



FROEHLING & ROBERTSON, INC.
FULL SERVICE LABORATORIES • ENGINEERS & CHEMISTS
"OVER ONE HUNDRED YEARS OF SERVICE"

November 21, 1989

United States Nuclear Regulatory Commission
Washington, DC 20555

Attn: Document Control Desk

Reference: Reply to Notice of Violation
Docket No. 030-06529
License No. 45-08890-01

Gentlemen:

The following information is furnished as per your "Notice of Violation" dated October 26, 1989:

Violation: 10CFR34.11 (d) (1). Include observation of the performance of each radiographer and radiographer's assistant during an actual radiographic operation at intervals not to exceed three months.

- Reply:
1. We concur with the general findings relative to the wording of "actual radiographic operation" and the limiting time factor of "not to exceed three months". Please note, however, that we were not in violation of our own ADMINISTRATIVE CONTROL AND RADIOLOGICAL PROTECTION PROCEDURES (see 3. below).
 2. Although we maintain complete records of quarterly inspection activities (to include inventories and maintenance records), it is not always a simple matter to conduct field inspections. We have experienced problems similar to those of your inspectors due to the very nature of industrial radiography (i.e. sporadic scheduling, off hours, access to job sites and geographical restrictions). The three month interval also presents a problem for the scheduling of trips, as does the distance separating our bases of operation.

8911300174 891121
REG2 LIC30
45-08890-01 PDC

HEADQUARTERS: 3015 DUMBARTON ROAD • BOX 27524 • RICHMOND, VA, 23261 •
TELEPHONE AREA CODE (804) 264-2701
BRANCHES: ASHEVILLE, NC • BALTIMORE, MD • CHARLOTTE, NC • CHESAPEAKE, VA •
CROZET, VA • FAYETTEVILLE, NC • FREDERICKSBURG, VA • GREENVILLE, SC •
RALEIGH, NC • ROANOKE, VA • STERLING, VA • SALISBURY, MD



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3. In correcting or adjusting our internal inspection system to allow for compliance, we have instituted the following changes:

a. Branch or Departmental Radiation Safety Officers have been tentatively appointed. This will allow for the expansion of the inspection program.

b. The internal Inspection Program, previously detailed in Section 14 of our ADMINISTRATIVE CONTROL AND RADIOLOGICAL PROTECTION PROCEDURES, has been revised to reflect the requirements of 10CFR34 and changed to Section 2.0. Other changes to the Procedure are:

...Section 1.0 was revised to cover Administrative Control and Organizational Structure,

...Section 3.0 was revised to include the old Section 2,

...Section 13.0 was revised to reflect minor changes,

...Section 13.0 was revised to reflect minor changes,

...Section 15 was deleted and reprinted as Section 14.0 with minor changes.

These revisions were distributed to applicable personnel on this date.

4. The implementation of the actions and associated changes to the safety procedures should prove to be adequate for establishing and maintaining compliance. Any significant adjustments to this system would be made through further revisions or clarifications to the safety procedures and copied to the Region II office.

5. It is anticipated that initial compliance will be achieved by December 31, 1989, with full compliance being attained during the first quarter of 1990.



We must point out that, although your letter cited a similarity in violations in referencing your letter of August 11, 1987, the violation in question was deleted in subsequent correspondence dated November 6, 1987; and we feel that this particular instance should not be considered as a "similar violation". As indicated by your inspector at the time of the September 27, 1989 review, F&R does have a good program for radiation safety. We do, however, recognize that there is always room for improvements and areas requiring revision in order to remain in compliance with the regulations.

We sincerely hope that our corrective actions will service to keep us on the right track and prevent recurrence of this particular violation; and we will, of course, make every effort to enforce the program. Should you have any questions or require additional information, please call us at your convenience.

Respectfully submitted,

Froehling & Robertson, Inc.

Samuel H. Kirby, Jr., P.E.
President

William W. Briody
Vice President
Metals/NDT

cc: United States Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Atlanta, GA 30323

WWB/jtd



FRUEHLING & ROBERTSON, INC.
FULL SERVICE LABORATORIES • ENGINEERS & CHEMISTS
"OVER ONE HUNDRED YEARS OF SERVICE"

Richmond, Virginia
November 15, 1989

TO: F&R Chesapeake, Roanoke and Richmond Metals/NDT Department
FROM: W. Briody, Corporate RSO
RE: Assignment of Branch RSO

Due to the requirement for the inspection of field radiographic operations, it has become necessary to appoint individual radiation safety officers at your locations. This was precipitated by our being cited by the USNRC for not fulfilling the requirements of Title 10 Code of Federal Regulations, 34.11(d) which states:

- (1) Include observation of the performance of each radiographer and radiographer's assistant during an actual radiographic operation at intervals not to exceed three months;
- (2) Provide that, if a radiographer or a radiographer's assistant has not participated in a radiographic operation for more than three months since the last inspection, that individual's performance must be observed and recorded the next time the individual participates in a radiographic operation.

The radiation safety officers are assigned as follows:

Roanoke - Lloyd Dillon
Chesapeake - Brett Clarke
Richmond Metals/NDT - Richard Hall

As noted, these inspections would be conducted on actual operations for each radiographer or assistant at periods not to exceed three (3) months. This could entail from four to five inspections per year for each radiographer and the assistants. The RSO, when working as a part of the radiographic crew, would be subject to inspection by the Corporate RSO. Use Form 608, Side B, with additional pages as necessary. We want your actual findings when visiting a site and not a simple write-off. Record what you see and emphasize any weak areas. This will enable us to follow up with

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additional training and even spot actual or potential equipment problems that could lead to overexposures and the imposition of civil penalties.

These new inspection duties should not add greatly to present work loads. In the case of the Richmond Metals/NDT Department, however, a complete file system must be re-established and maintained as opposed to being kept by the Corporate RSO. This will be set up during the fourth quarter inspection in December.

This program is in effect as of the date of this letter. Make arrangements for inspections in your area and keep the Corporate RSO informed as to work schedules. Inspections should be reported and copies to Richmond when completed.

Should you have any questions or require additional information, please contact me at your convenience.

Sincerely yours,

William W. Briody
Corporate RSO
Vice President

WWB/v



PART II: INSPECTION OF FIELD RADIOGRAPHIC OPERATIONS

Location _____
 Client _____
 Type of Operations _____
 Radiographer _____ Assistant Radiographer _____
 Exposure Device Model _____ Serial No. _____
 Radioscope _____ Serial No. _____
 Activity _____ Leak Test Date _____
 Survey Meter Model _____ Serial No. _____
 Calibration Date _____

INTERNAL INSPECTION CHECKLIST

Were the Radiographer and the Assistant Radiographer wearing Film Badges and Dosimeters? YES _____ NO _____

Was the Restricted Area delineated and posted with CAUTION RADIATION AREA signs? YES _____ NO _____

Was the High Radiation Area delineated and posted with CAUTION-HIGH RADIATION AREA signs? YES _____ NO _____

Was at least one operable and calibrated survey meter on hand? YES _____ NO _____

Was the Restricted Area properly controlled? YES _____ NO _____

Was the Utilization Log filled out? YES _____ NO _____

Was the Inspection & Maintenance Record completed? YES _____ NO _____

Was the Dosimeter Record properly maintained? YES _____ NO _____

Did the Radiographer have the following documents:

-Radiological Protection Procedures? YES _____ NO _____
-Radioactive Material License? YES _____ NO _____
-10 CFR Parts 19, 20 ? YES _____ NO _____
-DOT Shipping Documents? YES _____ NO _____

Was the vehicle properly placarded? YES _____ NO _____
 Survey reading _____ mR/hr.

Were radiation safety procedures generally followed? YES _____ NO _____

Were radiation surveys conducted properly? YES _____ NO _____

Did radiographic personnel exhibit acceptable knowledge of the required safety rules? YES _____ NO _____

General Comments: _____

Personnel notified concerning inspection results _____
 Inspector _____ Title _____



November 20, 1989

TO: All Radiographic Testing Personnel
FROM: Corporate Radiation Safety Officer
RE: Revisions to ADMINISTRATIVE CONTROL AND RADIATION SAFETY PROCEDURES

The enclosed revisions are to be posted to your safety procedures immediately:

- Delete Section 1 and add Section 1.0
- Delete Section 2 and add Section 2.0
- Delete Section 3 and add Section 3.0
- Delete Section 13 and add Section 13.0
- Delete Section 14 and add Section 14.0
- Delete Section 15

Additional sections and appropriate changes to page numbers will follow as soon as they are available.

Please note the revised Internal Inspection Program as it pertains to inspection of actual radiographic operations. We will be needing advance notice of field operations in the future; but, the revised program will be reviewed during the 4th Quarter inspections.

Please call if you have any questions.

A handwritten signature in cursive script, appearing to read 'Bill Briody'.

Bill Briody
Vice President
Corporate RSO



ADMINISTRATIVE CONTROL AND RADIATION SAFETY PROCEDURES

INDUSTRIAL RADIOGRAPHY

Froehling & Robertson, Inc.
P.O. Box 27524
3015 Dumbarton Road
Richmond, Virginia 23261

REVISION NUMBER	DATE	REVIEWED AND ACCEPTED	INITIALS
1	11/17/89	W. Briody	WB
0	05/23/86	W. Briody	WB



ADMINISTRATIVE CONTROL AND RADIATION SAFETY PROCEDURES

INDUSTRIAL RADIOGRAPHY

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SECTION 6.....	Storage of Radioactive Materials
SECTION 7.....	Transportation, Shipping & Receiving Radioactive Materials
SECTION 8.....	Minimizing Radiation Exposure in the Event of Accidents
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This copy assigned to _____ .Branch _____ .



1.0 ADMINISTRATIVE CONTROL AND ORGANIZATIONAL STRUCTURE

1.1 Scope

In order to maintain an efficient administrative control over the use of radioactive material as authorized by the United States Nuclear Regulatory Commission and/or Agreement State licenses, key personnel must be designated and accorded responsibilities pertinent to the safety and control of personnel relative to training, assignment, specific duties and radiation exposure. These key personnel shall also be responsible for maintaining complete records concerning all license activity as to usage and storage of the licensed byproduct material, all personnel records, inspection of facilities, etc.

1.2 Personnel

1.2.1 The key personnel assigned the responsibilities noted above shall be as follows:

1.2.1.1 Radiation Safety Coordinator

The RSC shall act as liaison between this Company and the licensing agency on any and all license matters. He shall also be responsible for the assignment of the Corporate Radiation Safety Officer and assistance in the general implementation of the overall safety program.

1.2.1.2 Radiation Safety Officers

The Company shall designate RSO's at different levels as follows:

a. Corporate Radiation Safety Officer

The Corporate RSO shall have the main responsibility for insuring that the conditions of the license are maintained. Generally, his duties are as follows:

1. Responsibility for the training and assignment of other RSO's.



2. Periodic inspection of operational branch locations.
3. Maintaining control over the procurement, storage, assignment and disposal of radioactive material.
4. Maintaining a current operating and emergency procedure and enforcement of same.
5. Maintaining a suitable personnel monitoring program.
6. Directing an adequate training program for radiographic personnel.
7. Acting as final word relative to the assignment of personnel to radiographic duties.
8. Maintaining a current record system under the central heading of RADIATION RECORDS.
9. Maintaining inventories of radioactive material relative to location and assignment.
10. Maintaining an internal inspection program for all radiographic operations.
11. To control emergency situations, recommend or conduct corrective actions if necessary, and investigate such incidents in order to determine causes and establish preventative procedures for future use.
12. Act in an advisory capacity to Branch and Agreement State RSO's.

b. Radiation Safety Officer (Branch)

Branch RSO's shall be assigned by the Corporate RSO with duties as follows:

1. To maintain primary control over radioactive



material assigned to their location while implementing all Company procedures and safety specifications.

2. To transfer on a quarterly basis, copies of applicable radiation records and information to RADIATION RECORDS. These records are detailed in SECTION 13.0.
3. To maintain complete records of radiographic operations within their district, as well as any transfer of radioactive material of other branches to or from their district.
4. To assist in conducting the training program.
5. To maintain personnel monitoring records and keep individuals informed as to exposure records.
6. To maintain properly calibrated survey instruments.
7. To insure the necessary performance of leak tests.
8. To conduct or assist in the performance of source changes.
9. To insure proper transportation of radioactive material.
10. To perform periodic inspections of operations within the district as detailed by the Corporate RSO.
11. Investigate incidents and suggest preventative actions.
12. Conduct the quarterly maintenance program as detailed by the RSO and/or assign the maintenance to qualified personnel.
13. To maintain adequate storage facilities for licensed byproduct material.



c. Radiation Safety Officers (Agreement State)

The duties of an AGREEMENT STATE RSO shall be essentially the same as those of the BRANCH RSO with the exceptions being as follows:

1. The AGREEMENT STATE RSO will act as liaison with the Corporate RSO and the State Regulatory Agency.
2. He will be responsible for keeping the regulatory agency informed relative to any and all radiographic operations.
3. He shall be responsible for maintaining records as required by the State regulatory agency and the transfer of identical data to the Corporate RSO and RADIATION RECORDS.

1.2.1.3 Radiographer

The RADIOGRAPHER is that duly qualified individual who performs radiographic operations or is in attendance at the site of operations to personally supervise the work. The RADIOGRAPHER is directly responsible to the management of the licensee for assuring that radiographic operations are conducted in accordance with the requirements of the United States Nuclear Regulatory Commission, the Agreement State regulations, individual State Boards of Health regulations, the United States Department of Transportation, and so on. The RADIOGRAPHER is directly responsible to his RSO relative to the maintenance of records and the implementation of all safety requirements.

1.2.1.4 Radiographer's Assistant

The RADIOGRAPHER'S ASSISTANT, hereafter referred to as ASSISTANT, is any duly qualified individual who assists the RADIOGRAPHER in the performance of radiographic operations. The ASSISTANT must be instructed in all operating and emergency procedures and must prove that he or she is competent in the use of exposure devices, survey instrumentation and techniques, etc., while



under the direct supervision of a qualified RADIOGRAPHER at all times.

1.2.1.5 Trainee

The TRAINEE is that individual who is in the process of being trained for duties as ASSISTANTS and, subsequently, RADIOGRAPHERS. TRAINEES will have no responsibilities until after assignment as radiographic personnel and this will not be done until such time that the individual has been trained in and tested for his knowledge and ability.

1.2.1.6 Helpers

There are occasions when trained personnel are not available to assist the RADIOGRAPHER in the performance of radiographic operations. In these instances, HELPERS may be utilized for general assistance of the RADIOGRAPHERS on a limited basis; but shall be kept away from the radiation area as much as possible. The HELPER is available as a safety precaution in the event of personal injury to the RADIOGRAPHER.

1.2.2 Personnel Qualifications

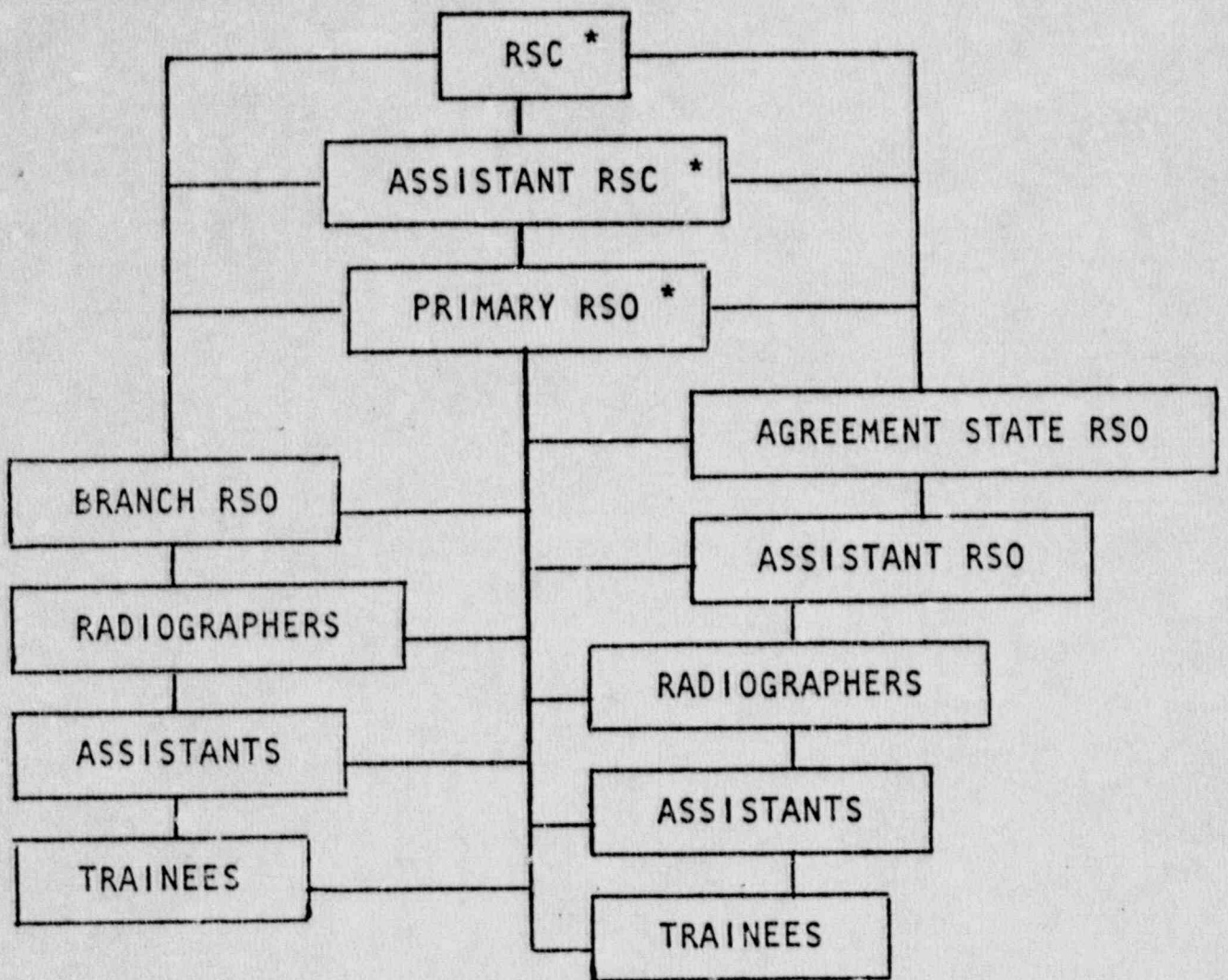
Due to the need for qualified individuals throughout the Company to implement the control necessary for insuring the safe and efficient operation of the system, certain requirements will be necessary before assignment of any title or relating duties. Basic requirements are as follows:

1.2.2.1 Radiation Safety Coordinator

The RSC is primarily an administrative title and will require little field knowledge of operations. It is, however, important that the RSC have knowledge of pertinent regulations. The RSC will be assisted by the RSO in all matters concerning the license or use of radioactive material.

1.2.2.2 Corporate Radiation Safety Officer

The Corporate R.) shall have a complete knowledge of

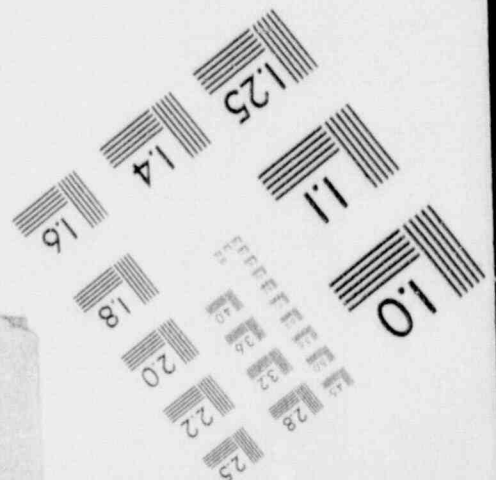
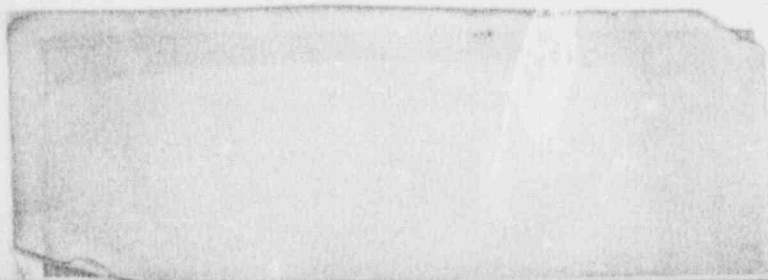
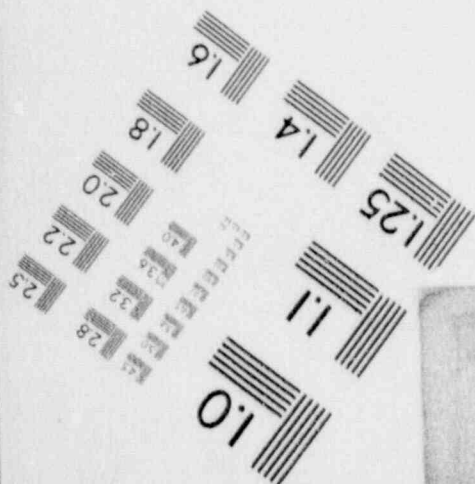
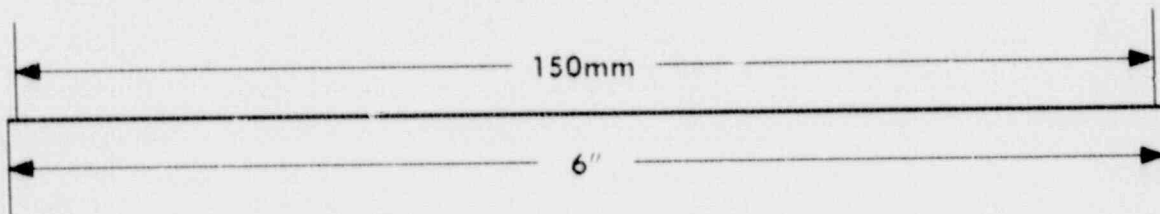
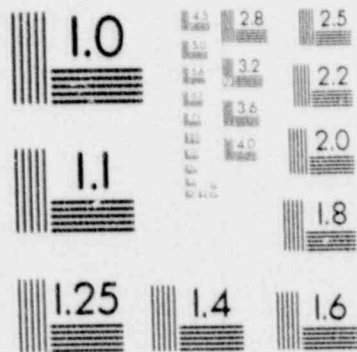
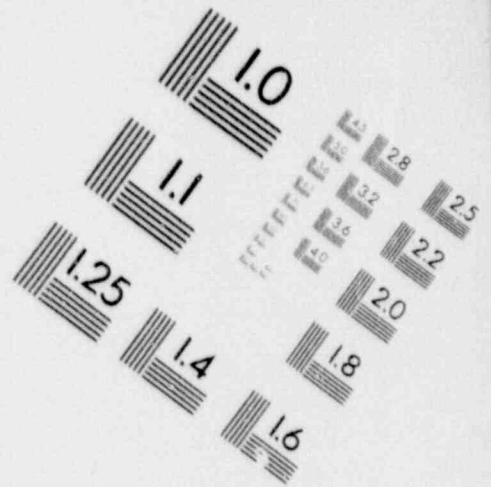
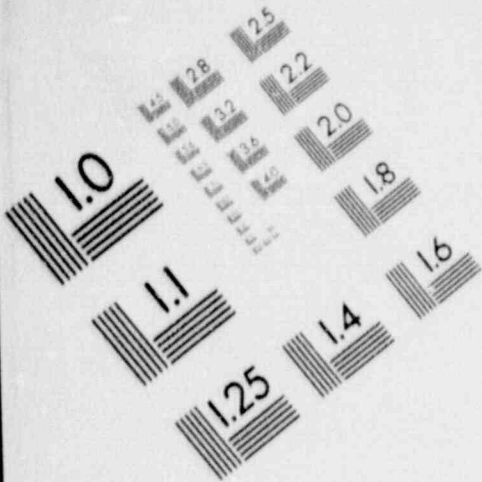


* Radiation Safety Committee

FIGURE NO. 1 ORGANIZATION STRUCTURE OF RADIOGRAPHIC PERSONNEL

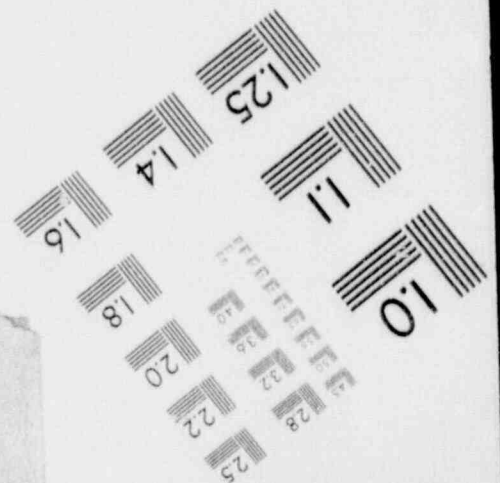
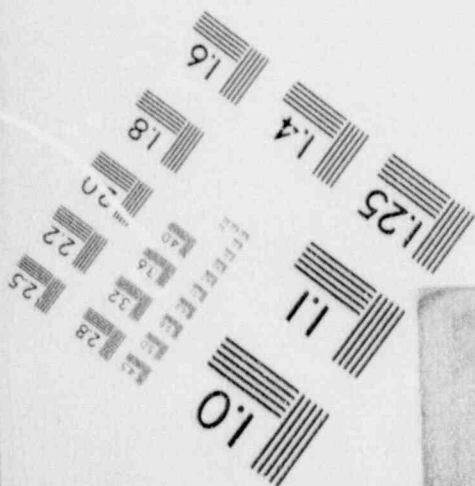
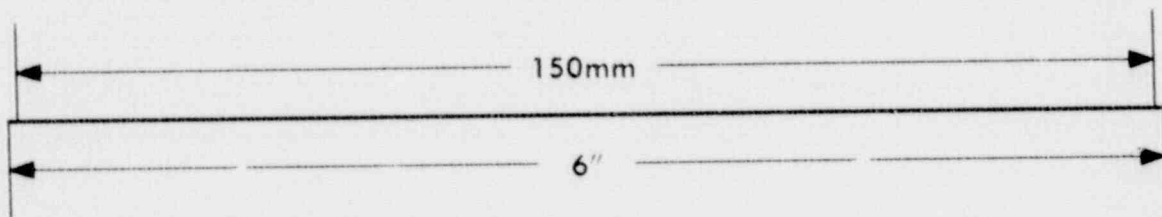
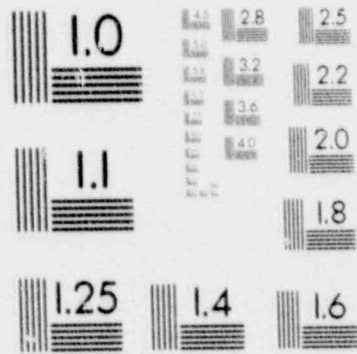
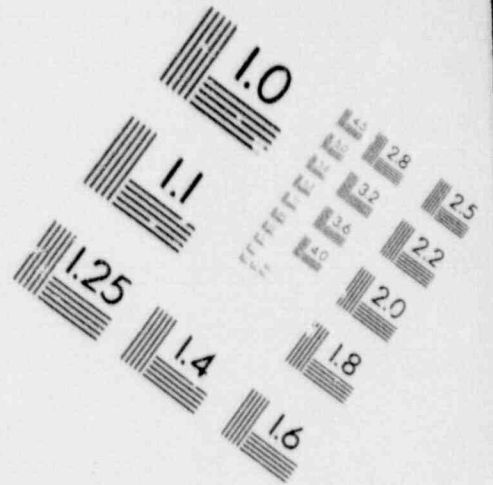
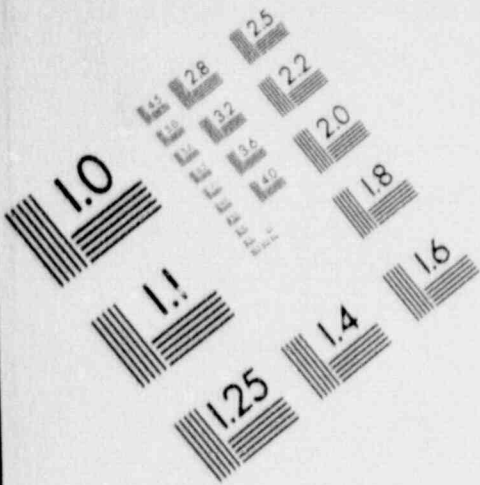
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IMAGE EVALUATION TEST TARGET (MT-3)



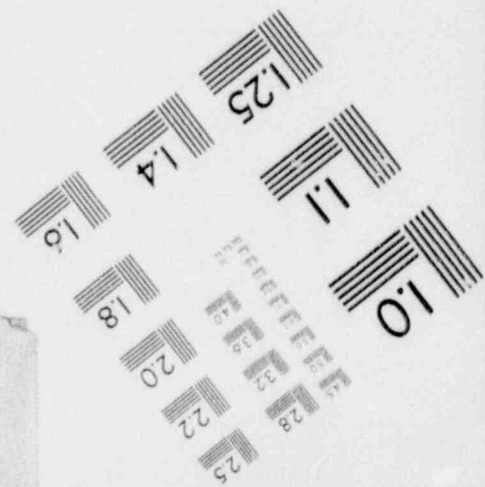
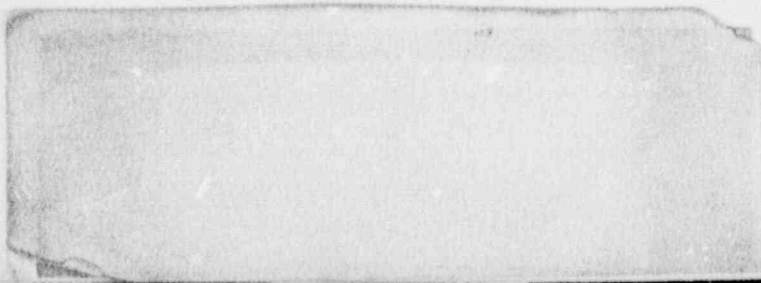
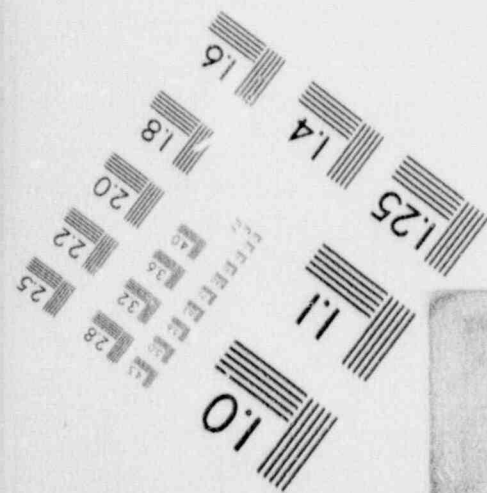
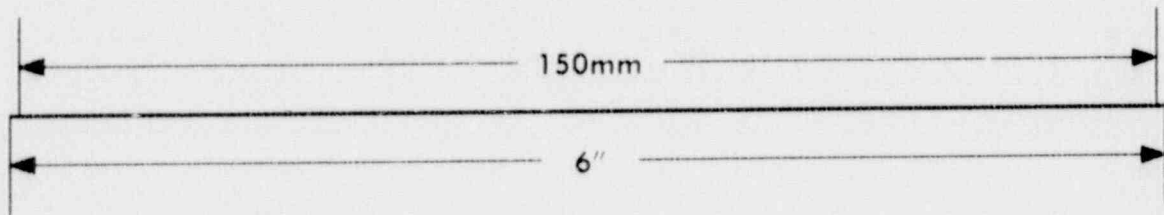
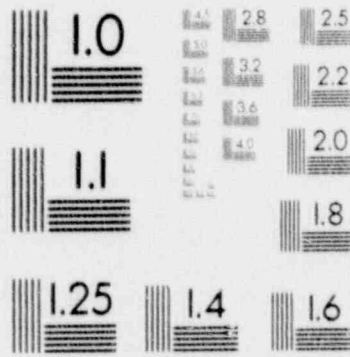
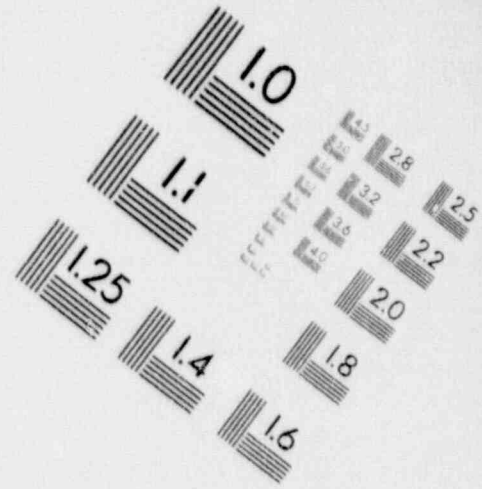
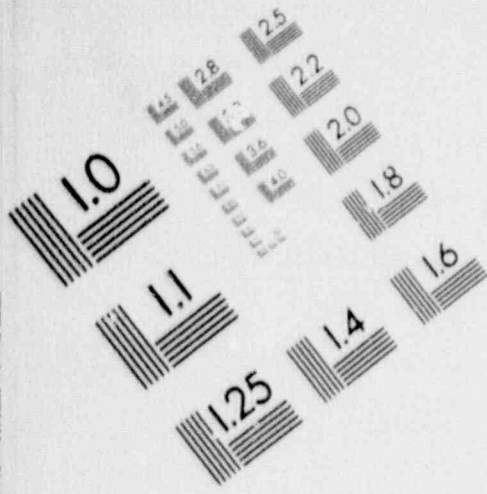
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IMAGE EVALUATION TEST TARGET (MT-3)



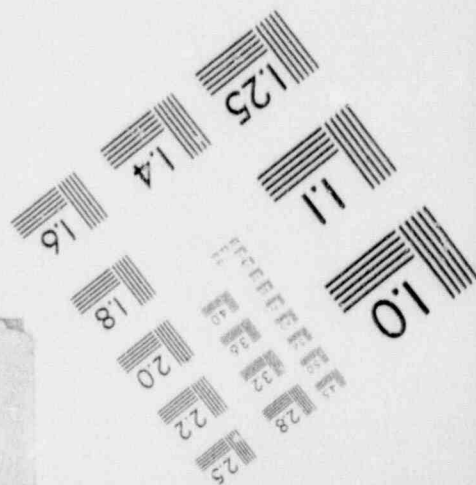
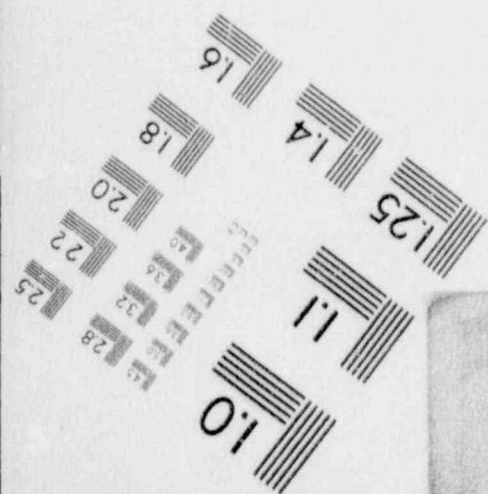
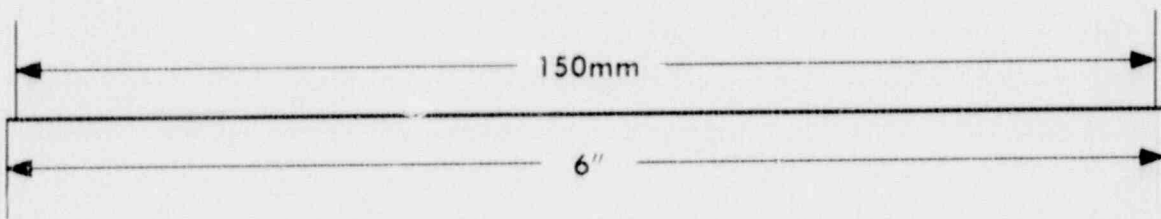
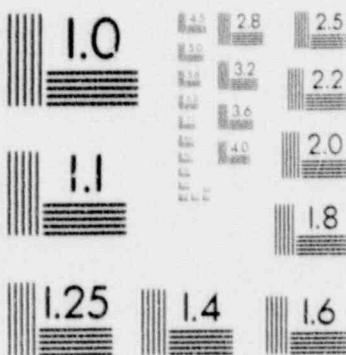
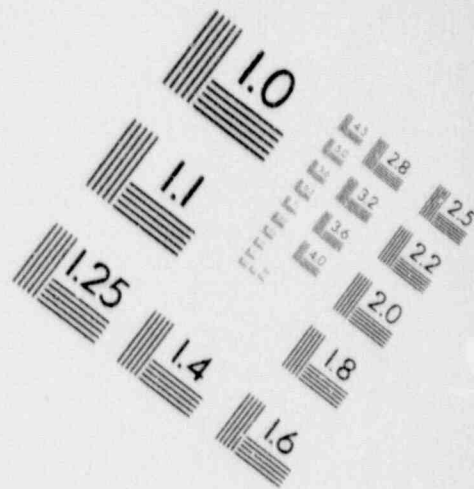
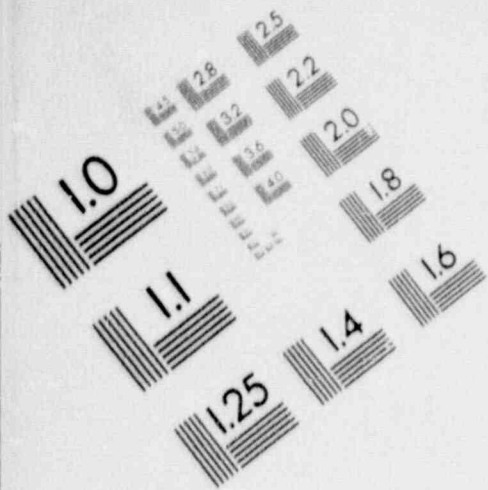
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all applicable regulations and Company procedures. At least five (5) years experience shall be required for consideration as Corporate RSO or his authorized assistant or representative. This experience should include the actual conduct of operations as a qualified radiographer, familiarization with applicable regulations, a knowledge of the necessary paperwork and a capacity for management of personnel. He shall be qualified to prepare and administer a proper radiological safety training program and shall act as the field representative of the RSC in all matters.

1.2.2.3 Radiation Safety Officer (Branch or Agreement State).

These individuals should be management-qualified personnel with a generally complete familiarization with pertinent regulations and Company procedures. They should have at least one (1) year of experience relative to the safety aspects of radiographic operations; and a complete knowledge of the required reports and records to be maintained. They should be able to rate the merits of personnel and procedures through the required inspections. More importantly, they must realize the necessity of coordination in maintaining an efficient program for safe radiographic operations. The BRANCH or AGREEMENT STATE RSO may appoint a qualified assistant to aid in areas of coordination; but the assignment shall not carry the administrative responsibility as assigned to the BRANCH or AGREEMENT STATE RSO.

1.3 The Organizational Structure of F&R, Inc., As It Pertains To Radiographic Personnel

1.3.1 The Organizational Structure of F&R, Inc., is shown in Figure 1.0.

1.3.1.a. General

The basic structure of this Company should be a matter of common knowledge to each and every RADIOGRAPHER, ASSISTANT, or TRAINEE. It is imperative that each individual be familiar with the personnel with whom they must keep informed relative to daily operations and the movement of radioactive material, any problems



encountered or suspected, and in the event of any "incident".

Industrial radiography usually requires a significant amount of highway travel, long or irregular hours, difficult conditions and a series of technical problems that arise due to test objectives. Despite the many advances in equipment design and personnel monitoring, the use of radioactive material is still hazardous because of the different conditions encountered along with the limitations of personnel and equipment. Because of this, it is necessary to utilize a system of checks and balances for the control of as many circumstances as possible.

For field personnel, this system or structure helps by relieving them from the pressure or responsibility for situations or problems for which they should not be help accountable; and provides for an order of control by and for the Company over all operations.

1.3.2 Organizational Structure for Field Personnel

1.3.2.1 Corporate Radiation Safety Officer

The Corporate RSO will have basic control over field personnel. He is in turn responsible to the RADIATION SAFETY COORDINATOR and the ASSISTANT RADIATION SAFETY COORDINATOR.

1.3.2.2 Radiation Safety Officer (Branch)

The Branch RSO will have direct control over the field personnel in that particular branch location. He is directly responsible to the Corporate RSO.

1.3.2.3 Radiation Safety Officer (Agreement State)

The AGREEMENT STATE RSO will be responsible for liaison between the Company and the applicable Regulatory Agency pertinent to all operations in the Agreement State. The AGREEMENT STATE RSO is directly responsible to the Corporate RSO.



1.3.2.4 Radiographer (see 1.5.1)

The RADIOGRAPHERS are responsible to the BRANCH or AGREEMENT STATE RSO, then to the Corporate RSO.

1.3.2.5 Radiographer's Assistant (see 1.5.2)

ASSISTANTS are directly responsible to the RADIOGRAPHER as well as to the BRANCH or AGREEMENT STATE RSO and then to the Corporate RSO.

1.4 Personnel Qualifications

All personnel in the organizational chain shall be subject to qualification and/or training in accordance with the requirements of the United States Nuclear Regulatory Commission, or the Agreement State regulations, and the Company training program (RSO's may refer to Section 14.0).

1.5 Definitions:

1.5.1 RADIOGRAPHER: The duly qualified individual who actually performs or is physically in attendance at the site where the sealed source(s) are being used under his personal supervision. The RADIOGRAPHER is responsible to the Company or licensee for assuring compliance with the conditions of the license and applicable regulations.

1.5.2 RADIOGRAPHERS ASSISTANT: The duly qualified individual who, under the personal and direct supervision of the RADIOGRAPHER, assists in the conduct of radiographic operations through use of exposure devices and sealed sources, use of related equipment and radiation survey instruments. The ASSISTANT cannot use sealed sources or exposure devices unless personally supervised by a qualified RADIOGRAPHER.

1.5.3 RADIOGRAPHY: The nondestructive method for testing materials and material structure using sealed sources of radioactive by-product material.

1.5.4 RADIOGRAPHIC EXPOSURE DEVICE: The instrument or mechanism containing a sealed source in which the sealed source of shielding may be moved or otherwise



changed to an unshielded position for the purpose of conducting radiographic exposures.

- 1.5.5 SEALED SOURCE: Any by-product material which is encased in a capsule designed to control or prevent leakage or escape.
- 1.5.6 STORAGE CONTAINER: A device or container in which the sealed sources are transported or stored.
- 1.5.7 DULY QUALIFIED: A term used to denote the status of personnel after satisfactory completion of all specified training programs and representative training.
- 1.5.8 INCIDENT: Term applied to an accident that may occur when using radioactive materials. Generally, an "Incident" is any instance that poses a threat or actually presents a danger of possible radiation exposure to unauthorized personnel or excessive exposure to our own authorized personnel.
- 1.5.9 UNAUTHORIZED PERSONNEL: Those individuals whose exposure to radiation is not being monitored by use of film badges, dosimeters, etc. Terms may also be expanded to include all personnel not employed by this Company.
- 1.5.10 ASSIGNED LOCATION: That Department, Branch Office, or other operational area having industrial radiographic testing capabilities and licensed material on its inventory.
- 1.5.11 Radiation Safety Committee: That group responsible for the design and implementation of the overall radiation safety program. The committee consists of the Radiation Safety Coordinator, the Assistant Radiation Safety Coordinator (if assigned) and the Corporate Radiation Safety Officer.

NOTE: A more complete listing of terms and definitions may be found in Appendix C of this procedure.



RADIOACTIVE MATERIAL SHIPMENT RECORD

DATE _____

FROM (Name)	TO (Name)
COMPANY	COMPANY
ADDRESS	ADDRESS
CITY STATE ZIP	CITY STATE ZIP

SHIPPED BY: _____

SHIPPER'S CERTIFICATION FOR RADIOACTIVE MATERIALS

NO. of PKGS	PROPER SHIPPING NAME	CLASSIFICATION	IDENTIFICATION NO.	NET QUANTITY PER PACKAGE	
RADIONUCLIDE	FORM	ACTIVITY	CATEGORY OF LABELS	TRANSPORT INDEX	PACKAGE IDENTIFICATION
SPECIAL HANDLING INFORMATION					
REMARKS					
I HEREBY CERTIFY THAT THE CONTENTS OF THIS CONSIGNMENT ARE FULLY AND ACCURATELY DESCRIBED ABOVE BY PROPER SHIPPING NAME AND ARE CLASSIFIED, PACKED, MARKED, AND LABELED AND IN PROPER CONDITION FOR TRANSPORT ACCORDING TO APPLICABLE NATIONAL GOVERNMENTAL REGULATIONS.					
NAME AND TITLE OF PERSON SIGNING CERTIFICATION					
TELEPHONE	EMERGENCY TELEPHONE	SIGNATURE OF SHIPPER			



14.0 TRAINING PROGRAM FOR RADIOGRAPHIC PERSONNEL

14.1 Individual Requirements

- 14.1.1 High School Diploma or Equivalent (Age and experience may satisfy this requirement)
- 14.1.2 Satisfactory physical condition.
- 14.1.3 Practical experience
 - 14.1.3.1 Assistant Radiographer applicants require little to no practical background, as this will be satisfied by our training program.
 - 14.1.3.2 Radiographer applicants shall have at least three (3) months experience as an Assistant Radiographer before consideration for Radiographer training is administered and then only at the recommendation of a qualified Radiographer. Generally, a period of six months is required before consideration is made. Personnel with previous experience are to be considered as per Paragraph 14.7 of this section.
- 14.1.4 Ability to perform basic mathematical formulas involved in industrial radiography.
- 14.1.5 Successful completion of the Radiological Safety Course.

14.2 Objectives of the Training Program

The primary aim of the Radiological Safety Course is to provide a program which will develop radiographic personnel to a degree of efficiency in:

- 14.2.1 Knowledge of U. S. Nuclear Regulatory Commission regulations.
- 14.2.2 Company Administrative Control and Radiological Protection Procedures.
- 14.2.3 Handling and use of radiographic devices and equipment.
- 14.2.4 Safe handling and use of radioactive material, and



- 14.2.5 A general working application of his knowledge to actual operations.
- 14.3 Training Program - General
 - 14.3.1 Equipment and Material Assignment
 - 14.3.1.1 At the onset of the program, each individual will be assigned,
 - a. U. S. Nuclear Regulatory Commission CRF Title 10, Parts 19 and 20
 - b. F&R, Inc., "Administrative Control and Radiological Protection Procedures"
 - c. Copy of the applicable Material License with Amendments.
 - 14.3.1.2 On the fourth day of training, it is probable that the instructor will be able to ascertain that the applicant will be able to complete the prescribed course satisfactorily, and then the following equipment will be issued:
 - a. Film Badge
 - b. Pocket Dosimeter
 - 14.3.1.3 Designation of Responsibilities

The Radiological Safety Course will be basically the same for RADIOGRAPHERS and ASSISTANT RADIOGRAPHERS, with the following exceptions:

 - a. RADIOGRAPHERS will be thoroughly familiarized with their individual responsibilities relative to the safe handling and use of radioactive materials. A composite grade of 80% will be required on the examination for assignment. This examination will be especially geared for RADIOGRAPHERS and not ASSISTANTS.
 - b. ASSISTANT RADIOGRAPHERS will be thoroughly instructed as to their responsibilities as well as the limitations of their position. A composite grade of 80% will be required for assignment.
 - 14.3.1.4 Practice Experience (OJT): Before definite assignment to any position is made, the individual must first work



directly under the control of a qualified and experienced RADIOGRAPHER. When, in the opinion of the Radiographer, the individual is considered capable to conduct or assist in actual operations, then he is permanently assigned to that particular position as subject to future review through inspections.

- 14.4 Reference Material
 - 14.4.1 United States Nuclear Regulatory Commission, Code of Federal Regulations, Title 10, Parts 19, 20, 34 and 71.
 - 14.4.2 Department of Transportation, Code of Federal Regulations, Title 49, Parts 170-178.
 - 14.4.3 Froehling & Robertson "Administrative Control and Radiological Protection Procedures".
 - 14.4.4 Applicable Material License
 - 14.4.5 Industrial Radiography Manual OE-84036
 - 14.4.6 Industrial Radiography Instructor's Guide OE84034.
 - 14.4.7 General Dynamics, Convair Division
 - 14.4.7.1 Programmed Instruction Handbook, NONDESTRUCTIVE TESTING, Radiographic Testing Pl-4-6.
 - a. Volume 1 - Origin and Nature of Radiation
 - b. Volume II - Radiation Safety
 - c. Volume III - Radiographic Equipment
 - 14.4.8 Working Safety In Industrial Radiography, NUREG/BR-0024
 - 14.4.9 Individual manufacturer specifications as applicable.
- 14.5 Examinations
 - 14.5.1 Formal Examination: A formal examination generally covering radiography shall be administered for each position. Time limit for the examination shall be a maximum of 180 minutes and pencils will be provided. Formal examinations will consist of the following:



- 14.5.1.1 Radiographers Examination: This test will consist of at least 40 questions of varying point value covering the following subjects:
- a. Radiation Units of Dose and Activity
 - b. Effects of Radiation
 - c. Controlling Radiation Exposure
 - d. Radiation Equipment and Survey Meters
 - e. Personnel monitoring equipment
 - f. Establishing and controlling the restricted area.
 - g. Emergency procedures and notification.
 - h. Shipping and transporting radioactive material.
 - i. Applicable regulations and responsibilities.
 - j. Reports and records.
- 14.5.1.2 Assistant Radiographers: The test shall consist of at least 30 questions of varying point value covering the same basic subjects contained in the Radiographic examination.
- 14.5.2 Oral Examination: An oral examination shall be administered to each individual. This examination shall stress the need for making quick decisions using basic math and reasoning without benefit of references or manual figuring with calculators or pencil and paper. The quiz shall consist of at least 10 questions and the grade will be determined by the examiner. (See 1.b. above).
- 14.5.3 Practical Examination: A brief practical demonstration of the individual's techniques in handling material shall be conducted and observed by the Examiner. A basic checklist will be used to cover all major areas of performance.
- 14.6 Grading of Examinations
- 14.6.1 Composite Grade: An average of all three (3) areas of the examination (Formal, Oral and Practical) shall determine the final grade. A passing grade in all segments will be required as follows:
- 14.6.1.1 Formal Examination
- a. Radiographers - 80% or better
 - b. Assistant Radiographers - 80% or better



14.6.1.2 Oral Examination

- a. Radiographers - 70% or better
- b. Assistant Radiographers - 70% or better (80% if oral examination is substituted for written test).

14.6.1.3 Practical Examination

- a. Radiographers - 80% or better
- b. Assistant Radiographers - 75% or better

14.6.2 Grades shall then be averaged using percentile weights for each examination as follows:

14.6.2.1 Percentile Weights: Levels of importance will be assigned to each examination.

Example: Formal - 0.5 percentile weight
Oral - 0.2 percentile weight
Practical - 0.3 percentile weight

14.6.2.2 These percentile weights (PW) are multiplied by the actual grade percentage (AP) and then added to achieve the final grade.

Example: Formal - AP (80%) times 0.5 PW = 44.5
Oral - AP (95%) times 0.2 PW = 19.0
Practical - AP (85%) times 0.3 PW = 25.5
Final Grades 89.0%

14.6.2.3 Final Grade Requirements

- a. Radiographers: A final grade of 80% will be required for assignment. Grades of 70% to 79% will call for additional training and retesting. Grades under 70% will disqualify the individual for further activity as radiographic trainee.
- b. Assistant Radiographers: A final grade of 80% will be required for assignment. Grading 65 to 70% will call for additional training and subsequent retesting. Grades under 65% will disqualify the individual from further activity as radiographic trainee.



14.7 Personnel with Previous Training and Experience in Radiography

There will certainly be instances when previous trained and experienced personnel will be applying for radiographic positions. The training program may certainly be adjusted as deemed necessary by the instructor. Personal interviews with the applicants will serve as standards for such adjustments.

14.7.1 Subject matter of the adjusted training program will place emphasis on:

14.7.1.1 New regulations

14.7.1.2 Company policies and procedures

14.7.1.3 Exposure devices and related equipment.

14.7.2 Testing will be in accordance with Company Policy.

14.7.3 Limitations: Under no circumstances will personnel be assigned without proper training and testing. Regardless of the past record of the individual a regular, but adjusted, program will be administered.

14.8 Training Schedule: See Table 4

Table 4 - Training Program - Radiological Safety

The training schedule outlined below will be for Radiographer's and Radiographer Assistants as well for the first three days. Specific training relative to the position will be covered on the fourth and fifth days.

Classroom Training Course

First Day

I. Fundamentals of Radiation Safety

a.	Characteristics of Gamma Radiation.....	30 min.
b.	Units of Radiation Activity and Dose.....	30 min.
c.	Biological Affects of Radiation.....	15 min.
d.	Hazards of Excessive Radiation Exposure.....	15 min.
e.	Radiation Levels from Licensed Byproduct Material.....	30 min.



- f. Controlling Radiation Dose
 - 1. Time15 min.
 - 2. Distance (Inverse Square Law).....45 min.
 - 3. Shielding30 min.
- g. Review (Question & Answer Period).....30 min.

II. Radiation Detection Instruments

- a. Radiation Detection Instruments Used by Company.....30 min.
- b. Use of Radiation Detection Instruments
 - 1. Operation.....30 min.
 - 2. Calibration.....15 min.
 - 3. Limitations.....15 min.
- c. Survey Techniques60 min.
- d. Personnel Monitoring Techniques
 - 1. Film Badges20 min.
 - 2. Dosimeter.....20 min.
- e. Review (Question & Answer Period).....50 min.

Second Day

I. Radiographic Equipment Used by Company

- a. Exposure Devices - Iridium 192
 - 1. Equipment Characteristics.....60 min.
 - 2. Principle of Operation.....30 min.
 - 3. Capabilities and Limitations.....30 min.
- b. Exposure Devices - Cobalt 60
 - 1. Equipment Characteristics.....10 min.
 - 2. Principle of Operation.....10 min.
 - 3. Capabilities and Limitations.....10 min.
- c. Storage of Radioactive Material.....30 min.
- d. Leak Tests.....10 min.
- e. Transportation of Radioactive Material.....25 min.
- f. Review (Question & Answer Period).....25 min.

II. Use of Radiographic Equipment

- a. Pre-exposure set-ups.....45 min.
- b. Post exposure procedures.....45 min.
- c. Use of Survey Meter During Operations.....30 min.
- d. Emergency Situations.....30 min.
- e. Review (Question & Answer Period).....30 min.

III. General Review.....60 min.



Third Day

- I. United States Nuclear Regulatory Commission Regulations.....120 min.
- II. Company ADMINISTRATIVE CONTROL AND RADIOLOGICAL PROTECTION PROCEDURES.....120 min.
- III. Review.....60 min.
- IV. Individual Responsibilities.....120 min.
 - a. Radiographer
 - b. Assistant Radiographer

Fourth Day

All training from this point will concentrate on the particular responsibilities of the position the individual(s) is being trained for. Radiographers will receive instruction concerning their duties and responsibilities. Assistant Radiographers will receive instructions concerning their duties with special emphasis placed on the limitations of these duties.

- I. Controlling Access to Radiation Areas
 - a. Establishing the Restricted Area.....60 min.
 - b. Posting the Restricted Area
 - 1. Signs.....30 min.
 - 2. Visual Surveillance.....30 min.
 - c. Adjustment of the Restricted Area.....15 min.
 - d. Allowable limits of the Radiation or Restricted Area.....45 min.
 - e. Review (Question & Answer Period).....60 min.
- II. Transporting Radioactive Material.....60 min.
- III. Notification in the Event of Incidents
 - a. Possible Incidents Requiring Special Attention..30 min.
 - b. Personal Action.....30 min.
 - c. Reporting.....30 min.
- IV. Records and Reports.....45 min.
- V. Review (Question & Answer Period).....45 min.

Fifth Day

- I. Inspection and Maintenance Program.....60 min.
- II. Source Changes.....30 min.
- III. General Review.....90 min.
- IV. Oral Examination.....*60 min.
- V. Practical Demonstration of Individual Proficiency..**60 min.
- VI. Formal Examination Period.....***180 min.



*Oral examinations are a good method of determining the ability of the individual to make quick decisions or use a basic math without benefit of references or pencil and paper.

**Practical examinations may be done with a small group or individually, dependent upon the equipment available.

***The formal examination will be administered to the applicants with no benefit or reference material. A sufficient supply of pencils and scratch paper will be supplied. Hand calculators may be used.



2.0 INTERNAL INSPECTION PROGRAM

2.1 General

Pursuant to Title 10 Code of Federal Regulations, Part 34, F&R, Inc., maintains an internal inspection program as a mechanism for insuring satisfactory compliance levels relative to the conduct of operations utilizing radioactive material under the conditions of our Material License(s).

2.2 Scope

It is the basic intent of F&R, Inc., that the implementation of the internal inspection program enable the overall organization to establish and maintain compliance with applicable regulations for operations involving activities licensed by the USNRC and/or Agreement States. The assurance of compliance is to be accomplished through a system of controls and inspections.

2.3 Areas of Control

2.3.1 Radioactive Material

2.3.1.1 Acquisition

2.3.1.2 Receipt

2.3.1.3 Shipping

2.3.1.4 Storage

2.3.1.5 Use

2.3.1.6 Maintenance

2.3.2 Personnel

2.3.2.1 Training

- a. Initial
- b. Periodic

2.3.2.2 Testing

2.3.2.3 Radiation Exposure



2.4 General Responsibilities

- 2.4.1 Radiation Safety Committee (see
 - 2.4.1.1 To review and evaluate the overall radiation safety program relative to effectiveness.
 - 2.4.1.2 Determine problem areas and issue applicable correspondence.
 - 2.4.1.3 Follow up on correction of problem areas or revisions to programs.
- 2.4.2 Corporate Radiation Safety Officer
 - 2.4.2.1 To maintain current Materials License(s).
 - 2.4.2.2 To maintain copies of pertinent records in accordance with 10 CFR34.4.
 - 2.4.2.3 To insure proper training and assignment of radiographic personnel in accordance with 10 CFR34.11(b).
 - 2.4.2.4 To appoint Radiation Safety Officers (see 2.4.3.)
 - 2.4.2.5 To maintain current operation and emergency procedures in accordance with 10CFR34.11(c) and to further insure that radiographic personnel are issue copies of all necessary documents.
 - 2.4.2.6 To implement and control an inspection program designed to insure compliance with regulations by radiographic personnel in accordance with 10 CFR34.11(d). Compliance requirements would include, but not be limited to, those listed in 10 CFR, Part 20 and 10 CFR, Part 34, Subpart B.
 - 2.4.2.7 To prepare and issue reports or insure posting of notices are per 10 CFR, Parts 19 and 20.
 - 2.4.2.8 To maintain permanent radiation exposure files.
- 2.4.3 Radiation Safety Officer



- 2.4.3.1 To generally assist the Corporate RSO relative to activities at the assigned location(s).
- 2.4.3.2 To conduct field inspections of radiographic personnel as per 10 CFR 34.11(d) as directed by the Corporate Radiation Safety Officer.
- 2.4.3.3 To conduct quarterly inventories (10 CFR 34.26) and inspection/maintenance in accordance with 10 CFR 34.28(b).
- 2.4.3.4 To assist in the training of radiographic personnel.
- 2.4.3.5 To generally insure compliance with all applicable regulations relative to use and storage of radioactive material at the assigned location(s).
- 2.4.3.6 To act as liaison between radiographic personnel and the Corporate Radiation Safety Officer relative to emergency situations or reportable conditions.
- 2.4.4 Radiographers
 - 2.4.4.1 To be directly responsible to the Radiation Safety Officer at the assigned location relative to all matters dealing with the Material License(s).
 - 2.4.4.2 To conduct radiographic operations in accordance with applicable regulations.
- 2.4.5 Radiographers Assistants
 - 2.4.5.1 To be directly responsible to the Radiation Safety Officer and Radiographers relative to all matters dealing with the Material License(s).
 - 2.4.5.2 To assist the radiographer in the conduct of radiographic operations in accordance with applicable regulations.

2.5 Inspection Program



2.5.1 Corporate Radiation Safety Officer

Inspections shall be made at least twice annually of each branch location engaged in operations using licensed radioactive material. These inspections may be on an announced or unannounced basis and shall include, but not be limited to, the following areas:

2.5.1.1 Records and Reports

- a. Utilization Records
- b. Inspection and Maintenance Records
- c. Decay Curves
 1. Record of survey readings measured upon receipt.
 2. Current Wipe Tests
- d. Survey Meter Calibrations
- e. Source change records
- f. Shipping records
- g. Dosimeter reports
- h. Radiation exposure records

2.5.1.2 General Filing System

2.5.1.3 Storage Facilities

- a. Posting
- b. Security
- c. Alarm system (if applicable)

2.5.1.4 Equipment

- a. Inventory
- b. Condition
 1. Maintenance records
 2. Records

2.5.1.5 Personnel

- a. Knowledge of regulations
- b. Use of personnel monitoring
 1. Dosimeter Calibrations
 2. Film badge use



2.5.1.6 Field Operations (should be inspected when possible using checklist on Form 608-1, Part B. See 14.5.2, below).

2.5.2 Radiation Safety Officer

Inventories and inspections shall be conducted at periods not to exceed three (3) months*. The inspections shall be made of actual operations for each radiographer and radiographer's assistant and shall include, but not be limited to, those areas noted on Form 608-1, Part B**.

*NOTE: When scheduling inspections, it is advisable to establish a "window" of fifteen (15) to twenty (20) days prior to the due date in which to complete the field inspection. If there is no field activity during this period, make a notation indicating that the inspection could not be conducted along with a complete explanation. Inspection should be made at the next, soonest opportunity. Also note that, if any radiographic personnel are not involved in field operation for any period equalling or exceeding three (3) months, then an inspection must be made at the time of the next operation.

** NOTE: When the Radiation Safety Officer is also a Radiographer, then any field operations conducted by the Radiation Safety Officer are subject to inspection by the Corporate Radiation Safety Officer.

2.5.3 Radiographer

2.5.3.1 To conduct inspection and maintenance procedures for the day-to-day use of radioactive materials.

2.5.3.2 To report all conditions affecting the safe conduct of field operations involving licensed material.

2.6 Records and Reports

All inspection findings and comments shall be recorded and appropriate forms and discussed with applicable personnel along with their immediate supervisor(s). Areas of noncompliance or actions requiring improvement should be



stressed and corrective actions recommended. Copies of reports should be supplied to the Corporate Radiation Safety Officer, the Radiation Safety Officer, the radiographic personnel and immediate supervisor(s).

2.7 Program Review

At least once per calendar quarter, the Corporate Radiation Safety Officer shall review inspection findings for the period and evaluate the overall effectiveness of the radiation safety program. The general inspection results, along with any comments or recommendations by the Corporate Radiation Safety Officer, is distributed to the Radiation Safety Committee for review and discussion. Any administrative, memorandum or special letters may be issued by the Radiation Safety Coordinator or jointly with the Corporate Radiation Safety Officer.

2.8 Enforcement Policies

2.8.1 General

Due to the nature of the activities connected with operations involving radioactive material, a system for insuring compliance to applicable regulations by assigned locations and/or individual radiographic personnel.

2.8.2 Severity Levels

The severity level, or importance of the violation relative to the safe conduct of operations, would be determined by the Corporate Radiation Safety Officer using the general guidelines of Title 10 Code of Federal Regulations, Part 2, Supplement VI. Severity Levels would range from V (violations having minor safety or environmental significance up to I (highest level of safety violation).

2.8.3 Enforcement

Enforcement could involve immediate correction of non-compliance areas to the most drastic scenario of actually suspending operations at the assigned location. Each case would be decided upon relative to



severity level, any extenuating circumstances, repetitive nature, etc. It should be made known to radiographic personnel that any significant failure to conduct operations in accordance with this procedure and applicable regulations could result in the termination of their employment.



3.0 EQUIPMENT

3.1 Scope

The intent of this Section is to provide personnel with a basic understanding of the operational characteristics, handling and use of the exposure devices, source changes and survey instrumentation presently used or licensed for use by F&R, Inc.

3.2 Radiographic Exposure Devices and Source Changes

3.2.1 Exposure Devices - Iridium 192

3.2.1.1 Gamma Industries Model Gamma Century SA

- a. Description....Remote-controlled radiation exposure device
- b. Capacity.....100 curies IR 192
- c. Shielding.....Depleted Uranium with stainless steel shell

3.2.1.2 Automation Industries Model 520 Iriditron

- a. Description....Remote-controlled radiation exposure device.
- b. Capacity.....100 curies IR 192
- c. Shielding.....Depleted Uranium with stainless steel shell

3.2.1.3 Automation Industries Model 100A Iriditron (Not In Use)

- a. Description....Remote-controlled radiation exposure device.
- b. Capacity.....100 curies IR 192
- c. Shielding.....Depleted Uranium with stainless steel shell

3.2.2 Exposure Devices - Cobalt 60

3.2.2.1 Technical Operations Model 703 (not in use)

- a. Description....Remote-controlled radiation exposure device.
- b. Capacity.....50 curies Co-60
- c. Shielding.....Lead with steel housing



- d. Design.....Wheel-mounted with lifting lugs
- e. Remarks.....Differs in basic design and components as follows:
 - 1. Source assembly connects to a cable by means of a built-in spring type connector which is connected or disconnected using a special tool.
 - 2. Control assembly has a built-in system of lights to indicate the position of the sealed source (STORED, OPEN AND ON).
 - 3. Control assembly has a system of three cables rather than two.

3.2.2.2 Gamma Industries Utility Twin 50A and 100A - No longer in production.

3.2.2.3 Gamma Industries Model Gammatron 50A and 100A - No longer in production.

3.2.3 Components of Remote-Controlled Radiation Exposure Devices. (See Figure 2).

All of the exposure devices listed above are comprised of the same basic components. They are generally broken down into three (3) basic items as follows:

3.2.3.1 Source Shield or Device

- a. Source Assembly: The radioactive material is encapsulated into a stainless steel shell and swedged onto a flexible steel cable. The cable has a "ball" located near the connecting end for retention of the source in the device after it is locked. The control cable connector is located at the end opposite to the source and its design may vary according to the manufacturer.
- b. The Universal "S" Tube: An S-shaped tube of alloyed material where the source assembly rests. The center area of the tube is where the source takes advantage of the greatest amount of shielding and is the point where the source is considered to be in the "SAFE" position.



- c. Shielding: A dense material of either lead or depleted Uranium which absorbs the radiation of the source, thereby, making handling possible.
- d. Shell: The shielding material is protected from damage by a casing or steel jacket. Access to the device interior is facilitated by end caps that are welded to the body of the device.
- e. Lock Box: The lock box is attached at the rear of the device and consists of a plunger-type lock which restrains the source when locked and the control cable connection.
- f. Source Tube Connection: The front of the device has a special connector for attachment of the source tube.
- g. Safety Plugs: Not actually a part of the device itself, these plus are provided to insure retention of the source in the "SAFE" position.

3.2.3.2 Source Tube

The source tube is a flexible metal or plastic tube through which the source is passed to and from the exposure position. The tube has a swivel-type connection at the opposite end for the attachment of the special tip where the source rests during the exposure.

3.2.3.3 Control Cable Assembly

- a. Drive Cable: The source drive cable is a flexible steel cable with a wrapped notching so as to relate to the drive gears. One end of the cable has a special connection that mates to the connection on the Source Assembly.
- b. Drive Gears: These gears are manually operated either the Crank Handle and serves to drive or retract the Source Assembly to and from the Device when assembled.



- c. Lock Box Connection: A special swivel connection at the end of the conduit that connects to the Lock Box after the cable has been attached to the Source Assembly. This connection is removable and designed so that the inside diameter is too small to allow the end of the Source Assembly to be retracted through and out of the Device.
- d. Conduit: A flexible composite conduit covers the control cable and connects to the Lock Box as noted above and then into the gear box. There are actually two sections of the Conduit covering the continuous length of the Control Cable - one holds the return section of the Cable while the other holds the main body of the cable.

3.2.4 Principle of Operation

All remote-type exposure devices employ the same basic principles of operation with only minor differences as noted.

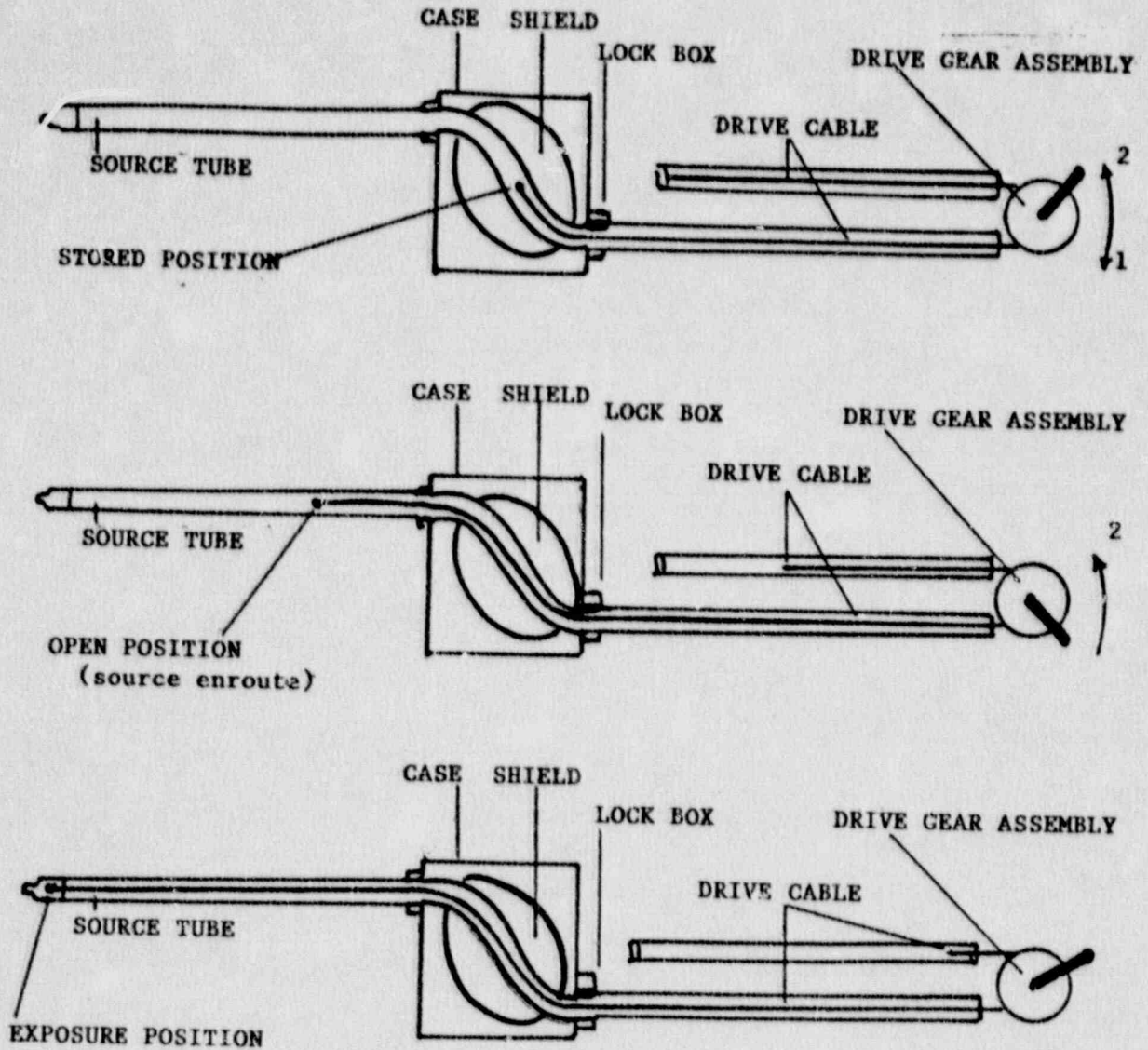
Please refer to Figure 2.

Once the safety plugs are removed, the source tube is attached to the front of the device, the control cable attached to the source assembly and the control cable assembly connection threaded into the lock box; then you are ready for the exposure.

A CALIBRATED AND OPERABLE SURVEY METER IS TO BE ON HAND AND TURNED ON AT ALL TIMES.

3.2.4.1 Arrangement of Components

- a. The device should be placed on a sturdy, flat, surface and tied off whenever necessary in order to prevent tipping over or falling.
- b. The source tube should be as straight as possible with no sharp curves or kinks.
- c. The control cable should be extended full length and also as straight as possible.



1. Handle is turned in a CLOCKWISE direction to expose source.
2. Handle turned in a COUNTER-CLOCKWISE direction to retract.

FIGURE NO. 2. MECHANICAL OPERATION OF REMOTE-TYPE EXPOSURE DEVICES



- 3.2.4.2 After unlocking the device, the exposure of the source is conducted as follows: (See Figure 1).
- a. The crank handle is rotated in a clockwise direction, thereby driving the control cable with the attached source assembly out of the device, into the source tube, and into the exposure position.
 - b. When winding the source out into the exposure position, do so in a smooth manner using moderate speed so as not to jam the source assembly into the end of the source tube.
- 3.2.4.3 Upon completion of the exposure, the handle is turned counter-clockwise. This pulls the source assembly on the drive cable back through the source tube and into the device where it finally comes to a stop with the source in the SAFE position within the S-Tube. When winding the source back into the device, use the same moderate speed utilized in winding out so as not to increase the chances of damaging the tube or the source assembly when encountering possible snags or rough spots.
- 3.2.4.4 When the source has been returned to the SAFE position, the following steps are to be followed:
- a. Approach the device from the rear with the survey meter in front of you, noting any readings.
 - b. Survey the back of the device.
 - c. Extend the meter to the front of the device while standing to the rear.
 - d. Survey the source tube and source outlet.
 - e. Lock the device after the readings have been completed and you are sure that the source is in the SAFE position.
- 3.2.4.5 When operations are completed, the components are disassembled in order and safety plugs reinserted before moving so as not to damage any connections.
- 3.2.5 Source Changers



3.2.5.1 The following source changers are presently licensed for use with the Gamma Century SA and A1520 exposure devices.

- a. Technical Operations Model C-10
- b. Technical Operations Model 500SU
- c. Technical Operations Model U-110

3.2.5.2 Design and Components

The basic design and components of the source changer are distinctly similar to the exposure devices with the following exceptions:

- a. There are two (2) lock boxes or chambers located on the changer.
 - 1. One chamber contains the new source to be extracted into the device.
 - 2. The second chamber is empty and is intended to receive the old source.
- b. Additional shielding is incorporated into the chamber to allow for the presence of more than one source.
- c. The S-Tube(s) are of different design.
- d. A short source tube is provided for the transferral of the sources.

3.2.6 Source Models for Various Exposure Devices and Changers

Each manufacturer has different model numbers assigned to the source assemblies in each type of exposure device relative to the length of the assembly, the connection design, etc. The models being or planned to be utilized by this Company are listed in Table 1.

NOTE: You will note that the SOURCE POSITION INDICATOR was not discussed as being part of the Control Cable anywhere in this Section. This is due to the fact that not all of our control cables are equipped with these mechanisms, as well as our policy emphasizes non-



EXPOSURE DEVICE	TECH OPS SOURCE MODEL NO.	TECH OPS SOURCE CHANGER MODEL NO.	MAXIMUM ACTIVITY	IARA SPECIAL FORM NO
Tech Ops Gamma Century SA	A-2-A	C-10, U-110, SU-500	85 ci 100 ci*	USA/0335/S
Tech Ops Model 520	866	C-10, U-110, SA-500	100 ci	USA/0335/S
Tech Ops Gamma Utility Twin 50A	A-10-A	C-8	50 ci	USA/0166/S
Tech Ops Gamma Utility Twin 100A	A-10-A	C-8	100 ci	USA/0166/S
Tech Ops Gamma Gammatron 50A	A-7-A	C-8	50 ci	USA/0166/S
Tech Ops Gamma Gammatron 100A	A-7-A	C-8	100 ci	USA/0166/S
Tech Ops Model 703	A424-16	NA	NA	USA/0377/S

* with overpack

Refer to Material License for list of approved source models and exposure devices.

TABLE NO. 1 SOURCE ASSEMBLIES AND SOURCE CHANGERS RELATIVE TO DEVICES



reliance on these indicators. There is no substitute for the use of a survey meter for ascertaining the correct status of the source.

3.3 Radiation Survey Equipment, Operation and Procedures

NOTE: It is absolutely forbidden by this Company to conduct industrial radiographic operations without at least one operable survey meter. Further, the survey instrument shall require calibration according to 10CFR34 and this Procedure. The absolute necessity of both having and using survey meters is of vital importance to any type of operation entailing the use or handling of radioactive material.

3.3.1 Equipment

The following battery-operated survey meters are in use or may be in use by this Company.

3.3.1.1 Victoreen 492 Survey Meter

- a. Radiation Detected.....X and Gamma
- b. Operating Range.....0 - 10, 0 - 100 and 0-1000 in 3 linear ranges
- c. Accuracy.....plus or minus 20% of full scale on all ranges.
- d. Response time.....90% of final reading in 10 seconds.
- e. Controls.....Rotary switch with 5 positions.

3.3.1.2 BICRON "Radiographer"

- a. Radiation detected.....X and Gamma
- b. Operating Range.....0-10, 0-100, and 0-1000 in 3 linear ranges.
- c. Controls.....Rotary
- d. Other.....Audible signal

3.3.1.3 Eberline E-130G Radiographic Survey Meter

- a. Radiation Detected.....X and Gamma
- b. Operating Range.....0-10, 0-100, and 0-1000 in 3 linear ranges.



- b. The internal working of the meter are effected by the elements and by exceptionally rough treatment (dropping from heights, etc.). Always try to keep your survey meter dry since erratic readings may result.
- c. When it is discovered that a meter is not operating properly, stop operations and try to obtain another meter. If moisture is the cause of the inconsistent readings or operations, the meter may be dried in your film dryer if necessary. Operability should be rechecked before restarting operations.

3.3.3 Survey Meter Calibration

3.3.3.1 Requirements

- a. No less than every three months.
- b. Whenever it is suspected that the meter is not working properly, the meter shall be sent in immediately for calibration.

3.3.3.2 Calibrating Agency

Calibration by this Company will not be conducted, rather, meters are to be sent in to an authorized agency.

3.3.4 Occasions for Use of Survey Meters and Recording of Results

3.3.4.1 When Survey Meters are to be available and turned on

- a. During any handling of radioactive material.
- b. During all radiographic operations.
- c. During transportation of radioactive material.
- d. During inspection and maintenance procedures.
- e. During leak tests.
- f. During shipment/receiving of materials.



3.3.4.2 Recording of survey results

- a. Upon removal of radioactive material from storage (Form 603).
- b. Vehicle survey of the surface and passenger department (Form 603 and 605).
- c. Before each exposure (Form 603).
- d. During exposure of the source so that the restricted area may be adjusted (Form 605).
- e. After each exposure so as to ascertain the source status (Form 603).
- f. Upon completion of operations to include vehicle (Form 603).
- g. Upon return to storage area facilities (Forms 603 and 611).
- h. During source changes (Form 610).
- i. Upon shipment of materials (Form 611).
- j. During inspection and maintenance (Form 604).



13.0 RECORDS AND REPORTS

13.1 NRC-4 (N.C. Rad. H-102, MD-DHMH-492 or facsimile)

Title: Occupational External Radiation Exposure History
Description: Record or estimation of the accumulated occupational radiation dose of an individual for whom form is completed.
When Completed: Upon assignment to radiographic duties.
Completed by: Radiation Records or applicable RSO.
Distribution: Radiation Records (RSO Files Optional)

13.2 NRC-5 (N.C. Rad. H-102, MD-DHMH-493 or facsimile).

Title: Current Occupational External Radiation Exposure
Description: Current record of individual radiation exposure on a monthly or quarterly basis to include total exposure received in career and remaining exposure in his bank.
When Completed: Form should be started at beginning of each calendar year and retained throughout.
Completed by: Radiation Records or applicable RSO.
Distribution: Radiation Records (RSO Files optional).

13.3 Form 603

Title: Dosimeter Readings and Survey Results
Description: Day-by-day record of dosimeter readings, survey readings of vehicle and storage containers, job number and location.
When Completed: Daily then turned in at end of week.
Distribution: Radiation Records, RSO files, and Radiographer.

13.4 Form 604

Title: Inspection and Maintenance Record (Remote type Exposure Devices)
Description: A check list and record of any inspection and maintenance performed on exposure devices and relating equipment.
When Completed: For each day of use and for quarterly or special inspection and maintenance to include source changes.
Completed by: Radiographer using equipment.
Distribution: Radiation Records, RSO file and Radiographer.



13.5 Form 606

Title: Film Badge Assignment Report
Description: Listing of all film badges as to when and to whom assigned, returned, and forwarded to supplier.
When Completed: Form is started upon assignment of new badges and completed upon return and submittal.
Completed by: RSO
Distribution: Radiation Records, RSO file and Film Badge Supplier

13.6 Form 607

Title: Material Inventory
Description: An itemized inventory of all radioactive material, exposure devices, and related equipment.
When Completed: Quarterly or as necessary
Completed by: RSO
Distribution: Radiation Records and RSO files.

13.7 Form 608

Title: Inspection Report
Description: Report of inspection of radiographic operations, files, personnel, etc., to include results.
When Completed: Upon completion of Quarterly Inspections and Field Inspection of Radiographic Operations.
Completed by: Radiation Safety Officers
Distribution: Radiation Records, RSO Files, Radiographer

13.8 Form 609

Title: Training Report
Description: Record of individual training and testing.
When Completed: For each training (initial, periodic, refresher).
Completed by: Instructor and/or Examiner
Distribution: Radiation Records and RSO files.



13.9 Form 610

Title: Source Change Record
Description: Record of source changes to include all surveys, equipment data, and condition of equipment.
When Completed: At each source change.
Completed by: Person conducting source change.
Distribution: Radiation Records, RSO files and Radiographer.

13.10 Form 611

Title: Radioactive Material Shipment Record
Description: Record of shipment or transfer of radioactive material.
When Completed: Upon transfer.
Completed by: Individuals preparing shipment, transporting shipment, and receiving shipment.
Distribution: Radiation Records, RSO files and Radiographer.

13.11 Form 613:

Title: Dosimeter Calibration Record
Description: Record of individual dosimeter calibration checks to verify accuracy of response.
When Completed: Upon annual conduct of calibration.
Completed by: RSO or authorized representative conducting procedure.
Distribution: Radiation Records and RSO files.

13.12 Form 614:

Title: Record of Removal and Return of Radioactive Material from Storage
Description: Sign-out log for use during designated period (one week, one month, etc.).
When Completed: Upon removal of radioactive material from storage for transport to temporary job site.
Completed by: Radiographic personnel removing material from storage.
Distribution: One each to Radiation Records and RSO files.



13.13 NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS (10 CFR19)

The United States Nuclear Regulatory Commission and/or applicable Agreement States have certain requirements relative to the posting of notices, instructions and reports to employees, etc. These requirements are:

13.13.1 Posting of Notices (NRC-3)

13.13.1.1 NOTICE TO EMPLOYEES: This poster is posted in all areas where personnel engaged in licensed activities may observe them coming or going to radiographic operations. These posters will be displayed in conspicuous areas to include offices, portable darkrooms, etc.

13.13.1.2 Other

- a. Any notice of violation issued by the USNRC or other regulatory agency and involving radiological working conditions, imposition of civil penalty or other violation issued pursuant to Title 10 CFR Part 19.11 shall be posted within two working days of dispatch and remain posted for a minimum of five days or until action correcting the violation is completed, whichever is greater.
- b. The following documents shall be either posted or location referenced where they may be examined.
 1. Current copies of 10 CFR, Parts 19 and 20.
 2. Current copy of Materials License
 3. Current Operating Procedures

13.13.2 Reports and Notifications

13.13.2.1 Notifications and Reports to Individuals:

Radiation exposure information shall be reported to each individual and shall include all information delineated in 10CFR20, Section 19.13. At the request of any individual, radiation



exposure records shall be made available on an annual basis or as requested. Upon termination of employment and upon request by the former employee, a report of his radiation exposure for the length of his employment must be furnished within 30 days of his request or from the time such information is available. When any individual exceeds his quarterly radiation exposure limit as allowed by 10 CFR 20, a report shall be filed with the USNRC or applicable regulatory agency and the individual will be duly provided with the identical information.