. with respect to the calibration source.
- b. Place the instrument at the 525 mR/hr point and expose the source. The Models 317 and 367 should exhibit a continuous alarm.
- c. Place the instrument at the 410 mR/hr. location. The Model 317 should be silent. The Model 367 should chirp.

- d. For the Model 367, the chirp rate should be determined by placing the unit at the 60 mR/hr. point. At 60 mR/hr., the instrument will accumulate 1 mR in 1 minute. Count the chirps for one minute and compare the value to the specified chirp rate for the instrument. Note that the chirp rate is approximate and may be plus or minus 20% of the specified rate.
- e. If the Models 317 and 367 do not produce a continuous alarm at 525 mR/hr., unscrew the bottom cap, remove the battery and the PC board, and rotate the potentiometer clockwise. It is best to use very small increments when turning the potentiometer.
Remember that the instrument must be checked at the 410 mR/hr. to show that no tone exists. Reassemble the instrument and recheck.
- f. If the instrument produces a tone at 410 mR/hr., rotate the potentiometer counter-clockwise in small steps until no tone exists at that value. Reassemble the instrument and recheck.
- g. If the chirp rate is different from the specification, it is necessary to change a resistor on the PC board. In this unlikely event, refer to the factory for servicing.
- h. Check the instrument for saturation at 100 R/hr. or more, if possible, for saturation. A continuous alarm should occur for all instruments at this level. Although saturation is not an identified failure mode for PIN diodes, if it does occur, the unit should be returned to the factory.
- i. Note that the Model 317 will produce an intermittent alarm at dose rate levels greater than 410 mR/hr. and less than 525 mR/hr. This is normal and should not be considered a failure.

The procedure for NDS Products RA500 is as follows:

- a. Install a fresh 9-volt battery, leaving it outside of the case. Look inside at the exposed end of the circuit board. The potentiometer with the blue thumbwheel is the calibration potentiometer.
- b. When the power switch is turned on, a single chirp should be heard. If the unit is operating properly, a low-frequency motorboating sound should be audible when held close to the ear in a quiet location. If this does not occur, do not continue until unit is repaired.
- c. The instrument is calibrated by placing the unit in a 450 mR/hr. Cs-137 radiation field. If necessary, adjust the potentiometer until a crackling chirp is heard. Move the unit toward the radiation field. The alarm should become a continuous tone.

D. Records

Records of the calibration check shall be documented.

III. Operational Test of Gamma Alarm

A. Purpose

The purpose of this procedure is to provide the requirements for the operational test of the exposure room gamma alarms.

B. Scope

This procedure applies to any gamma alarm in Prime's exposure rooms.

C. Procedure

1. All gamma alarms shall be hard-wired into a junction box for electrical power.
2. The door shall be open to allow for a check of the audible alarm.
3. Using the Amersham Model 773 Cs-137 source, radiate the alarm with 80 mR/hr.

4. At 80 mR/hr., both lights shall light and the audible alarm shall sound.
5. Return the source to its shielded position and the lights shall go out and the audible shall stop.
6. This procedure shall be done at least every three months by any qualified radiographer.

D. Operational Test

The alarm system must be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test must include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry must be tested monthly. If an entrance control device or an alarm is operating improperly, it must be immediately labeled as defective and repaired within 7 calendar days. The facility may continue to be used during this 7-day period, provided the continuous surveillance requirements of 10 CFR 34.51 are implemented and an alarm rate meter is also used. Test records for the entrance controls and audible and visible alarm must be maintained in accordance with 10 CFR 34.75

IV. Safety Considerations

- A. All calibrations will be done by the Radiation Safety Officer or by a radiographer trained and qualified by the RSO.
- B. When using the Cesium calibration source, all the precautions used when making radiographic exposures must be followed.



5 Eastmans Road • Parsippany, NJ 07054

TEL 201-887-7100 FAX 201-887-4732

QUARTZ FIBER DOSIMETERS

Charging Instructions

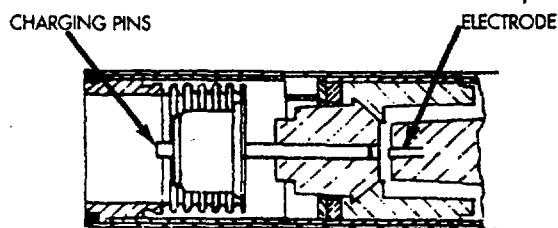


Figure 1
FREE POSITION

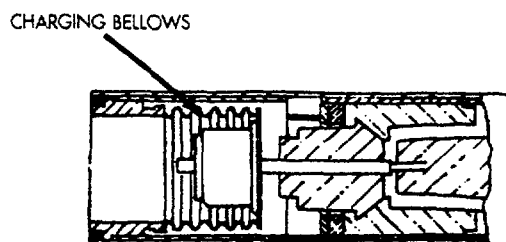


Figure 2
CHARGING POSITION

INSTRUCTIONS FOR CHARGING

The charging end of the dosimeters is illustrated in Figures 1 and 2. The charging mechanism consists of a central pin enclosed in an insulator attached to the case of the instrument via a flexible bellows. When the charging pin is depressed the bellows flex, as shown (Figure 2) until the inner end of the charging pin makes electrical contact with a metal electrode which is moulded into an insulator of exceptionally high quality. When pressure on the charging pin is released the flexible bellows return the charging pin to the free position (Figure 1) and the internal electrode is isolated.

The voltage required to charge a dosimeter to zero varies from one unit to another, but never exceeds 240 volts. Voltage output from the charger, however, may be much higher than this when the potentiometer is at maximum setting. It is, therefore, evident that when a dosimeter is placed on the charger at these conditions the cursor image will disappear completely to the left of zero. The remedy is to reduce the charger voltage by turning the potentiometer knob SLOWLY clockwise.

DOSIMETERS NOT IN USE

When dosimeters are out of use for lengthy periods, charge will slowly be lost and the cursor line will move down scale or off scale. Before bringing back into service, it is advisable to charge to zero and rest for 24 hours, when they should again be set to zero before use.

If this operation is not carried out a portion of the initial charge will be dissipated on the insulator (charge soak) causing excessive movement of the cursor in the first 24 hours.

FAULT DIAGNOSIS

| SYMPTOMS | ACTION |
|--|--|
| 1. Cursor moves one or two divisions of scale only with maximum rotation of control knob | Increase downward pressure on dosimeter |
| 2. Cursor cannot be found. | Increase downward pressure on dosimeter. Rotate control to stop clockwise. SLOWLY rotate control anti-clockwise to increase volts. |

NOTE: When control rotated rapidly, cursor moves across scale to left of zero very fast and without being seen.

TO CHARGE

1. Rotate the control knob of the charging unit clockwise to the extreme (minimum output voltage).
2. Using a full hand grip, place the dosimeter into the charging socket, ensuring the dosimeter is vertical. Press downwards with a weight equal to 3Kgs.
3. SLOWLY rotate control knob counter-clockwise until cursor line appears at the left hand end of scale. Continue until cursor is set approximately one small scale division to the left of zero.
4. Remove the dosimeter from the charging unit and gently touch the exposed end of the charging pin with a metallic object to remove residual charge from the pin. This will cause the cursor line to kick onto zero at which point the dosimeter is ready for use.
5. For high range dosimeters, 5R and greater, set cursor line exactly on zero and ignore Item 4.

IMPORTANT

The cursor kick on low range dosimeters is caused by the residual charge remaining on the charging pin being dissipated. In high range dosimeters this effect is negligible.

If the pin is not earthed on low range dosimeters (Item 4) the charge will leak away (in minutes or hours) from the charging pin and the cursor will move down scale in consequence.

If the user is not aware of the fact, he will interpret this movement as dose measurement or natural leakage of the insulator. In the latter case the instrument will appear to be leaking greater than the manufacturer's specified tolerance, when in fact it is not.

Pocket Dosimeter Response Test CertificateName: _____

Date Tested: _____ Previous Test Date: _____

| | <u>Model</u> | <u>Ser. No.</u> | <u>Actual Exposure</u> | <u>Reading</u> |
|----|--------------|-----------------|----------------------------|----------------|
| 1. | _____ | _____ | _____ | _____ |
| 2. | _____ | _____ | _____ | _____ |
| 3. | _____ | _____ | _____ | _____ |
| 4. | _____ | _____ | _____ | _____ |
| 5. | _____ | _____ | _____ | _____ |
| 6. | _____ | _____ | _____ | _____ |
| 7. | _____ | _____ | _____ | _____ |
| 8. | _____ | _____ | _____ | _____ |

Comments: _____ Drift in 24 hrs. <5%

The above listed pocket dosimeters have been tested according to NRC rules and regulations using 6.7 microcuries of Cesium 137.

The actual dosimeter response is within + 20% of the true exposure, unless indicated.

Test Performed By: _____

Next Test Due: _____

ALARM RATE METER CALIBRATION RECORD

[illegible]

ROOM

[illegible]

L - 11

APPENDIX M

SEALED SOURCE LEAK TESTS

SOURCE LEAK TESTINGI. Leak Testing of Exposure Device Containing a Sealed Source

The exposure device contains a sealed source which shall be leak tested at six month intervals and a test done for DU annually. This shall be done according to the following:

Note: Protective gloves shall be worn during all leak operations.

- A. Be sure source is fully retracted into projector. (Use a survey meter to be sure that radiation levels are normal.)
- B. Remove source tube from face of shield or remove shipping plug.
- C. Insert the swab into the hole in the shield. Wipe the interior of the hole thoroughly by rotating swab holder.
- D. Withdraw swab and place in envelope, which has been identified with the source type, serial no., date, and site location. Seal the envelope with tape or by stapling. Caution: Do not lock the gummed flap.
- E. The swab shall now be monitored by turning the survey meter to its most sensitive range. Place the meter in a low-background area and move the swab in its envelope to to the meter, not the meter to the swab.
- F. If there is no indication on the meter, or if the indication is no more than 0.2 mR/hr. above background, put the plastic envelope with the swab in the mailing box and mail to the commercial service supplier. Be sure to fill out Form 8.1 (Leak Test Record).
- G. If the swab should show more than 0.2 mR/hr, do not mail.

NOTE: If the survey meter available does not have the capability of detecting as little as 0.2 mR/hr, ship the leak test swab to the commercial service via a parcel post service other than the U.S. Postal Service. Do not ship if the radiation from the swab exceeds 2 mR/hr. The leak-test swab will be subjected to a precise radio assay when received by the commercial service suppliers and a leak-test certificate will be mailed promptly. This certificate shall be kept on file and be available for inspection.

- H. The protective gloves used during the leak test shall be treated as potentially contaminated and placed in a sealed plastic bag or suitable container and isolated until the results indicate that the level of removable contamination is less than .005 microcuries.

NOTE: The plastic bag or suitable container shall be identified with the source type, serial no., and date of test.

- I. Should the leak test results indicate .005 microcuries or more of removable contamination, the source and all contacted equipment shall be isolated. The Radiation Safety Officer will provide specific instructions. A written report within five days after obtaining the results of the leak test shall be filed with the NRC or Appropriate Agreement State describing the equipment involved, the test results, and the corrective action taken.

II. Leak Testing of Tech/OPS 773 Calibration Source

The T/0-773 calibration kit contains a sealed source which shall be leak tested at six month intervals. This shall be done according to the following:

NOTE: Protective gloves shall be worn during all leak test operations.

- A. Place the T/0-773 calibrator in a restricted area.
- B. Remove the lock and rotate the handle from the top of the source rod. Remove the shipping cover.
- C. Moisten the leak test swab with the supplied liquid solution. Blot off the excess.
- D. Wipe around the top of the source rod.
- E. Standing away from the beam port, raise the source rod to the open position and wipe the exposed source rod thoroughly. Place the swab in an envelope which has been identified with the source type, serial no., date, and site location. Seal the envelope with tape or by stapling. Caution: Do not lick the gummed flap.
- F. The swab shall now be monitored by turning the survey meter to its most sensitive range. Place the meter in a low background area and move the swab in its envelope to the meter, not the meter to the swab.

- G. If there is no indication on the meter, or if the indication is no more than 0.2 mR/hr above background, put the envelope with the swab in the mailing box and mail to the commercial service supplier. Be sure to fill out and include Form 8.1.
- H. If the swab should show more than 0.2 mR/hr, do not mail via the U.S. Postal Service. Instead, use a parcel post service and ship in accordance with U.S. Department of Transportation requirements.

NOTE: If the survey meter available does not have the capability of detecting as little as 0.2 mR/hr, ship the leak test swab to the commercial service via a parcel post service other than the U.S. Postal Service. Do not ship if the radiation from the swab exceeds 2 mR/hr. Contact the Office of Radiation Safety for specific instructions. The leak-test swab will be subjected to a precise radio assay when received by the commercial service suppliers and a leak-test certificate will be mailed promptly. This certificate shall be kept on file and be available for inspection.

- I. The protective gloves used during the leak test shall be treated as potentially contaminated and placed in a sealed plastic bag or suitable container and isolated until the results indicate that the level of removable contamination is less than .005 microcuries.

NOTE: The plastic bag or suitable container shall be identified with the source type, serial no., and date of test.

- J. Should the leak test results indicate .005 microcuries or more of removable contamination, the source and all contacted equipment shall be isolated for further evaluation by the Radiation Safety Officer. He shall provide specific instructions. A written report within five days after obtaining the results of the leak test shall be filed with the NRC or appropriate Agreement State describing the equipment involved, the test results, and the corrective action taken.

AEA TECHNOLOGY QSA, INC.

SENTINAL LEAK TEST KIT MODEL 518

INSTRUCTIONS FOR USE

This kit is designed for use on IR192, Co60 and Cs137 projectors. It provides a convenient and safe method of performing leak tests of radiographic sources in accordance with NRC regulations, which require such tests at intervals of not more than 6 months.

CONTENTS

Flexible swab holder with swab
Vial of EDTA solution
Plastic Envelope
Mailing Box
Identification Sheet

PROCEED IN THIS MANNER:

1. Be sure source is fully retracted and secured in the projector. (Use a survey meter to be sure that radiation levels are normal.)
2. Remove source guide tube from front of projector or remove shipping plug.
3. Wet the swab with EDTA solution. Shake off excess and insert the swab into the hole in the shield. Wipe the interior of the hole thoroughly by rotating swab holder.
4. Withdraw swab and place in plastic envelope.
5. The swab should now be monitored by turning the survey meter to its most sensitive range. Place the meter in a low background area and move the swab in its plastic envelope to the meter, not the meter to the swab.
6. If there is no indication on the meter, or if the indication is no more than 0.2 mR/hr. above background, put the plastic envelope with the swab in the mailing box and mail to AEA Technology QSA, Inc., 6765 Langley Drive, Baton Rouge, LA 70809. Be sure to fill out and return the identification sheet.

AEA TECHNOLOGY QSA, INC.

SENTINAL LEAK TEST KIT MODEL 518

INSTRUCTIONS FOR USE (CONTINUED)

7. If the swab should show more than 0.2 mR/hr, do not mail. Contact AEA for specific instructions.

NOTE: If the survey meter available does not have the capability of detecting as little as 0.2 mR/hr., ship the wipe-test swab to AEA, via express. Do not ship if the radiation from the swab exceeds 2 mR/hr. and contact AEA for specific instructions. The wipe-test swab will be subjected to a precise radio-assay when received by AEA and a leak-test certificate will be mailed promptly. The NRC requires that this certificate be kept with your records and that it be available for inspection (10 CFR 34.67(c)).

**SPEC MODEL I LEAK TEST KIT
WIPE TEST INSTRUCTIONS**

Crank Out Models:

- 1) Fill out Identification form. Put original in plastic envelope and keep duplicate copy.
- 2) Remove lock cap and safety plug from camera.
- 3) Insert swab 1" and wipe inside tube.
- 4) Seal swab in plastic envelope.

Pipeliner Models:

- 1) Fill out Identification form. Put original in plastic envelope and keep duplicate copy.
- 2) Wipe shaft of control knob(s).
- 3) Wipe joint between camera housing and base plate.
- 4) Seal swab in plastic envelope.

NOTE: Survey envelope with survey meter. If meter detects radiation do not mail envelope. Call SPEC for Instructions.

Phone 504/464-9471

**SPEC TYPE 1 LEAK TEST KIT
IDENTIFICATION FORM**

Company Name: _____

Address: _____

Radioisotope:

- | | |
|---|-------------------------------|
| <input type="checkbox"/> Iridium-192 | Source Model & Serial # _____ |
| <input type="checkbox"/> Cobalt-60 | Source Model & Serial # _____ |
| <input type="checkbox"/> Cesium-137 | Source Model & Serial # _____ |
| <input type="checkbox"/> Depleted Uranium | Device Model & Serial # _____ |

**** Separate wipe is required for each radioisotope analysis.**

Leak Test Performed By: _____

Date: _____ PO# _____

NOTE: Leak tests are analyzed for the following isotopes **only**.

Iridium-192
Depleted Uranium
Cesium-137
Cobalt-60

Wipes on any other isotope will be returned unprocessed.



INSTRUCTIONS FOR MODEL 818 LEAK TEST KIT

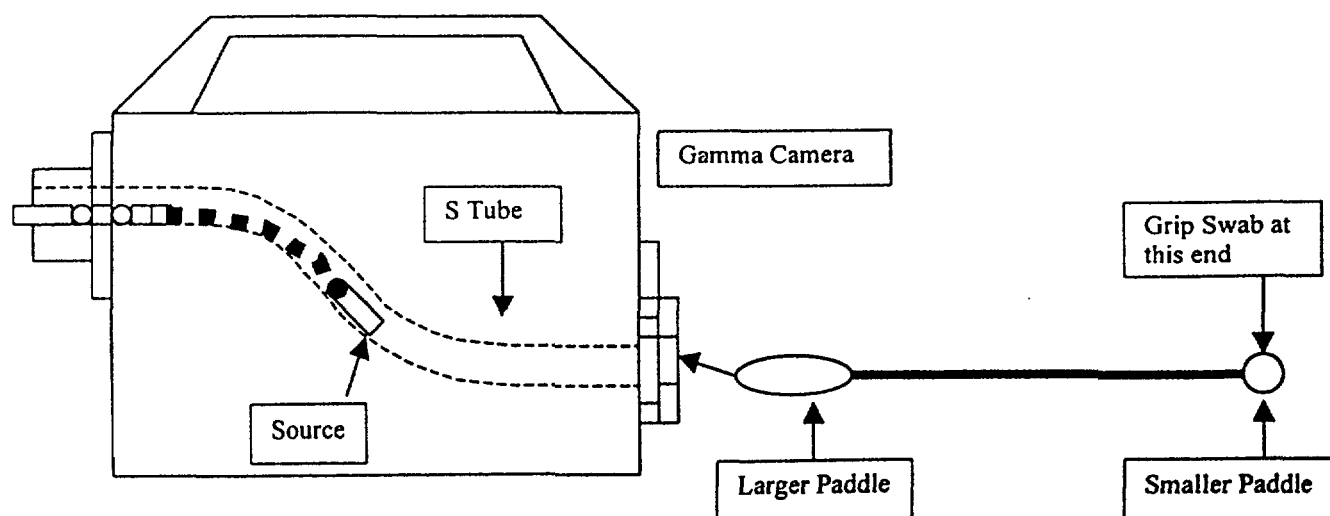
The model 818 leak test kit is designed for use on Gamma Ray Projectors. It provides a simple and safe method of conducting leak tests on radiographic sources and depleted uranium (DU) "S" tube shields, in accordance with Title 10 Code of Federal Regulations, part 34, or equivalent agreement state regulations.

PACKAGE CONTENTS:

- Double-ended Swab
- Alcohol Prep Pad
- Swab Tube with caps
- Mailing Envelope
- Identification Sheet

INSTRUCTIONS FOR USE:

1. Assure source is fully retracted and locked in the projector. Perform a survey of the entire circumference of the device using a survey meter to assure that radiation levels are within normal values for the source contained.
2. Remove the source guide tube or the shipping plug from the front of the projector. Place a survey meter at the front of the projector and monitor radiation levels.
3. Wet the **LARGER PADDLE** shaped end of the double-ended swab by tearing open the alcohol prep pad packet. Grasp the smaller paddle shaped end of the swab and insert the **LARGER PADDLE** shaped end into the alcohol prep pad packet. Squeeze the packet around the **LARGER PADDLE** shaped end of the swab to wet.
4. Wipe the source and the interior of the "S" tube by grasping the smaller paddle shaped end of the swab. Fully insert the swab, **LARGER PADDLE** shaped end first, into the "S" tube and rotate it several times. Withdraw the swab.



| | | | | | |
|--|-----------|--------|--|---|--------------|
| Title: Instructions for Model 818 Leak Test Kit | No. 81801 | Rev. 0 | Checked: <i>[Signature]</i> 12/1/91 | Approved: <i>[Signature]</i> 5/27/92 | Page: 1 of 2 |
|--|-----------|--------|--|---|--------------|



5. Fully insert the double-ended swab in to the swab tube, being sure not to touch the larger paddle shaped end of swab with hands. Ensure that both ends of the swab tube are capped and place it in the mailing envelope provided.
6. Monitor the swab and envelope by moving the survey meter to a low background area. Adjust the meter to its most sensitive range. Move the swab and envelope over the detector surface.
7. Be sure to fill out the enclosed identification sheet.
8. If there is no indication above background levels on the meter, or if the indication is no more than 0.2 mR/hr above background, Mail the envelope, swab, and identification sheet to CIS-US, Inc. Attn: Radioassay Department, 35 Flagship Drive, North Andover, MA. 01845.
9. If the swab should show more than 0.2 mR/Hr, do not mail. Contact the CIS-US, Inc. Radiation Safety Officer ((781) 275-7120 X3020) for specific instructions.

NOTE: if the survey meter available does not have the capability of detecting as little as 0.2 mR/hr, ship the wipe-test swab to CIS-US, Inc., via express mail. If the radiation level from the swab exceeds 1 mR/hr, do not ship, contact CIS-US, Inc., for specific instructions. The wipe-test swab will be subjected to a precise radio-assay for the indicated Radionuclide and, when applicable, depleted uranium once received by CIS-US, Inc. A leak-test certificate will be mailed promptly after radio-assay is performed. NRC and agreement state regulations (10 CFR 34.67) require that this certificate be kept with your records and that it be available for inspection.

| | | | | | |
|--|-----------|--------|--|---------------------------------|--------------|
| Title: Instructions for Model 818 Leak Test Kit | No. 81801 | Rev. 0 | Checked: <i>SP/LS</i> <i>ma-jac</i> | Approved: <i>ma-jac</i> 8/21/88 | Page: 2 of 2 |
|--|-----------|--------|--|---------------------------------|--------------|

**MODEL 818 LEAK TEST REQUEST AND REPORT****Company Information:**

Company Name _____ Date _____

Address _____

Source Information:

Radionuclide _____ Activity _____ As of _____

Manufacturer _____ Model No. _____ Serial No. _____

Device Information:

Manufacturer _____ Model No. _____ Serial No. _____

Leak Test Information:

Leak Test For: Iridium 192 _____ Depleted Uranium _____ Other (specify) _____

Date of Leak Test _____ Monitored for activity before mailing _____

Taken By _____ Date Mailed _____

Analysis (For CIS-US use):

Date of analysis: _____ Net CPM: _____

_____ microcurie Ir-192[] _____ microcurie Depleted Uranium[] _____ microcurie(____)[]

[] Reported result is the Minimum Detectable Activity by the measurement performed.

Certified by: _____
For CIS-US, Inc.

| | | | | |
|---|-----------|--------|-----------------------------|------------------------------|
| Title: Model 818 Leak Test Request and Report | No. 81802 | Rev. 0 | Checked: <i>[Signature]</i> | Approved: <i>[Signature]</i> |
|---|-----------|--------|-----------------------------|------------------------------|

APPENDIX N
AUDIT FORMS

MAKE IN TRIPLICATE

UNANNOUNCED ()
ANNOUNCED ()

"RADIOGRAPHER'S PERFORMANCE REVIEW"

RADIOGRAPHER _____ S.S. NO. _____ DATE AND TIME _____

JOB LOCATION _____

U.S.N.R.C. REGION: I II III IV V STATE: _____

RSO OR JOB RADIOGRAPHER _____ ASST. RADIOGRAPHER _____

PROJECTOR MODEL AND SERIAL NUMBER _____ RADIOACTIVE CONTENT _____

SOURCE SERIAL NUMBER _____ CURIES _____

SURVEY METER SERIAL NUMBER _____ CALIBRATION DUE DATE _____

SURVEY METER SERIAL NUMBER _____ CALIBRATION DUE DATE _____

1. Was the Radiographer wearing a film badge? _____ YES _____ NO
Film Badge Number _____ Exposure Period _____
Where was film badge worn? _____
2. Was the Assistant Radiographer wearing a film badge? _____ YES _____ NO
Film Badge Number _____ Exposure Period _____
Where was film badge worn? _____
3. Was the Radiographer wearing a dosimeter? _____ YES _____ NO
Dosimeter Number _____ Calibration Due Date _____
Where was the dosimeter worn? _____
Reading at the time of inspection _____
4. Was the Assistant Radiographer wearing a dosimeter? _____ YES _____ NO
Dosimeter Number _____ Calibration Due Date _____
Where was the dosimeter worn? _____
Reading at the time of inspection _____
5. Was the Radiographer wearing his alarm meter?
_____ YES _____ NO Meter No _____ Cal. Due _____
6. Was the assistant wearing his alarm meter?
_____ YES _____ NO Meter No _____ Cal. Due _____
7. Was there an operable dosimeter charger in the lab? _____ YES _____ NO
8. Was the Restricted Area posted with "Caution (or Danger) Radiation Area" signs? _____ YES _____ NO

9. What were the physical readings at the signs? _____MR
10. Was the High Radiation Area posted with "Caution (or Danger) High Radiation Area" signs? _____ YES _____ NO
11. Was the approximate distance calculated properly? _____ YES _____ NO
12. Was the Restricted Area properly controlled to prevent unauthorized entry? _____ YES _____ NO
13. Was the Radiographer or Assistant properly surveying the projector and source tube and locking the camera after each exposure?
_____ YES _____ NO
14. Was the survey report current with the activity? _____ YES _____ NO
15. Was there evidence that the daily equipment maintenance check had been done? _____ YES _____ NO
16. Were all labels and tags on the projector legible? _____ YES _____ NO
17. Were copies of U.S.N.R.C. Form #3 and/or applicable State forms properly posted? _____ YES _____ NO
18. Was there a copy of the Radiographic Operations Manual with all the required information available? _____ YES _____ NO Manual # _____
19. When not in use, was the projector stored properly and kept locked to prevent unauthorized removal? _____ YES _____ NO
20. When in storage, was the storage area posted with "Caution (or Danger) Radioactive Material" signs? _____ YES _____ NO
21. After watching the Radiographer and/or Assistant, and during the oral review, was it your opinion that they had sufficient knowledge of safety rules? _____ YES _____ NO
22. Did the Radiographer and Assistant have there Radiation Safety Cards?
Radiographer _____YES _____NO Assistant Radiographer _____YES _____NO
23. If there was any area of noncompliance or concern, please list, by item number, below in more detail:

REMARKS:

PRIME RADIATION SAFETY OFFICER

RADIOGRAPHER'S ACKNOWLEDGEMENT

APPENDIX O
FACILITIES

DESCRIPTION OF PHYSICAL FACILITIES

5260 WEST COPLAY ROAD
WHITEHALL, PA 18052

I. Permanent Storage

- A. The IR-192 and Cs-137 projectors and sources are stored in a steel fireproof cabinet located inside exposure room #2. The cabinet has been modified to use a heavy hasp and lock. The CO-60 projectors are located in exposure rooms #2 and #3. The old gamma Co-60 projector is chained to the cabinet in room #2. The AEA Co-60 projector is left in the shipping container that is kept locked. At the end of the day both room doors are padlocked for safety.
- B. The storage area is posted with a "Caution Radioactive Material" sign on the door of the exposure room. The door is also posted with a sign that reads "Radiation Area - Authorized Personnel Only."
- C. As a safeguard the area above the exposure rooms have been sealed off with only one entrance. That entrance is above exposure room #1. The door is locked and the keys are in the possession of the RSO and his assistant. The three visible sides of this area are posted with "Caution Radiation" signs. We have also posted the wall outside of the building directly behind the exposure rooms and the roof with "Caution" signs.
- D. At the entrance between the security wall and exposure room #1, we have painted a large sign on the floor that says "Radiation Area, Authorized Personnel Only." All doors to the exposure rooms are also posted with this sign plus the "Caution Radiation" area sign.

II. Job Site Storage

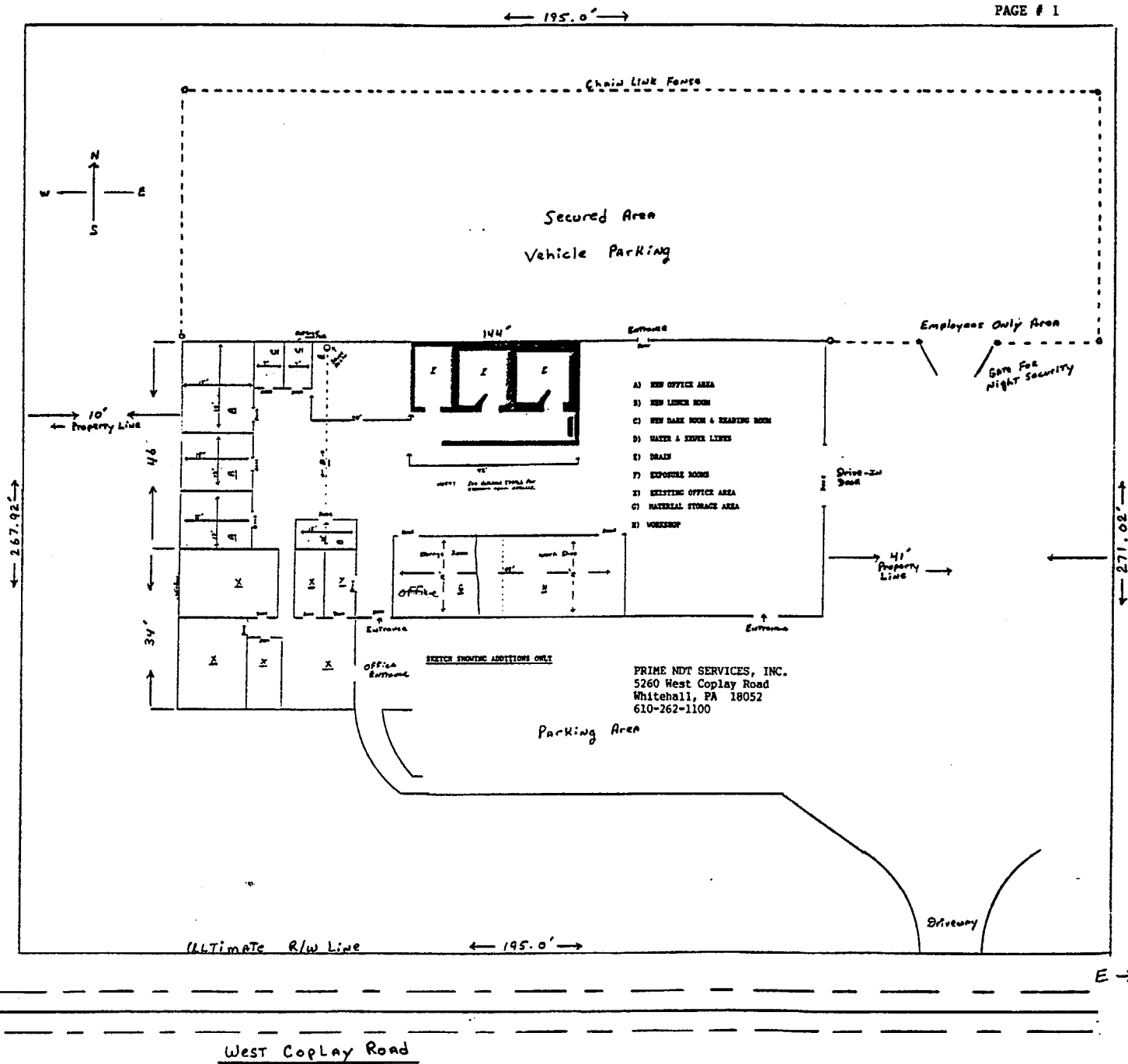
- A. Portable darkrooms provided at the job sites are normally used for camera storage. A darkroom may be on a pick-up truck, off-loaded from a vehicle, or in a separate trailer. Cameras may be stored in specifically constructed vaults inside the darkrooms. The projectors are left in the approved shipping containers.
- B. Exterior Radiation Levels - Radiation levels at the exterior of the darkroom do not exceed that permissible for unrestricted areas (less than two millirems in any one hour or 100 millirems in any seven consecutive days.)

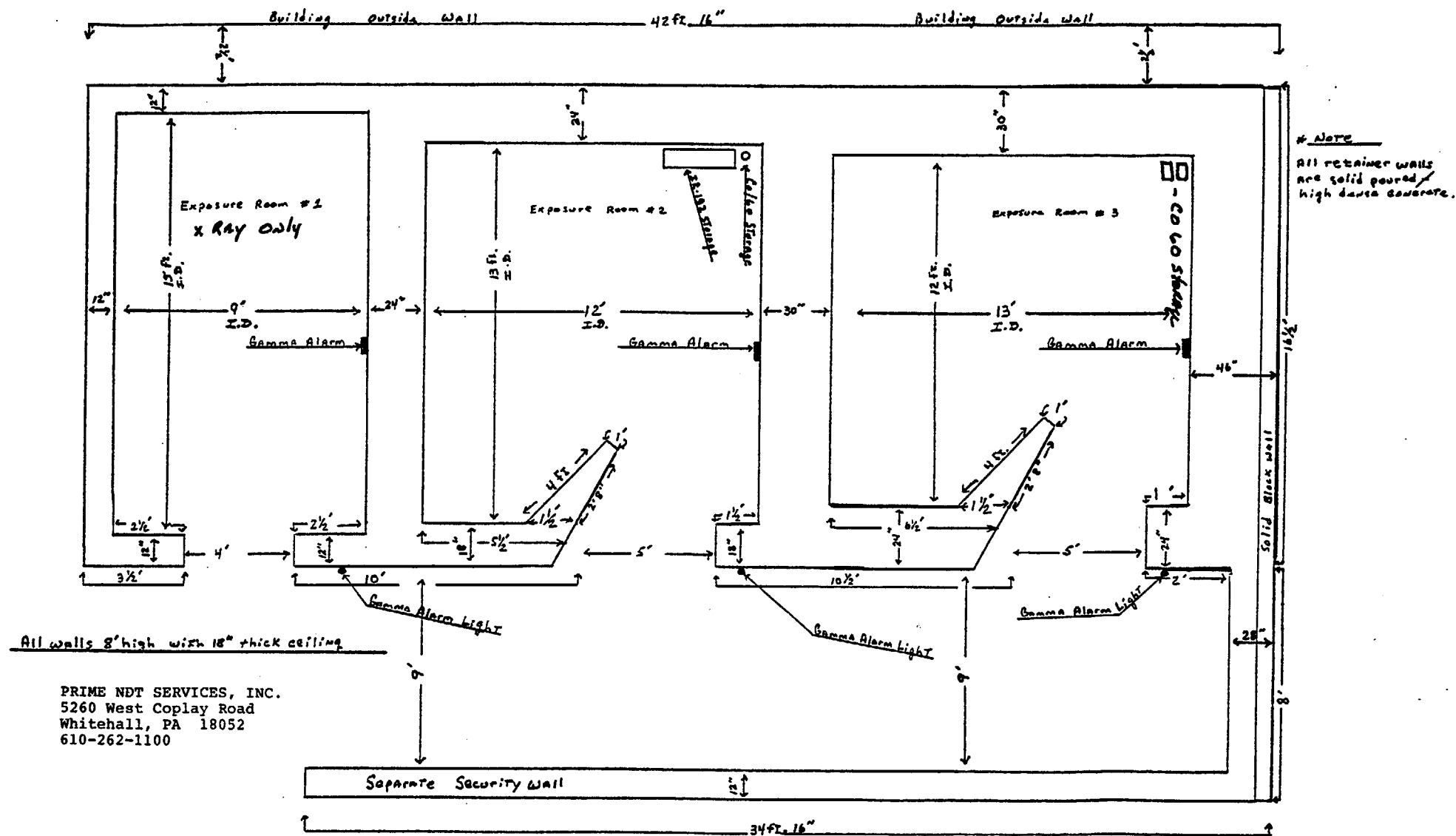
C. Storage Area Safeguards.

1. Security - The darkroom or vault will be kept locked to prevent unauthorized access or removal of cameras.
2. Posting - The vault and/or entrance to the darkroom will be posted with a "Caution Radioactive Material" sign.

III. Permanent Radiographic Installation

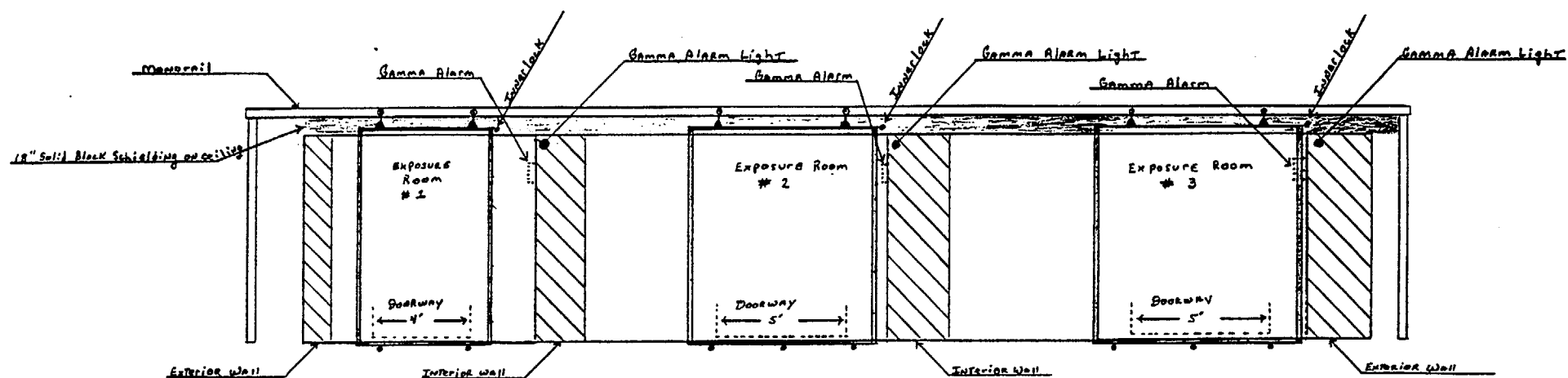
- A. The exposure room shall be equipped with a visible and audible alarm signal.
 1. The visible alarm shall be activated by radiation when the source is exposed.
 2. The audible alarm shall be generated so that the radiographer would be aware of any attempt to enter during an exposure.
- B. Inoperable alarm equipment shall be repaired or replaced immediately. The alarm shall be tested for proper operation daily before use. The test must include a check of both the visible and audible signals. A calibration check shall also be done on a quarterly basis. If an alarm is operating improperly, it must be immediately labeled as defective and repaired within seven (7) calendar days. We may continue to use the facility during the seven day period. Continuous surveillance must be maintained and alarm rate meters must be worn. The Radiographer must be accompanied by at least one other qualified radiographer or individual who has at a minimum met the requirements of 10 CFR 34.43. Records of the alarm check and operational status shall be maintained for two years.
- C. A functioning and currently calibrated survey instrument shall be available for use in the exposure room. The survey instrument shall be used for each entry to the exposure room to verify radiation levels.
- D. The exposure room shall be checked prior to each exposure to assure the area is cleared of personnel.
- E. If an exposure device (with radioisotope) is to be left unattended or not used for immediate planned radiography exposure, the source shall be returned to the shielding and locked in position. The room shall be locked.





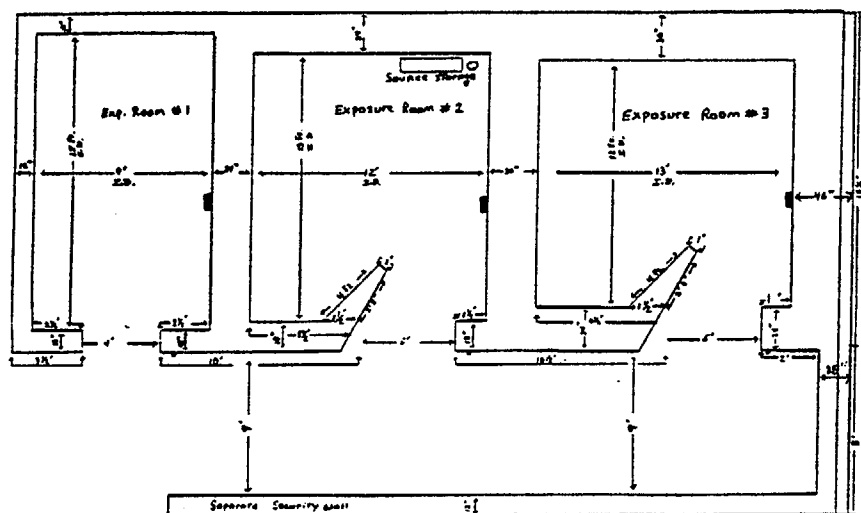
(3) Exposure Rooms (Top View)

Scale : $\frac{1}{4}'' = 1 \text{ Ft.}$



FRONT VIEW OF EXPOSURE ROOM DOORS

EXPOSURE ROOM LAY-OUT



APPENDIX P
AGREEMENT STATE CONTACTS

NRC REGIONS AND EMERGENCY NOTIFICATION PHONE NUMBERS

| <u>Region</u> | <u>Location</u> | <u>24-Hour Telephone No.</u> |
|---------------|--|------------------------------|
| Region I: | USNRC 475 Allendale Rd. King of Prussia, PA 19406-1415 | 800-432-1156 |
| Region II: | USNRC Sam Nunn Federal Center 61 Forsyth Street, SW, Suite 23T85 Atlanta, GA 30303-3415 | 800-577-8510 |
| Region III: | USNRC 801 Warrenville Rd Lisle, IL 60532-4351 | 800-522-3025 |
| Region IV: | USNRC Texas Health Resources Tower 611 Ryan Plaza Drive Suite 400 Arlington, TX 76011-8064 | 800-952-9677 |

To report safety concerns or violations of NRC requirements by your employer call-NRC SAFETY HOT LINE 1-800-695-7403.

To report incidents involving fraud, waste, or abuse by an NRC employee or NRC contractor call - OFFICE OF THE INSPECTOR GENERAL 1-800-233-3497.

AGREEMENT STATES

NRC REGION
24 HOUR
TELEPHONE NO.

Alabama 334-206-5391

Region II
800-577-8510

Mr. Kirksey E. Whatley, Director
Office of Radiation Control
Alabama Department of Public Health
201 Monroe St.
P O Box 303017
Montgomery, Alabama 36130-3017

Arizona 602-255-4845

Region IV
800-952-9677

Aubrey V. Godwin, Director
Arizona Radiation Regulatory Agency
4814 South 40th Street
Phoenix, Arizona 85040

Arkansas 501-661-2173

Region IV
800-952-9677

Jared W. Thompson, Director
Division of Radiation Control and
Emergency Management
Arkansas Department of Health
4815 West Markham St. Slot 30
Little Rock, Arkansas 72205-3867

California 916-440-7899

Region IV
800-952-9677

Edgar D. Bailey, C.H.P., Chief
Radiologic Health Branch
Division of Food, Drugs, and Radiation Safety
California Department of Health Services
15 Capitol
P O Box 997414
Sacramento, California 95899-7414

Colorado 303-692-3423

Region IV
800-952-9677

Steve Tarlton, Director
Hazardous Materials & Waste Division
Department of Public Health & Environment
4300 Cherry Creek Dr. South
Denver, Colorado 80246-1530

Florida 850-245-4266

Region II
800-577-8510

William A. Passetti, Chief
Bureau of Radiation Control
Florida Department of Health
4052 Bald Cypress Way, SE, Bin C21
Tallahassee, Florida 32399-1741

Georgia 404-362-2675

Region II
800-577-8510

Cynthia Sanders, Manager
Radioactive Materials Program
Department of Natural Resources
4244 International Parkway, Suite 114
Atlanta, Georgia 30354

Illinois 217-785-9868

Region III
800-522-3025

Gary N. Wright, Director
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, Illinois 62704

Iowa 515-281-3478

Region III
800-522-3025

Donald A. Flater, Chief
Bureau of Radiological Health
Iowa Department of Public Health
401 SW 7th St., Suite D
Des Moines, Iowa 50309

Kansas 785-296-1565

Region IV
800-952-9677

Thomas A. Conley, RRPJ, CHP
Section Chief Radiation and Asbestos Control
Kansas Department of Health & Environment
1000 SW Jackson, Suite 320
Topeka, Kansas 66612-1366

Kentucky 502-564-7818

Region II
800-577-8510

Robert L. Johnson, Manager
Radiation and Toxic Agents Control Branch
Cabinet for Health Services
275 East Main Street
Frankfort, Kentucky 40621-0001

Louisiana 225-219-3366

Region IV
800-952-9677

Michael E. Henry, Senior
Office of Environmental Services
P.O. Box 4313
Baton Rouge, Louisiana 70821-4313

Maine 207-287-5677

Region I
800-432-1156

Jay Hyland, Acting Program Manager
Radiation Control Program
Division of Health Engineering
10 State House Station
Augusta, Maine 04333

Maryland 410-537-3300

Region I
800-432-1156

Roland G. Fletcher, Manager
Radiological Health Program
Air and Radiation Management Administration
Maryland Department of the Environment
1800 Washington Blvd
Suite 750
Baltimore, Maryland 21230-1724

Massachusetts 617-427-2944

Region I
800-432-1156

Robert Walker, Director
Radiation Control Program
Department of Public Health
90 Washington St.
Dorchester, Massachusetts 02121

Mississippi 601-987-6893

Region II
800-577-8510

Robert W. Goff, Director
Division of Radiological Health
State Department of Health
3150 Lawson Street
P.O. Box 1700
Jackson, Mississippi 39215-1700

Nebraska 402-471-8566

Region IV
800-952-9677

Julia A. Schmitt, Program Manager
Department of Regulation and Licensure
Nebraska Health and Human Services System
P.O. Box 95007
Lincoln, Nebraska 68509-5007

Nevada 775-687-5394 Ext. 276

Region IV
800-952-9677

Stanley R. Marshall, Supervisor
Radiological Health Section
Health Division
Department of Human Resources
1179 Fairview Drive, Suite 102
Carson City, Nevada 89701-5405

New Hampshire 603-271-4588

Region I
800-432-1156

Dennis O'Dowd, Supervisor
Radiological Health Bureau
Division of Public Health Services
Health and Welfare Building
6 Hazen Drive
Concord, New Hampshire 03301-6527

New Mexico 505-827-1080

Region IV
800-952-9677

John Parker, Chief
Radiation Control Bureau
Field Operations Division
Department of Environment
1190 St. Francis Dr., Rm S2100
Santa Fe, New Mexico 87502

New York 518-457-1202

Region I
800-432-1156

Clayton Bradt, Principal Radiophysicist
Radiological Health Unit
Division of Safety and Health
New York State Department of Labor
New York State Office Campus
Building 12, Room 169
Albany, New York 12240

North Carolina 919-571-4141

Region II
800-577-8510

Beverly O. Hall, Chief
Division of Radiation Protection
Department of Environment & Natural Resources
3825 Barrett Drive
Raleigh, North Carolina 27609-7221

North Dakota 701-328-5188

Region IV
800-952-9677

Terry L. O'Clair, Director
Division of Air Quality
North Dakota Department of Health
1200 Missouri Avenue, Room 304
P O Box 5520
Bismarck, North Dakota 58506-5520

Ohio 614-644-7860

Region III
800-522-3025

Robert Owen, Chief
Bureau of Radiation Protection
Ohio Department of Health
P.O. Box 118
Columbus, Ohio 43266-0118

Oklahoma 405-702-5155

Region IV
800-952-9677

Mike Broderick, Environmental Program Administrator
Radiation Management Section
OK Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677

Oregon 503-731-4014 Ext. 660

Region IV
800-952-9677

Terry D. Lindsey, Program Director
Radiation Protection Services
Oregon State Health Division
800 N.E. Oregon Street, Suite 260
Portland, Oregon 97232

Rhode Island 401-222-7755

Region I
800-432-1156

Marie Stoeckel, Chief
Division of Occupational
and Radiological Health
Rhode Island Department of Health
3 Capitol Hill, Room 206
Providence, Rhode Island 02908-5097

South Carolina 803-737-7400

Region II
800-577-8510

T. Pearce O'Kelley, Chief
Bureau of Radiological Health
Department of Health &
Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Tennessee 615-532-0364

Region II
800-577-8510

L. Edward Nanney, Director
Division of Radiological Health
Tennessee Department of Environment
and Conservation
L&C Annex, Third Floor
401 Church Street
Nashville, Tennessee 37243-1532

Texas 512-834-6679

Region IV
800-952-9677

Richard A. Ratliff, P.E., L.M.P. Chief
Bureau of Radiation Control
Texas Department of Health
1100 W. 49th Street
Austin, Texas 78756-3189

Utah 801-536-4250

Region IV
800-952-9677

Dane Finerfrock, Director
Division of Radiation Control
Department of Environmental Quality
168 North 1950 West
P.O. Box 144850
Salt Lake City, Utah 84114-4850

Washington 360-236-3210

Region IV
800-952-9677

Gary L. Robertson, Director
Division of Radiation Protection
Department of Health
7171 Clean Water Lane, Building #5
P O Box 47827
Olympia, Washington 98504-7827

Wisconsin

Region III
800-522-3025

Paul Schmidt, Chief
Radiation Protection Section
Division of Public Health
Department of Health and Family Services
P.O. Box 2659
Madison, WI 53701-2659

APPENDIX Q

SHIPPING CONTAINER QUALITY ASSURANCE PROGRAM

DESCRIPTION OF QUALITY ASSURANCE PROGRAM FOR TYPE "B"

QUALITY SHIPMENTS OF RADIOACTIVE MATERIAL

I. Organization

- A. PRIME N.D.T. SERVICES, INC. pursuant to 10-CFR 71.12 and 10-CFR 71.51 (a) is responsible for a Quality Assurance Program for Type "B" quality shipments and transportation of radioactive material. Fabrication and design of Type "B" packages are not included.
- B. The organizational structure in Chapter 2 is applicable.
 - 1. The Radiation Safety Officer (RSO) is responsible for administration of the program, training of personnel, procurement of manufacturer's certifications, maintaining packaging and shipping documents, retention of records and program audits.
 - 2. Radiographers are responsible for handling, storage, shipping and transporting radioactive packages in accordance with the procedures in Chapters 7 & 12 and they are responsible for inspecting, surveying and maintenance reports in accordance with the procedures in Chapter 9.

II. Quality Assurance Program

- A. Radiographers are trained in their responsibilities above according to Chapter 5.
- B. The Quality Assurance Program will be viable, requiring management approval, and the program encompasses specific requirements stated in the package approval for use, and general radiation safety and shipping requirements.
- C. Manufacturer's certifications will be requested and maintained on all N.R.C. Type "B" packages manufactured and procured after January 1, 1979.

III. Document Control

- A. Packaging, shipping, inspection, and handling instructions from the manufacturers shall be maintained for each model Type "B" package.

- B. The Radiation Safety Officer (RSO) shall ensure that the shipment and transportation of Type "B" packages is conducted in accordance with the above documents.

IV. Handling, Shipping, Transportation and Storage

- A. Radiography personnel will handle, ship, transport, and store radioactive packages in accordance with the procedures in Chapters 7 & 12.
- B. Radiography personnel will determine the completeness of package inspections and presence of manufacturer's certificates before shipment.

V. Inspection, Surveys, and Maintenance Reports

- A. Inspection, surveys and maintenance reports on Type "B" packages will be made in accordance with Chapters 9 & 13 procedures.
- B. Quarterly inspection and maintenance of Type "B" packages will be performed by the Radiation Safety Officer (RSO) as outlined in Chapters 9 & 13.

VI. Quality Assurance Records

- A. Utilization logs, shipment records, package surveys, and quarterly inspection records will be maintained as specified in Chapter 7.
- B. Training records are maintained in accordance with Chapter 5.
- C. Equipment and package, procedures and instructions are maintained by the RSO.

VII. Audits

- A. Quarterly audits of the entire Radiation Safety Program are performed in accordance with Chapter 13.
- B. The quarterly audits include the necessary checks on the Quality Assurance Program as outlined in Chapter 13.
- C. Any deficiencies revealed by the audits are corrected in accordance with Chapter 13.

APPENDIX R
PROCEDURES FOR RETRIEVAL
AND RECOVERY OF A SOURCE

PROCEDURES FOR RETRIEVAL AND RECOVERY OF A SOURCE

All retrievals will be done or supervised by Prime NDT's RSO who has successfully completed the AEA Technology Retrieval Course.

The following instructions are Prime N.D.T.'s Emergency Operation Procedures to be used by the RSO employed by Prime for source recovery due to broken drive cables, disconnect, stuck source in guide tube, stuck shutter on a beam type projector, etc.

I. Exposure Limit

During any recovery attempt if an individual, as stipulated in para. 4.13.1, receives an exposure level in excess of 200 mR or if his dosimeter becomes completely off-scale, the recovery attempt is to cease immediately. The individual, C or D, must check their dosimeter reading and recharge their dosimeter to zero. This will enable the radiographer to know what his/her exposure has been at any time during the recovery procedure. Post a guard to keep the area under surveillance and wait for further instructions from Prime's RSO.

Any exposure level received by the RSO will be governed by U.S.N.R.C. 10 CFR, Part 20. A constant check on each individual's dosimeter must be checked, recorded, and reset. All attempts must be made to minimize any accumulated dose of radiation.

II. Source Recovery Safety Equipment

- A. Survey Meters
- B. Dosimeters (200 mR, 500 mR, 10 R)
- C. Lead Sheets
- D. Lead Tunnel
- E. Safety Tongs (for picking up source)
- F. Lead Lined Box

All the recovery equipment listed above is available for use at Prime N.D.T.'s Home Office in Whitehall, PA. Not all mobile units will be equipped with every item. In circumstances where these items are not readily available to you, other shielding methods are to be considered -- sand bags, scrap steel, dirt, concrete, etc. The radiographer present during the time of a disconnect must use whatever shielding is available to minimize the radiation area.

III. Recovery Procedure - Beam Type Exposure Device

The first action a radiographer is to take, if the rotating cylinder will not return to the safe position, is to retreat to the safe area and evaluate the situation. Check your dosimeter, record the reading, and reset it to zero. This frequent checking will enable you to keep a close and accurate check on the amount of radiation you have received.

Check your restricted area limits with your survey meter, and if necessary, adjust your barriers and signs to conform to the 2 mR/hr. level.

Approach the device rapidly and remove it from the pipe, being careful to always keep as much of your body as possible on the shielded side of the device; set the device on the ground so that the radiation beam is projected directly into the ground. Place other shielding, such as dirt or bags of sand, around the base to provide further shielding, using your survey meter to establish the fact that you do have a field of radiation comparatively safe to work in for a short time. Again, check your dosimeter, record the reading, and reset to zero. Now that the device is adequately shielded, try to gently rock the rotator back and forth. If it fails to return to a safe position, keep the area under surveillance, and call your Radiation Safety Officer.

Under the direction of the RSO, as stipulated in para. 4.13.1, the situation will be evaluated and further recovery attempts discussed. Recovery efforts with this type projector are limited due to the projector being hermetically sealed. Should efforts taken to turn the rotating knob back to the shielded position fail, the unit would be placed inside a shielding box (item F, para. 4.13.3) for removal from the job site. The manufacturer would be contacted for further instructions pertaining to recovery by their personnel or for shipping of the unit back to their facility. Shipping handled by the manufacturer would depend on their approved shipping container. Shipping by Prime NDT Services, Inc. would be by company vehicle and transported by a Radiation Safety Officer, or any qualified monitored radiographer under the direction of the RSO.

IV. Recovery Procedure - Wind Out Panoramic Exposure Device

The first thing the radiographer must do is to get out of the radiation field and study the situation and plan his actions so there will be a minimum of unnecessary time spent in the radiation field. Using his survey meter, reaffirm accuracy of restricted area limits, and readjusts as necessary. He should also check his dosimeter reading, record the reading, and recharge his dosimeter to zero. This will enable him to know what his exposure has been at any time during the

recovery procedure.

The area shall be kept under constant surveillance until the situation is rectified.

With the radiation area secured, the next step will be to determine the location of the source in the guide tube, and try to determine if you have a disconnect, broken drive cable, or if the source is stuck. Remember to plan your actions to minimize your radiation dose. Use any shielding available to hide behind or to shield the exposed source. Once in a safe position, try turning your control crank handle. Naturally, if it moves freely the source is not stuck. If it moves freely, try cranking the drive cable out into the exposed position. While cranking, do so in a slow process, and pay close attention to any change or stoppage that could indicate to you the location of the source. Many options could be considered at this time, but until the Radiation Safety Officer is notified for further instructions, you, as a radiographer, are only allowed to try cranking your drive cable in and out several times. In some cases, even a disconnect or broken drive cable will snag the loose source and enable you to return it to a safe shielded position, or the cranking in and out of the drive cable could possibly drive the source into the tip end of the guide tube where you could concentrate your shielding efforts. Should you have a collimator on the end of the guide tube tip, this will also help with shielding. Until now, your direct actions should have taken only a few seconds and your radiation dose should have been minimal, but now you should have enough information to notify your Radiation Safety Officer. Be sure that when you call you have not only this information, but also your dose records taken from your dosimeter readings. Never exceed an accumulated dose over 200 mR.

The information you supply the RSO with will enable him to determine the severity of the situation and instruct you as to what steps to take next. Seldom will there be any two incidents alike, so each case will be dealt with in the manner most suited for recovery efforts that will impose the least amount of danger and radiation exposure.

Before actual recovery attempts are made, all information supplied to the RSO will be evaluated and calculations will be made beforehand to predetermine estimated dosage and estimated time allowed in the "High Radiation Area". Each step taken in the recovery attempt shall be predetermined and, if possible, these steps should be practiced out of the radiation area -- use of lead tunnels, picking up dummy source pigtail with safety tongs, etc. In some cases where an individual making the recovery attempt is working in a high radiation area and is only allowed a few seconds in this area, the radiation dose can be minimized by more than one

qualified person working together with each person taking a recovery step.

All recovery attempts shall be documented on a step-by-step basis. This documentation shall include, but not be limited to:

1. Survey and Utilization Reports
2. Dosimetry Reports
3. Description of circumstances under which the disconnect, loss or theft occurred.
4. The extent of possible hazard to persons in unrestricted areas -- for proper notification to U.S.N.R.C.
5. All actions which were taken, or will be taken, to recover the source, including sketches of the actual recovery operation.
6. Procedures or measures which have been, or will be, adopted to prevent a reoccurrence of the loss or theft of licensed material.

The above information will be used for proper Notification to the U.S.N.R.C. under Title 10, Part 34.101 following the outline on page R-7.

REPORTING REQUIREMENTS

In accordance with 10 CFR 34.101, we are required to report the following:

1. Unintentional disconnection of the source assembly from the control cable.
2. Inability to retract the source assembly to its fully shielded position and secure it in this position.
3. Failure of any component (critical to the safe operation of the device) to properly perform its intended function.

The following information must be submitted to the RSO so that he can make a formal report to the N.R.C.:

1. A description of equipment problem.
2. Cause of the incident, if known.
3. Manufacturer and model number of the equipment involved in the incident.
4. Place, time, and date of incident.
5. Action taken to establish normal operations.
6. Corrective actions taken or planned to prevent recurrence.
7. Qualifications of personnel involved in the incident.

In addition, please submit exposure information on all people involved.

SUBMITTED BY: _____ DATE: _____

This is to acknowledge the receipt of your letter/application dated

12/10/2009, and to inform you that the initial processing which includes an administrative review has been performed.

☒ Renew 37-2332-01
There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 136151.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

: (FOR LFMS USE)
: INFORMATION FROM LTS
: -----
:
: Program Code: 03320
: Status Code: 2
: Fee Category: 30 2B
: Exp. Date: 20050131
: Fee Comments: _____
: Decom Fin Assur Req'd: N
: ::::::::::::::::::::::::::::::::::::::

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED

Applicant/Licensee: PRIME NDT SERVICES, INC.
Received Date: 20041217
Docket No: 3020982
Control No.: 136151
License No.: 37-23370-01
Action Type: Renewal

2. FEE ATTACHED

Amount: _____
Check No.: _____

3. COMMENTS

Signed M. A. Perkins
Date 12/19/2004

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /___/)

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:

Amendment _____
Renewal _____
License _____

3. OTHER _____

Signed _____
Date _____