Radiation Technology, Inc.
Process Technology Subsidiaries

Procedure

Facility:	Department:	Page
CORPORATE	IRRADIATOR OPERATIONS	1 of 4

Subject:	Section/Number/Revision
IRRADIATOR SOURCE UP AND DOWN LOG	9.504 ORIGINAL
	Effective Date: JULY [illegible], 1986

Prepared By:	Approved Technically	Approved By Quality
R.G. COCKRELL	R.G. Cockrell	[signature]

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1.0 PURPOSE

To provide a descriptive information source of time irradiator source is up and down, and reasons or problems of operation, i.e., systems malfunction.

2.0 SCOPE

Applies to direct irradiator operations.

3.0 REFERENCES

None

4.0 DEFINITIONS

4.1 Time up - the clock time the source was in a full raised position.

4.2 Time down - the clock time the source was in a down or stored position.

4.3 Problem - a brief description of why the source dropped, i.e., systems malfunction of conveyor, interlock violation, etc.

4.4 Operation - a brief description of operation, i.e., static run, cell load or unload, 8 position walk around, safety interlock test.

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

5.1 Irradiator Down Time Log, used in conjunction with Irradiator Log.

6.0 SAFETY REQUIREMENTS

None

7.0 PROCEDURE

7.1 Irradiator Down Time Log

7.1.1 Provides the dates and times of cell operation, i.e., up and down time records as well as a brief description of the problems incurred with the raising and lowering of the cell along with cell operation.

7.1.2 The up time and date for the Irradiator Down Time Log (Exhibit A) must correspond directly with the start time and date of the Irradiator Log (Exhibit B).

NOTE: Accuracy in problem recording will better facilitate the operations department in providing an adequate maintenance schedule on consistent cell/conveyor/source malfunctions.

NOTE: Operation indication will provide a brief description of the operations of the cell pertaining to source up, source down functions, i.e., Load/unload cell for processing runs, static runs, 8 position walk arounds. Abnormal cell operation with a brief description of the malfunctions, i.e., source drop because of jam on Piston 1.

7.2 Damage to conveyor system because of malfunctions should be noted at the end of each shift in the Supervisors Log Book.

7.3 Overall, in normal operations, the Irradiator Down Time Log provides the Operations Department immediate visual verification of normal run times for any given work shift.

8.0 EXHIBITS

A - Irradiator Down Time Log
B - Irradiator Log

EXHIBIT A

IRRADIATOR DOWN TIME LOG FOR: , 1986.

TIME UP	TIME DOWN	OPERATIONS OR PROBLEM

EXHIBIT B

[illegible]	[illegible]RT [illegible]IME	CUSTOMER RUN CODE	MASTER TIMER SETTING	RUN TIMER READING	SHUFFLE/ FEED COUNTER SETTING	MODE	REMARKS	INITIAL

IRRADIATION LOG SHEET

Radiation Technology, Inc.
Process Technology Subsidiaries

Procedure

Facility: CORPORATE	Department: IRRADIATOR OPERATIONS	Page 1 of 7
Subject: DEFECT REPORTING REQUIREMENTS USNRC		Section/Number/Revision 9.601, ORIGINAL
		Effective Date: July 17, 1986
Prepared By: R.G. COCKRELL	Approved Technically R G Cockrell	Approved By Quality

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1.0 PURPOSE

Describes defect reporting requirements to U.S. Regulatory Commission.

2.0 SCOPE

Applies to any dedicated safety related component in RTI irradiator.

3.0 REFERENCES

10 CFR 21

4.0 DEFINITIONS

4.1 "Basic component" - when applied to RTI or subsidiary facilities and when applied to activities licensed pursuant to 10 CFR Parts 30 and 71, means a component structure, system, or part thereof that is directly procured by the licensee of a facility or activity subject to the regulations in 10 CFR 21 and in which a defect (see 10 CFR 21.3(d)) or failure to comply with any applicable regulations in 10 CFR, order, or license issued by the Commision could create a substantial safety hazard (see definitions).

4.2 "Basic component" - includes design, inspection, testing, or consulting services important to safety that are associated with the component hardware, whether these services are performed by the component supplier or others.

4.3 "Commercial grade item" - an item that is (1) not subject to design or specification requirements that are unique to facilities or activities licensed pursuant to Parts 30, 71 and (2) used in applications other than facilities or activities licensed pursuant to Parts 30, 71 and (3) to be ordered from the manufacturer/supplier on the basis of specifications set forth in the manufacturer's published product description (for example a catalog). A commercial grade item is not a part of a basic component until after dedication (see definition in Section 4.5)

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4.0 DEFINITIONS (cont)

4.4 "Constructing" or "construction" - the design, manufacture, fabrication, placement, erection, installation, modification, inspection, or testing of a facility or activity which is subject to the regulations in and consulting services related to the facility or activity that are important to safety.

4.5 "Dedication" of a commercial grade item occurs after receipt when that item is designated for use as abasic component.

4.6 "Defect" means:

4.6.1 A deviation (see definitions in Section 4.7)in a basic component delivered to a purchaser for use in a facility or an activity subject to the regulations in this part if, on the basis of an evaluation (see definition in Section 4.9) the deviation could create a substantial safety hazard: or

4.6.2 The installation, use or operation of a basic component containing a defect as defined in Section 4.6.1.

4.7 "Deviation" - a departure from the technical requirements included in a procurement document (see definition in Section 4.11).

4.8 "Director" - an individual appointed or elected according to law, who is authorized to manage and direct the affairs of a corporation, partnership or other entity. In the case, of an individual proprietorship "director" means the individual.

4.9 "Evaluation" - the process accomplished by or for RTI to determine whether a particular deviation could create a substantial safety hazard.

4.0 DEFINITIONS (cont)

4.10 "Operating" or "operation" - the operation of a facility or the conduct of a licensed activity which is subject to the regulations in this part and consulting services related to operations that are important to safety.

4.11 "Procurement document" - a contract that defines the requirements which facilities or basic components must meet in order to be considered acceptable by the purchaser.

4.12 "Responsible officer"- the President, Vice President, or other individual in the organization of a corporation, partnership or other entity who is vested with executive authority over activities subject to this part.

4.13 "Substantial safety hazard" - a loss of safety function to the extent that there is a major reduction in the degree of protection provided to public health and safety for any facility or activity licensed, other than for export pursuant to 10 CFR, Parts 30.

4.14 "Supplying" or "supplies" - contractually responsible for a basic component used or to be used in a facility or activity which is subject to the regulations in 10 CFR 21.

5.0 EQUIPMENT/MATERIALS REQUIREMENTS

None

6.0 SAFETY REQUIREMENTS

None

7.0 PROCEDURE

7.1 The Vice President of Operations or responsible officer subject to the regulations of this part or a person designated by RTI management shall notify the Commission when he obtains information reasonably indicating a failure to comply or a defect affecting (a) the construction or operation of RTI or a subsidiary facility or an activity that is subject to the licensing requirements under 10 CFR Parts 30, 71 and that is within his organization's responsiblity and is supplied for a facility or an activity within the United States that is subject to the licensing requirements under 10 CFR Parts 30,71 or 72. The above notification is not required if such individual has actual knowledge that the Commision has been adequately informed of such defect or such failure to comply.

7.2 Initial notification required by this paragraph shall be made within two days following receipt of the information. Notification shall be made to the Director, Office of Inspection and Enforcement, or to the Regional Administrator of Region I (Exhibit B). If initial notification is by means other than written communication, a written report shall be submitted to the appropriate Office within 5 days after the information is obtained. Three copies of each report shall be submitted to the Director, Office of Inspection and Enforcement (Exhibit A).

7.3 RTI and its subsidiaries shall post current copies of following documents in a conspicuous position on any premises, within the United States where the activities subject to this part are conducted (1) the regulations in 10 CFR 21 (2) section 206 of the Energy Reorganization Act of 1974, and (3) procedures adopted pursuant to the regulations in 10 CFR 21 or corresponding Agreement State regulation.

7.0 PROCEDURE (cont)

If posting of regulations in this procedure or the procedures adopted pursuant to the regulations in this part is not practicable, the licensee or firm subject to the regulations in this part may, in addition to posting section 206, post a notice which describes the regulations/procedures, including the name of the individual to whom reports may be made, and states where they may be examined.

7.4 Exemptions

The Commission may, upon application of any interestedperson or upon its own initative, grant such exemptions from the requirements of the regulations in 10 CFR 21 as it determines are authorized by law and will not endanger life of property or the common defense and security and are otherwise in the public interst. Suppliers of commercial grade items are exempt from the provisions of this part to the extent that they supply commercial grade items.

7.4.1 Maintenance of Records

RTI and its subsidiaries shall maintain such records in connection with the licensed facility or activity as may be required to assurecompliance with the regulations in 10 CFR 21 or corresponding Agreement State Regulations.

7.4.2. RTI personnel shall prepare records in connection with the designs, manufacture, fabrication, placement, erection, installation, modification, inspection or testing of any facility, basic component supplied for any licensed facility or to be used in any licensed activity sufficient to assure compliance with the regulations in 10 CFR 21 or appropriate Agreement State Regulations. After delivery of the facility or component and prior to the destruction of the records relating to evaluations or notifications to the Commission such records shall be offered to the purchaser of the facility or component. If such purchaser determines any such records.

7.0 PROCEDURE (cont)

7.4.2.1 Are not related to the creation of a substantial safety hazard, he may authorize such records to be destroyed or

7.4.2.2 Are related to the creation of a substantial safety hazard, he shall cause such records to be offered to the organization to which he supplies basic components or for which he constructs a facility or activity.

If such purchaser is unable to make the determination as required above then the responsibility for making the determination shall be transferred to the individual, corporation, partnership, or other entity subject to the regulations in 10 CFR 21 or Appropriate Agreement State regulations that issued the procurement document to the purchaser. In the event that the determination cannot be made at that level then the responsibility shall be transferred in a similar manner to another individual, corporation, partnership, or other entity subject to the regulations in this part until, if necessary the licensee shall make the determination.

7.4.3 Records that are prepared only for the purpose of assuring compliance with the regulations in this procedure and are not related to evaluations or notifications to the Commission may be destroyed after delivery of the facility or component.

7.5 RTI and its subsidiaries shall assure that each procurement document for a facility, or a basic component specifies, when applicable, that the provisions of 10 CFR Part 21 apply.

7.0 PROCEDURE (cont)

7.6 RTI and its subsidiaries shall permit duly authorized representatives of the Commission or appropriate Agreement State Representatives to inspect its records, premises, activities, and basic components as necessary to effectuate the purposes of this part.

8.0 EXHIBITS

NRC Addresses

A - Director Office of Inspection and Enforcement

U. S Nuclear Regulatory Commission
Washington, DC 20555
Attention: Director Office of Inspection and Enforcement

B - Regional Administration

U. S. Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, PA 19406
Attention: Regional Administrator

Radiation Technology, Inc.
Process Technology Subsidiaries

Procedure

Facility:	Department:	Page
CORPORATE	IRRADIATOR OPERATIONS	1 of 12

Subject:	Section/Number/Revision
IRRADIATOR OPERATOR CERTIFICATION	9.700 ORIGINAL
	Effective Date: July 23, 1986

Prepared By:	Approved Technically	Approved By Quality
LES ROSS	Robert G. Cockrell	P. A. Thayer

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1.0 PURPOSE

To outline the training requirements for an Irradiator Operator.

2.0 SCOPE

Applies to all trainees selected for operator training.

3.0 REFERENCES

None

4.0 DEFINITIONS

4.1 Radiation Safety Officer - The qualified individual who is responsible for carrying out the licensee's radiation safety program and who is listed as the Radiation Safety Officer on the application for the license.

4.2 Training Coordinator - Individual designated by Vice President of Operations/Engineering to coordinate the training of certified operators for all facilities. The Training Coordinator shall have been certified as an operator on at least one Irradiator similar to those operated by RTI and subsidiaries.

4.3 Annual - Once every twelve (12) months plus or minus three (3) months.

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

None

6.0 SAFETY REQUIREMENTS

None

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7.0 PROCEDURE

7.1 Irradiator Operator Certification shall require a minimum of four (4) months training.

7.1.1 The initial three (3) months shall consist of on the job training (OJT).

NOTE: OJT includes forty (40) hours formal classroom training outlined in Exhibit B.

7.1.2 The fourth month is a provisional qualification period. After the operator trainee has completed three (3) months OJT, has received forty (40) hours of formal classroom instruction and has passed a comprehensive examination, then the operator trainee is provisionally qualified as an Irradiator Operator for thirty (30) days. During this provisional period, the trainee will assume the duties/responsibilities of an operator under the direct supervision of a certified operator. An Operator Qualification Card (Exhibit C) will be issued during this period and initialed only by the certified operator directly surpervising the trainee. The initials fo the certified operator on the trainee's card attests to the trainee's proficiency in that particular area.

7.1.2.1 The provisional qualification period may be extended if a minimum level of proficiency is not demonstrated within thirty (30) days.

NOTE: Management reserves the right to remove any operator trainee from provisional operator status and operator training program for failure to possess the proper aptitude or failure to demonstrate the necessary skills to perform the duties/responsibilities of a certified operator.

7.0 PROCEDURE (cont)

7.2 Upon completion of three (3) months OJT and forty (40) hours formal classroom instruction, a comprehensive written examination shall be given. The operator trainee shall achieve a minimum score of 80% to pass. The examination shall consist of a minimum of one hundred (100) questions.

7.2.1 If a trainee should fail to pass the written examination, a second examination may be given.

NOTE: Retaken exams shall have a maximum of 30% repeat questions form the previous exam.

7.2.1.1 A minimum of thirty (30) days shall elapse between initial examination and retest to allow for meaningful study and improvement on the behalf of the trainee.

7.2.1.2 Failure to pass the written examination on second attempt shall be cause for termination from opertor trainee status. The resulting deselection from operator training program is permanent.

7.2.2 The Training Coordinator is responsible for preparation, control, and administration of all examinations. He shall be assisted by the Manager of Operations at each facility.

7.2.2.1 All examinations will be graded and retained by the Training Coordinator. The examination scores will be reported, by letter, to the appropriate Manager of Operations for ultimate inclusion in the individual operator training folder.

NOTE: All examinations will be strictly controlled - a red stamp "Do Not Duplicate" will be stamped on each exam.

7.0 PROCEDURE (cont)

7.3 Refresher training for plant operational personnel will be conducted annually. This annual refresher training should be a minimum of four (4) hours in length. Topics shall include radiation safety, facility license review and updating in regards to operational/emergency procedural changes. The training will be conducted by the Training Coordinator, Radiation Safety Officer, or his designee.

7.3.1 A written examination will be given following the refresher training. A score of 80% is required to pass. Areas where the examination reveals deficiencies will be discussed with examinees following grading of the exams. Documentation of successful completion of annual refresher training will be recorded in the operators individual training folders. Examination scores will be provided to the Manager of Operations, by letter, from the Training Coordinator.

7.3.1.1 Failure to achieve 80% on the refresher examination will be cause for an interview with the Training Coordinator to determine the corrective measures required to bring the operator's knowledge level to the desired standard. The minimum measure to be taken is self study and the taking of a similar exam. A serious and continued deficiency could be cause for retraining or dismissal.

7.4 A certified operator, when transferred to another facility, shall be re-certified.

7.4.1 If the operator was previously certified on the same model Irradiator, he may be re-certified by passing the Irradiator Operator Examination and completing walk-through (oral examination) of the facility with the Manager of Operations or the Radiation Safety Officer.

7.0 PROCEDURE (cont)

7.4.2 If the operator was previously certified on a different model Irradiator, he shall be re-certified by the completion of the following:

7.4.2.1 pass the Irradiator Operator exam with a score of 80% or high to waive the three (3) month OJT requirement;

7.4.2.2 complete a thirty (30) day provisional operator period under the direct supervision of a certified operator;

7.4.2.3 complete the items on the Operator Qualification Card, having them initialed by the certified operator who supervised the trainee's provisional qualification period.

NOTE: All re-certifications must be reviewed and signed by the Radiation Safety Officer.

7.5 When an operator trainee is designated, the Manger of Operations shall cause a training folder to be initiated. The training folder shall include a corporate training record (Exhibit A), the start and ending dates for OJT, documentation of forty (40) hours formal training to include date of examination and score. The folder shall also include start and ending date of Provisional Operator Qualification and the trainee's completed Operator Qualification Card. The Radiation Safety Officer shall review the examination score and completed Operator Qualification Card to ensure documentation of training is complete. The final operator certification shall then be signed by the Radiation Safety Officer.

NOTE: Training records will be maintained for three (3) years following termination of the employee.

8.0 EXHIBITS

A - Corporate Training Record
B - Irradiator Operator Training Program
C - Operator Qualification Card

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EXHIBIT A

RADIATION TECHNOLOGY, INC. CORPORATE TRAINING RECORD | NAME | ID #

EDUCATION

1. High School (Circle Highest) 6 7 8 9 10 11 12 Graduated - Yes/No Year____ GED - Yes/No
2. College - Degree_____ Year Graduated_____ School_____
3. Graduate School - Degree _____ Year Graduated_____ School_____

FORMAL TRAINING

SUBJECT	YEAR ATTENDED	SOURCE (Military, Trade School)	REMARKS

EXPERIENCE

TITLE	FROM	TO	SOURCE (Military, Company)	REMARKS

PROCESS TECHNOLOGY, INC. WORK HISTORY

JOB ASSIGNMENT	DATE	ASSIGNED BY:

IRRADIATOR OPERATOR TRAINING COMPLETED:_____ _____

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EXHIBIT A

RTI SUPPLEMENTAL TRAINING

SUBJECT	INSTRUCTOR	DATE

EXHIBIT B

Name _____

Date _____

Given By _____

Progress Card

IRRADIATOR OPERATOR TRAINING PROGRAM

A. FORMAL TRAINING

1. BASIC RADIATION THEORY (4 hours)

	Date	Initials
(a) Theory of the atom		
(b) Radioactive decay		
(c) Half-life		
(d) Source of radiation		
(e) Definitions		
(f) Units		

2. EFFECTS OF IONIZING RADIATION ON THE BODY (4 hours)

(a) Chronic and acute exposure	
(b) Somatic and genetic effects	
(c) Radiation sickness	
(d) Accidents in irradiation facilities	

3. FEDERAL/STATE REGULATIONS (4 hours)

(a) Standards for Protection Against Radiation	
(b) Notices, Instructions, Reports, and Inspections	
(c) Requirements of State License	

4. PERSONNEL RADIATION EXPOSURE CONTROL TECHNIQUES AND PERSONNEL MONITORING (4 hours)

(a) Application of time, distance, and shielding to minimize exposure	
(b) Shielding materials	
(c) Exposure limits	
(d) Radiation surveys	
(e) Personnel radiation monitoring	
(f) Known rules	
(g) Personnel responsibilities	

EXHIBIT B

Progress Card (cont)

5. RADIATION MONITORING DEVICES (4 hours)

	Date	Initials
(a) Portable survey instruments operation		
(b) Counter-scaler operation		
(c) Area monitor operation		

6. RADIOACTIVE CONTAMINATION (4 hours)

(a) Loose surface contamination		
(b) Fixed contamination		
(c) Waterborne contamination		
(d) Contamination control		

7. RTI FACILITIES REVIEW (8 hours)

(a) Irradiator construction and operation		
(b) Demineralizer plant construction and operation		
(c) Effects of radiation on materials		
(d) Irradiation Techniques		
(e) Radiation Dosimetry Systems		
(f) Production irradiation		
(g) Nuclear component testing		

8. RTI OPERATING PROCEDURES REVIEW (4 hours)

(a) RTI by-products license review		
(b) Operating instructions		
(c) RTI emergency procedures review		

B. WRITTEN EXAMINATION Date _____ Score _____

C. PROFESSIONAL QUALIFICATION (20 days) Started _____

Completed _____

(a) Operator Qualification card completed and filed

D. CERTIFICATION

QUALIFIED FOR OPERATIONS: _____
Radiation Safety Officer

DATE _____

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EXHIBIT C

OPERATOR
RTI (NC)

QUALIFICATION CARD

Rockaway Qual Card is in preparation.

The practical factors listed below must be satisfactorily demonstrated to and signed off by one of the following instructors: Les Ross, Mike Doyle or Howard Overson.

BASIC RADIATION THEORY/APPLICATION

1. Demonstrate a practical knowledge of radiation theory and prescribed limits (Federal, State, as well as company action limits). _____

2. Demonstrate the ability to accurately use the Co^{60} Decay Table to update dwell tables for customer protocol. _____

3. Demonstrate the ability to battery check and operate both radiac survey instruments including correct interpretation of readings at all scales. _____

4. Demonstrate Swipe Technique. _____

5. Demonstrate the ability to read and explain the gate area monitor. _____

6. Demonstrate the ability to survey the cell and record in irradiator log. _____

OPERATIONAL RESPONSIBILITIES

1. Demonstrate the ability to take and record water temperature readings, check pool water level and fill when necessary. _____

2. Demonstrate the ability to take and record dosimeter readings. _____

3. Demonstrate the proper setting up of solid plates for L/S operations. _____

EXHIBIT C

OPERATIONAL RESPONSIBILITIES CONTINUED

4. Demonstrate setting up the LMS _____

5. Demonstrate the ability to correctly perform an irradiator startup in all modes (auto, manual and static). _____

6. Demonstrate the ability to perform daily interlock testing and properly record. _____

7. Demonstrate the ability to explain all functions of the computer main menu. _____

   1. Utility Functions _____
   2. Graphic Overview _____
   3. Create Certification Header _____
   4. Create Customer File _____
   5. Certification Print-Out _____
   6. Static Program _____
   7. Status Screen _____
   8. Customer File Print-Out _____

8. Demonstrate the ability to correctly fill out the run log. _____

9. Demonstrate the ability to correctly fill out the irradiator log. _____

10. Demonstrate the ability to correctly fill out the operator key log. _____

11. Demonstrate the ability to correctly fill out the security log. _____

12. Demonstrate the ability to print out a certification print out. _____

13. Demonstrate the ability to correctly fill out a product description sheet. _____

EXHIBIT C

OPERATIONAL RESPONSIBILITIES CONTINUED

14. Demonstrate proficiency at the following calculations: cu/ft, density, 1st car out, run time. _____

15. Demonstrate a familiarity with military time and julian date. _____

16. Demonstrate the ability to set up and process customer protocols. _____

17. Demonstrate an understanding of definitions dealing with Dose Mapping techniques. _____

18. Demonstrate the ability to determine dwell times, top-off dwell, dose range, and max/min ratio. _____

19. Demonstrate the ability to make-up and issue secondary dosimetry for various protocols. _____

20. Demonstrate a working knowledge of the factors involved in protocol configuration. _____

21. Demonstrate the ability to configure a product for a Phase II. _____

22. Demonstrate the ability to set up a Dose Mapping Grid on a product. _____

23. Demonstrate knowledge of the components contained in the PLC-2 Systems. (Function) (Location) _____

24. Demonstrate the ability to use the industrial terminal to correct malfunctions or assist in routine maintenance. _____

Radiation Technology, Inc.
Process Technology Subsidiaries

Procedure

Facility:	Department:	Page
CORPORATE	ENGINEERING	1 of 4

Subject:	Section/Number/Revision
DESIGN CONTROL	13.1 . A
	Effective Date: 10/01/86

Prepared By:	Approved Technically:	Approved By Quality:
R. COCKRELL	R. COCKRELL	P. O. SHAPIRO

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1.0 PURPOSE

To establish the quality assurance program for the design of safety related structures, systems and components.

2.0 SCOPE

Includes the review for suitability of application of materials, parts, equipment, and processes that are essential to safety related functions.

3.0 REFERENCES

None

4.0 DEFINITIONS

None

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

None

6.0 SAFETY REQUIREMENTS

None

7.0 PROCEDURE

7.1 Radiation Technology, Inc. (RTI) has the responsibility for design control. Other organizations may be delegated to establish and execute specific parts but RTI retains ultimate responsibility.

7.2 All interface controls for organizations performing safety related design work shall be identified and implemented according to procedure.

7.3 The adequacy of design will be verified to the extent specified. The depth of verification depends upon the importance and complexity of design, the degree of standardization, the state of the art, and similarity with proven designs.

4pp.

7.0 PROCEDURE (cont)

7.3.1 Verification shall be by individuals other than those who performed the design.

7.3.2 The originators supervisor may perform the verification provided the supervisor:

7.3.2.1 Did not specify the design approach.

7.3.2.2 Did not rule out certain design considerations.

7.3.2.3 Did not establish the design inputs.

7.3.2.4 Is the only person competent to perform the verification.

7.3.3 Justification for the originators supervisor verifying the design must be documented.

7.3.4 All changes require verification.

7.4 RTI Engineering is responsible for the design, design review, engineering approval of design changes, design evaluation and design control of RTI facilities.

7.4.1 RTI Engineering may delegate activities but retains responsibility for the overall design.

7.4.2 In all cases, final engineering decisions and ultimate design control of safety related structures, systems, and components related to RTI facilities shall be the responsibility of RTI Engineering.

7.5 Design process

7.5.1 Design control measures shall be applied to design analyses, such as thermal, hydraulic and nuclear radiation, compatibility of materials; accessibility for in-service inspection, maintenance, and repair; and delineation of acceptance criteria for inspections and tests.

7.0 PROCEDURE (cont)

7.5.2 Procedures define the RTI method for implementing design control measures. These measures shall require that applicable design requirements, such as design basis, regulatory requirements, codes, and standards are translated into specifications, drawings, procedures, or instructions. All materials, parts, equipment, and processes, including standard "off the shelf" commercial or previously approved items, essential to the safety related functions shall be selected and reviewed for suitability of application. The basis for selection may include industry standards, material and prototype hardware testing programs, and design reviews.

7.6 Design Change Control

7.6.1 Procedures governing design change control during construction, modifications to operating plants, control of discrepant or deficient design conditions, and reported unsatisfactory performance provide for the identification of the need for design changes and a documented method to control these changes. Design and specification changes shall be subject to design control measures commensurate with those applied during the original design.

7.6.2 During the design and construction phases, an independent review and approval of design changes shall be performed by the organization that conducted the original design reviews, unless the originating organization designates another organization to perform this function.

7.0 PROCEDURE (cont)

7.6.3 During the operations phase, proposed safety related design changes/modifications shall be submitted to the operating plant management for processing and review. The proposed plant change/modification (PC/M) shall be submitted to Engineering, following plant review, for final design. Final review and approval of the design change shall be performed by the Radiation Safety Officer for a facility specific change or by the Vice President of Operations and Engineering for a generic design change.

7.7 Design Interface Control

Procedures provide the method for identification of design interfaces, design interface changes, and modifications affecting drawings and documents. Engineering is responsible for review and coordination of design interfaces. Engineering assures that interface problems are resolved and that all design interface changes or modifications are reviewed for interface effects prior to approval.

7.8 Design Verification

Ultimate responsibility for design adequacy and evaluation is retained by Engineering. The depth of a design review shall be commensurate with the significance of the safety function performed by the item, the complexity of the design, experience with the design, and experience with potential suppliers of the item.

8.0 EXHIBITS

None

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Subject: FACILITIES CHANGES		Section/Number/Revision 13.2. ORIGINAL
		Effective Date: JULY 28, 1986
Prepared By: J. BRIER	Approved Technically: R. COCKRELL R.G. Cockrell	Approved By Quality P.O. SHAPIRO

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1.0 PURPOSE

To describe the method by which RTI implements and processes design changes and modifications to operating irradiation plants that affect nuclear safety or have an affect on the environment.

2.0 SCOPE

This procedure applies to the control of design changes to structures, systems and components important to the safety of plants that have an USNRC or agreement state Operating License. It also includes provisions for submitting design changes to the Licensing Authority for approval whenever they relate to an item specified in the license.

3.0 REFERENCES

10CFR20,30
ANSI 43.10

4.0 DEFINITIONS

4.1 Unreviewed Safety Question - A proposed PC/M to equipment or systems important to the safety of plants that have byproducts Operating License shall be deemed to involve an Unreviewed Safety Question if:

4.1.1 The probability of occurence or the consequences of an accident or malfunction of equipment to safety may be increased.

4.1.2 The possibility for an accident or malfunction of a different type than any evaluated previously may be created.

4.2 Safety Evaluation - A written record which provides the basis for determination that the PC/M does or does not involve an Unreviewed Safety Question.

4.0 DEFINITIONS (cont)

4.3 Plant Change/Modification (PC/M) - Any change or modification to plant systems or equipment that affects safety or includes a revision to the operating license.

4.4 PC/M Package - The file containing all pertinent documentation concerning a PC/M, e.g., the Plant Change/Modification Form, the Safety Evaluation, all required written reviews, design material, quality control documentation, acceptance tests and procedures and relevant correspondence of material applicable to the change.

4.5 Design Verification - Checking or verifying the adequacy of design, such as by ther performance of design reviews, the use of simplified or alternate calculational methods or by the performance of a suitable test program.

The design verification shall be performed and documented by a person other than the originator of the design. If necessary, the verification may be performed by the originator's supervisor, provided the supervisor did not specify a singular design approach or rule out certain design considerations, and did not establish the design inputs used in the design. The use of the originator's supervisor for design verification should be restricted to special situations where the supervisor is the only individual within the design organization competent to perform the verification.

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

None

6.0 SAFETY REQUIREMENTS

None

7.0 PROCEDURE

7.1 The Vice President Operations and Engineering or the Plant Radiation Safety Officer is responsible for:

7.0 PROCEDURE (cont)

7.1.1 Determining whether or not a proposed change or modification, or revision thereto, affects nuclear safety or is a license related item.

7.1.2 Approving or disapproving implementation of the PC/M after receipt of a recommendation from the Plant Safety Committee. (As used in this procedure, the designation PC/M refers only to those changes or modifications affecting nuclear safety or having an adverse impact on the environment.)

7.2 The Plant Safety Committe (PSC) is responsible for review of all proposed PC/M's to plant systems or equipment that affect nuclear safety.

7.3 The Director of Engineering - Radiation Technology is responsible for:

7.3.1 Performing the safety evaluation of proposed PC/M to plant systems and equipment that affect safety to determine if the proposal involves an Unreviewed Safety Question.

7.3.2 Design verification, including evaluation of the effects of those PC/M's on the overall design, to ensure that the design adequacy is verified.

7.3.3 Enginering approval of design changes.

7.3.4 Documenting and controlling design interfaces, including documentation of the resolution of design interface questions between departments.

7.3.5 Revising drawings.

7.4 The Plant Manager is responsible for:

7.4.1 Assigning a control number, tracking the status and maintaining a file of each proposed PC/M.

7.0 PROCEDURE (cont)

7.4.2 Reviewing proposed PC/M for inclusion of appropriate quality criteria, standards and hold points.

7.4.3 A review of the completed PC/M package after implementation, for compliance with this and other governing procedures to include a review of all endorsements, sign-offs, completion of required acceptance testing and inspection.

7.4.4 When appropriate in accordance with drawing control procedures, forwarding information required by those procedures to RTI Engineering for incorporation into Plant drawings.

7.4.5 Transmitting the completed PC/M package to Vice President of Operations.

7.5 Processing of PC/M's

7.5.1 A standard form and numbering system shall be established and utilized at each plant to assure that all PC/M's are handled in a uniform manner and properly documented. The form shall contain, as a minimum, that information shown in Exhibit A of this procedure.

7.5.2 All personnel conducting design/engineering work on the proposed PC/M shold be aware of the regulatory requirements and other applicable codes standards in preparing and reviewing the proposed PC/M. Quality levels at least equivalent to design basis shall be maintained.

7.5.3 If necessary, an implementation procedure shall be drafted and included in the PC/M package.

7.0 PROCEDURE (cont)

7.5.4 PC/M revision:

7.5.4.1 If at any point during the review cycle it is determined that PC/M should not be implemented in its present form, coordination should be established with the originator for revision or cancellation. This coordinatin shall be documented and become part of the PC/M package.

7.5.4.2 If at any point after final approval of the PC/M it is determined implementation should not be made in its present form, the Plant Superintendent shall be responsible for:

7.5.4.2.1 Authorizing the revision or cancellation, if he determines nuclear safety is not affected.

7.5.4.2.2 Forwarding the revision or cancellation for review in accordance with section 7.6 of this procedure, if nuclear safety is affected.

7.6 Preparation of Plant Changes/Modifications (PC/M's):

A PC/M may be requested by any RTI department by using the guidelines in this procedure.

7.6.1 When a PC/M is proposed, the cognizant RTI department head shall be responsible for the performance of preliminary research and completion of the applicable sections of the PC/M form. The PC/M shall then be forwarded to the Vice President-Operations.

7.0 PROCEDURE (cont)

7.6.2 The Vice President-Operations may authorize the implementation of the proposed change or modification if he determines nuclear safety is not affected and it does not relate to the operating license. If nuclear safety or a license condition is affected the proposed PC/M shall receive the review described in this procedure. The Plant Superintendent shall then distribute the PC/M.

7.6.3 The Plant Superintendent shall review all PC/M's for appropriate quality criteria, assign a control number and distribute in accordance with the determination made in paragraph 7.6.2.

7.6.4 Internal plant coordination and review of PC/M's shall be controlled by approved Plant Administrative Procedures or Quality Instructions. To the extent feasible, a preliminary safety evaluation and associated data should be included in the PC/M package.

7.6.5 Each PC/M shall be forwarded to RTI Engineering. RTI Engineering is responsible for performing the Safety Evaluation, design verification, coordinatin and controlling of design interfaces and engineering approval of design changes.

7.6.6 The Plant Superintendant shall be responsible for a review of the PC/M package prior to final submittal to the Vice President-Operations for completion of all required endorsements.

7.6.7 All proposed PC/M's considered to be an Unreviewed Safety Question or requiring a change in Technical Specifications or license shall be processed by the Corporate Radiation Safety Office.

7.0 PROCEDURE (cont)

7.7 Records and Notifications:

7.7.1 The PC/M package shall be filed and retained at each plant.

7.7.2 A brief description of each PC/M and a summary of the Safety Evaluation shall be reported to the Director of Quality.

8.0 EXHIBITS

A - Information for form PC/M handling

EXHIBIT A

Listed below is the minimum information required for PC/M forms to be used at each irradition plant. Additional information may be required by individual plant procedures.

1. Plant and Unit identification.

2. Plant Change/Modification (PC/M) request number.

3. Title of change

4. Description of the PC/M, including design analysis and design inputs prepared, if required.

5. Purpose of need for the PC/M.

6. A Preliminary Safety Evaluation.

7. Quality Requirements or Considerations e.g., inspectin, tests, records, etc.

8. Effect of the PC/M on:

   - Drawings
   - Spare Parts Inventory
   - Plant Procedures
   - Technical Specifications

9. Indication as to the PC/M being Safety Related or Non-Safety Related.

10. Review and approval signatures as required by Technical Specifications, Plant procedures and Procedure 13.2.

11. Implementation authorization signature and date.

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FOR INFORMATION ONLY

EXHIBIT A

Page _____ of _____

PLANT CHANGE/MODIFICATION

PCM No.
Plant/Unit
Date

(1) Originator/Dept

(2) Title of Change

(3) Description of PC/M

(4) Need for PC/M

(5) Estimated Cost

(6) Procedures Involved	(7) Drawings Involved

(8) Quality Requirement

(9) Submitting Activity Signature/Title	(10) Plant Manager Signature
(11) Safety Evaluation Attacned Signature_____ Date _____	(12) Unreviewed Safety Question (If Yes, Attach) Yes___ No ___

(13) Other Areas Affected

	Required	Specify
Operating Procedure		
Maintenance Procedure		
Surveillance Procedure		
Spares Inventory		
Operator Training		
Drawings		
Other Considerations		

EXHIBIT A

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PC/M No _____

Plant/Unit _____

(14) Type of Modification: Safety-Related _____ Non-Safety-Related _____

Licensing Revisions Required: FSAR: Yes ____ No ____ Technical Specification Yes__ No__

Report to Nuclear Regulatory Commission: Semi-Annual _____ Immediate _____

(15) Test Requirements:

(16) Approvals:

Quality Control	Date	Plant Superintendent/Manager	Date
Engineering - Radiation Technology, Inc.			Date
Plant Radiation Safety Officer			Date
		Installation Authorized _____ Vice President Operations	Date

(17) Completion Information

(a) Procedures Revised	Technical Staff	Date	(d) Training Complete	Training Coordinator	Date
(b) Semi-Annual Report Complete	Technical Staff	Date	(e) Design Documents Revised	Tech. Staff	Date
(c) Mod Status Record Up-Dated	Coordinator	Date	(f) Quality Control		Date

(18) Cancellation Information

Date

EXHIBIT A

INSTRUCTIONS FOR COMPLETING
PLANT CHANGE/MODIFICATION

GENERAL

The PC/M package shall provide the necessary information required to evaluate proposed change. Enclosures (supplemented with necessary exhibites, sketches and drawings) referenced in the Blocks on the PC/M Form shall be used when necessary to enable an understanding of the total impact of the change.

PC/M	-To be obtained form QC after proposed change has been signed by Plant Manager.
Plant/Unit	- Enter name of plant or location and unit(s) effected.
Date	-Enter the date of submittal of PC/M.
Block 1	-Enter the name and department of person submitting the PC/M.
Block 2	-Enter a brief descriptive title indicating the purpose of PC/M.
Block 3	-The description of the change which is proposed shall be given in sufficient detail to permit ready identification. Where space is not adequate, supplemental drawings and sketches shall be provided to the extent necessary to clearly portray the proposed change.
Block 4	-Enter a comprehensive discussion of either the problem the PC/M intends to correct, or the new capability the PC/M intends to provide. The nature of the defect, failure, incident, malfunction, etc., substantiating the need for the change shall be described in detail.

EXHIBIT A Page 5 of 6

Page 2 of 3

INSTRUCTIONS FOR COMPLETING
PLANT CHANGE/MODIFICATION

GENERAL (cont)

Block 5	-Enter an estimated cost, completion time, man hours, etc., required by the PC/M.
Block 6	-Enter the procedure(s) that you know are involved in the proposed change.
Block 7	-Same as Block 6 except give Drawing No.
Block 8	-Enter such things as qualification of personnel, procedures and equipment (not listed) in addition to hold points, witness points, code (specific), standards, test and inspection levels, acceptance criteria, documentation and related control criteria.
Block 9	-An authorized official of the activity entered in Block 1 shall affix his signature and title in this block. This indicates the PC/M has the official sanction of the submitting activity.
Block 10	-This signifies that the Plant Manager concurs that the PC/M has sufficient merit for further study.
Block 11	-Consideration must be given as to the safety of the change by EPP and so stated.
Block 12	-Indicate "yes" or "no", attach report if yes.
Block 13	-Enter the effects of the PC/M on other area by stating if they are required by "yes" or "no" and specify by identifying the procedure, parts, drawing or training, as appropriate. Entries shall be made by cognizant departments during their review.

EXHIBIT A Page 6 of 6

Page 3 of 3

INSTRUCTIONS FOR COMPLETING
PLANT CHANGE/MODIFICATION

GENERAL (cont)

Block 14 -Place a check (√) in one or more of the blanks as applicable.

Block 15 -Identify those test required by procedure number, or new test and acceptance criteria.

Block 16 -Enter acceptance or approval signatures of the respective activity.

Block 17 -Enter signature to verify that the listed activities have been completed.

(a) Procedures have been revised, if affected and distributed in accordance with plant requirements.
(b) PC/M is being reported in the semi-annual report.
(c) Modification status report has been up-dated.
(d) New, or revise training requirements have been completed.
(e) Drawings, specifications, etc. have been revised or modified showing the changes and distributed to affected group.
(f) Makes a final check to assure that the PC/M has been reviewed, approved and that all working documents associated, i.e., operational, special test, maintenance request, test reports, sketches, calibration sheets, etc. have been performed, are satisfactory and properly documented.

Block 18 -Enter detailed information why the PC/M was determined to be inadvisable at this time and is cancelled.

RTCH: NASDAQ

TELEX: 642948 RNDH
ATTN: RAD TECH

Radiation Technology, Inc.

108 LAKE DENMARK ROAD, ROCKAWAY, N. J. 07866
(201) 625-8400

January 28, 1987

Docket No. 030-07022
License No. 29-13613-02

MS16
K9

Mr. Thomas T. Martin, Director
Division of Radiation Safety and
Safeguards
United States Nuclear Regulatory
Commission
631 Park Avenue
King of Prussia, PA 19406

Dear Mr. Martin:

Enclosed are the following procedures that our listed in the application renewal for the Rockaway license in response to a request made by Mr. Frank Costello January 28, 1987:

9.100A
9.301B
9.502A

Additional procedures that our listed in the Rockaway renewal application are being sent in a separate package.

Sincerely,

Robert G. Cockrell/jk
Robert G. Cockrell
Vice President Operations
and Engineering

RGC:jk

106655

"OFFICIAL RECORD COPY"

ML18

8801210237

JAN 29 1987

Facility: CORPORATE	Department: IRRADIATOR OPERATIONS	Page 1 of 7
Subject: CALIBRATION AND USE OF THE COUNTER SCALER		Section/Number/Revision 9.301. B
		Effective Date: JANUARY 7, 1987
Prepared By: R. COCKRELL	Approved By: R. COCKRELL	Approved By Quality: P. O. SHAPIRO

1.0 PURPOSE

To describe the steps necessary to calibrate and use the counter scaler.

2.0 SCOPE

Applies to all irradiator operators at Radiation Technology, Inc. and Process Technology, Inc. Subsidiaries.

3.0 REFERENCES

3.1 NCRP Report No. 58, A Handbook of Radioactivity Measurements Procedure, Section 7.1.3

3.2 D.A. Gollnick, Basic Radiation Protection Technology, p. 276-286

4.0 DEFINITIONS

4.1 Lower Level of Detection (LLD) - the smallest concentration of radioactivity in a sample that will yield a net count (above system background) that will be detected with a 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

5.1 Shield Pig with NaI crystal

5.2 Counter Scaler

5.3 Calibrated sealed Co60 source disk

5.4 Calibrated liquid Co60 source

6.0 SAFETY REQUIREMENTS

6.1 No special radiological safety procedures are required during these procedures, however, caution should be used in handling potentially contaminated samples to prevent low level contamination of personnel and equipment.

7.0 PROCEDURE

7.1 Energize counter scaler, then adjust high voltage to plateau voltage. Allow equipment to warm up for approximately 15 minutes.

NOTE: If a new plateau must be determined, refer to the Users Manual for the counter scaler.

7.2 Check to be sure that the shield pig is free of samples and count background for 20 minutes (for water or sludge samples) or for 2 minutes (for swipes).

7.3 Compute the background count rate, R_b, with the formula:

$$R_b = \frac{C_b}{T_b} \quad \text{cpm}$$

where C_b = total counts for background
T_b = counting time in minutes for background count
T_b = 2 minutes when counting swipes
T_b = 20 minutes when counting water or sludge

7.4 Compute the standard deviation of the background count rate, σ_b, with the formula:

$$\sigma_b = \sqrt{\frac{R_b}{b}} \quad \text{cpm}$$

7.5 Method for Counting 100 sq. cm. Swipes

7.5.1 Place a calibration source disk into the shield pig and count for 2 minutes to determine the count rate for source plus background, R_{s+b}. Compute the count rate for the Source, R_s, as follows:

$$R_{s+b} = \frac{C_{s+b}}{T_s} \quad \text{cpm}$$

$$R_s = R_{s+b} - R_b \quad \text{cpm}$$

where C_{s+b} = total counts for the source plus background
T_s = counting time for the source in minutes

7.0 PROCEDURE (cont)

7.5.2 Determine the activity of the calibration source, A_s, by reducing the initial activity of the calibration source in dpm by the decay factor for today's date.

7.5.3 Calculate the equipment efficiency, E, as follows:

$$E = \frac{R_s \quad (cpm)}{A_s \quad (dpm)}$$

Note that E has dimensions of counts/disintegration.

7.5.4 Determine the Lower Level of Detection (LLD) for the counter scaler using the formula:

$$LLD = 0.021 \frac{\sigma_b}{E} \quad pCi/100 \text{ sq. cm.}$$

7.5.5 Count each 100 sq. cm. swipe for 2 minutes and calculate the activity using the formula:

$$A = \frac{C - C_b}{2.22\ ET} \quad pCi \text{ per } 100 \text{ sq. cm.}$$

where:

C = the total number of counts in 2 minutes
E = efficiency determined in Step 7.5.3
C_b = the background count in 2 minutes from step 7.3
T = counting time (the same as T_b and usually 2 minutes).

7.0 PROCEDURE (cont)

7.5.6 The standard deviation in the activity is calculated using the formula:

$$\sigma = \frac{\sqrt{C + C_b}}{2.22E\ T} \quad \text{pCi per 100 sq. cm.}$$

7.5.7 Results are reported as : A +/- σ

7.5.8 If A > LLD, increase the counting time to 20 minutes for the background and for the swipe. If the 20 minute count yields A > LLD, report the results to the RSO or RSS.

7.5.9 Values of A < 0 are possible and are interpreted as zero.

7.6 Method for Counting Water or Sludge Samples

7.6.1 Place a calibrated liquid Co60 source into the shield pig and count for 20 minutes to determine the count rate for source plus background, R_{s+b}.

7.6.2 Use the formulas in Steps 7.5.1, 7.5.2, and 7.5.3 to determine the equipment efficiency, E.

7.6.3 Determine the Lower Level of Detection (LLD) for the counter scaler using the formula:

$$LLD = 2.10 \frac{\sigma_b}{EV} \quad \text{pCi/ml}$$

where:

σ_b = background standard deviation defined in Step 7.4
E = equipment efficiency from Step 7.6.2
V = volume of liquid calibration source, ml

7.0 PROCEDURE (cont)

7.6.4 Count each liquid sample for 20 minutes and calculate the activity using the formula:

$$A = \frac{C - C_b}{2.22\ ETV} \quad pCi/ml$$

where:

C = the total number of counts in 20 minutes
C_b = the background count in 20 minutes from Step 7.3
E = efficiency determined in Step 7.6.2
V = sample volume in ml. (Sample must be the same size as the calibration source)
T = counting time (usually 20 minutes)

7.6.5 The standard deviation in the activity is calculated using the formula:

$$\sigma = \frac{\sqrt{C + C_b}}{2.22\ ETV} \quad pCi/ml$$

7.6.6 Results are reported as A +/- σ.

7.6.7 If A > LLD, increase the counting time to 60 minutes for the background and for the sample. If the 60 minute count yields A > LLD, report the results to the RSO or RSS.

7.6.8 Values of A < 0 are possible and are interpreted as zero.

7.7 Record the following data in the activity calculation notebook for each type of sample (swipe or water/sludge) measured:

C_b
σ_b
T_b
R_{s+b}
E
LLD
T
A +/- σ
Calibration Source Decay Factor

7.0 PROCEDURE (cont)

7.8 Record survey data on the front of the Facility SURVEY DATA SHEET, Exhibit A.

7.9 Sign the data sheet and have it checked and signed by the RSO or RSS.

7.10 If the activity exceeds 90 pCi/100 sq. cm. for a swipe or 5 pCi/ml for a water or sludge sample, notify the RSO or his designated alternate immediately.

8.0 EXHIBITS

A - Facility Survey data Sheet

EXHIBIT A

Form No. : RTI 1022
Page : __ OF __
Issued On :
Revised On :
Approved by:

FACILITY SURVEY DATA SHEET

DATE: _____ SURVEY TAKEN BY: _____

LABORATORY NOTEBOOK REFERENCE: _____ APPROVED BY: _____

EQUIPMENT USED: _____ SERIAL NO. _____

SWIPE MDA _____ SWIPE EFFICIENCY _____

LIQUID MDA _____ LIQUID EFFICIENCY _____

TIME	SWIPE NO.	SAMPLE CPM	BKG'D CPM	CORRECTED CPM	ACTIVITY dpm/100 cm2	REMARKS

TIME	SAMPLE LOCATION	VOLUME	SAMPLE CPM	BKG'D CPM	CORRECTED CPM	ACTIVITY uc/ml	REMARKS

Ref: RTI NRC License #29-13619-02

Facility: ROCKAWAY	Department: IRRADIATOR OPERATION	Page 1 of 6
Subject: IRRADIATOR STARTUP		Section/Number/Revision 9.100.A
		Effective Date: November 5, 1986
Prepared By: R. COCKRELL	Approved Technically: R. COCKRELL	Approved By Quality: P. O. SHAPIRO

1.0 PURPOSE

Describe the operations required to startup the irradiator.

2.0 SCOPE

Applies to irradiator operations at the Rockaway facility.

3.0 REFERENCES

NRC License #29-13613-02

4.0 DEFINITIONS

First Shift - The first scheduled shift that begins after sunrise.

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

5.1 Calibrated Radiation Survey Instrument

5.2 Irradiator key

6.0 SAFETY REQUIREMENTS

6.1 Irradiator interlock checks shall be performed in accordance with the decision chart shown in figure 1.

6.2 Irradiator key shall be in possession of a certified operator or stored in a secure location at all times when the irradiator is not operating.

7.0 PROCEDURE

7.1 Place the irradiator key in the POWER key switch on the control panel and turn to the RESET position and back to the ON position.

7.2 Check the alarm and status display to ensure that all alarms are clear and that the irradiator is ready for startup.

7.0 PROCEDURE (cont)

NOTE: All fault conditions shall be cleared prior to continuing irradiator startup.

7.3 Verify that the maze monitor is operational:

7.3.1 Check the light to ensure the unit is operational.

7.3.2 Check the monitor to ensure it is reading the check source.

7.4 Check the internal CONVEYOR status to verify that the proper operational mode is indicated.

7.5 Verify the green permissive light on the personnel door is illuminated.

7.6 Remove the irradiator key from the POWER switch.

NOTE: The key shall be attached to the survey instrument when the source is not in the shielded position.

7.7 Perform the following to ensure proper operation of the survey instrument.

7.7.1 Test the battery on the survey instrument.

NOTE: If an unsatisfactory reading is obtained, replace the battery or use another survey instrument and not in the supervisors log.

7.7.2 Check the instrument calibration date.

NOTE: If the instrument is out of calibration, obtain a calibrated survey instrument and remove the out-of-calibration instrument from the control room, tag the instrument, and note in the supervisors log.

7.7.3 Place the survey instrument range selector to the lowest scale, and ensure the audible switch is in the "ON" position.

7.7.4 Remove the quick disconnect on the air line interlock, and leave disconnected.

7.0 PROCEDURE (cont)

7.7.5 Place the survey instrument probe directly below the personnel door key switch and verify that the instrument responds to the check source.

7.7.6 Move the survey instrument away from the check source, and verify that the reading returns to a normal background.

7.8 Place the irradiator key into the personnel door electric lock and open the door.

NOTE: Observe the personnel door light is illuminated on the interlock panel.

7.9 Enter the maze observing the following:

7.9.1 Check the meter on the survey instrument continually for indications of radiation levels higher than background.

NOTE: If the radiation level is 8 times or greater than the background, exit the cell immediately and report the condition to the plant superintendent or to the operations manager. The plant superintendent or operations manager will report the condition to the RSO or RSS. Record in the supervisors log.

7.9.2 Observe the ozone present in the air to determine if levels are abnormally high.

7.9.3 Check that part of the source cable that is visible between the bottom of the conveyor structure and the surface of the pool.

7.9.4 Check the totes for proper loading.

7.9.5 Check that no personnel are in the cell.

7.10 Actuate the irradiator startup switch located in the radiation room.

NOTE: Observe that the st[illegible]arm sounds and the warning light in the maze b[illegible]nk.

7.0 PROCEDURE (cont)

7.11 Exit the radiation room and perform the following:

7.11.1 Pull on the door to ensure it is locked.

7.11.2 Reconnect the air line interlock quick disconnect.

7.11.3 Check that the PERSONNEL DOOR light on the interlock panel extinguishes.

7.11.4 Check that no SAFETY FAULT or INTERNAL CONVEYOR MALFUNCTION lights are illuminated.

7.11.5 Check that the MACHINE READY light is illuminated.

7.12 Place the irradiator key into the MACHINE key switch. Turn the key to the start position and release.

7.13 Observe indication of the source being raised:

7.13.1 Check that the SOURCE DOWN light extinguishes.

7.13.2 Check that the source in motion horn sounds.

7.13.3 Check that the DANGER HIGH RADIATION light over the personnel door illuminates.

7.13.4 Check that the green permissive light on the personnel door extinguishes.

7.14 Observe indication that the source is in the fully raised position:

7.14.1 Check the source in motion horn silences.

7.14.2 Check the maze radiation monitor's ALERT lamp illuminates.

7.14.3 Check the SOURCE UP split light illuminates.

7.14.4 Check that the source timer starts to count.

NOTE: If any of these indications are not received and the source is not lowered, push the STOP button on the panel.

7.0 PROCEDURE (cont)

7.15 Record the date, start time, customer run code, master timer setting, run timer reading, shuffle/feed counter setting, mode and initials on the irradiator log sheet for all startups.

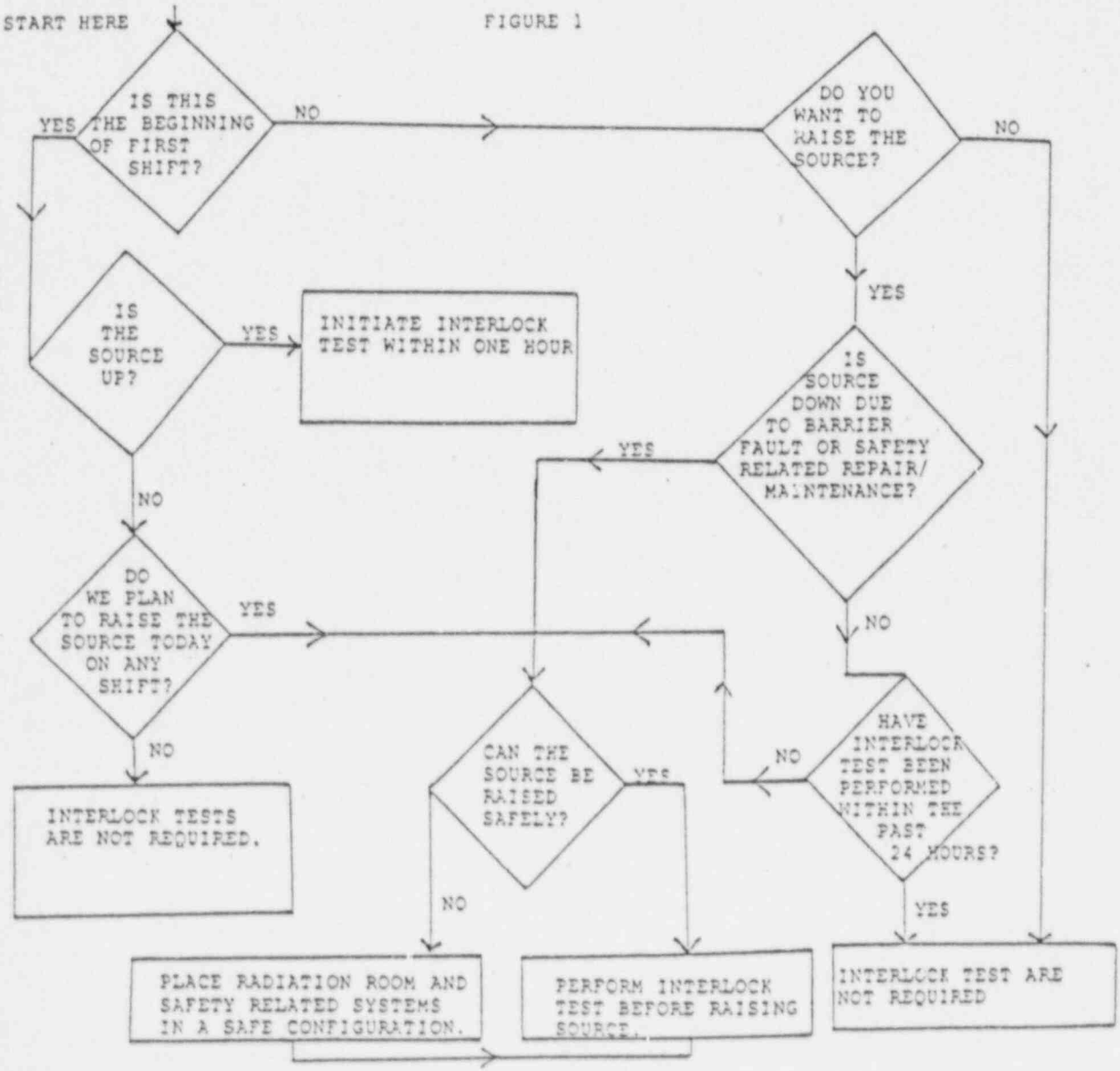
NOTE: Deviation from this procedure is prohibited without the expressed written approval of the RSO or his alternate designated in the license.

7.16 Log any variances from this procedure in the supervisor log, including the date and time that permission was granted by the RSO or his designated alternate.

8.0 EXHIBITS

Figure 1 - Decision Chart For Safety Interlock Tests

FIGURE 1


START HERE
IS THIS THE BEGINNING OF FIRST SHIFT?
YES
NO
DO YOU WANT TO RAISE THE SOURCE?
NO
YES
IS THE SOURCE UP?
YES
INITIATE INTERLOCK TEST WITHIN ONE HOUR
NO
IS SOURCE DOWN DUE TO BARRIER FAULT OR SAFETY RELATED REPAIR/ MAINTENANCE?
YES
NO
DO WE PLAN TO RAISE THE SOURCE TODAY ON ANY SHIFT?
YES
NO
INTERLOCK TESTS ARE NOT REQUIRED.
CAN THE SOURCE BE RAISED SAFELY?
YES
NO
HAVE INTERLOCK TEST BEEN PERFORMED WITHIN THE PAST 24 HOURS?
NO
YES
PLACE RADIATION ROOM AND SAFETY RELATED SYSTEMS IN A SAFE CONFIGURATION.
PERFORM INTERLOCK TEST BEFORE RAISING SOURCE.
INTERLOCK TEST ARE NOT REQUIRED

Facility:		Page
ROCKAWAY	IRRADIATOR OPERATION	1 of 10

Subject:	Section/Number/Revision
RESIN REGENERATION	9.502.A
	Effective Date: October 30, 1986

Prepared By	Approved By Technical	Approved By Quality
Robert G. Cockrell	Robert G. Cockrell	Paul O. Shapiro
R. COCKRELL	R. COCKRELL	P. O. SHAPIRO

1.0 PURPOSE

To describe the operations required to regenerate the demineralizer resin beds.

2.0 SCOPE

Applies to irradiator operators at the Rockaway facility.

3.0 REFERENCES

Operation and Maintenance Instructions for Vaponics Model VI-10F, Manual No. 439-1.

4.0 DEFINITIONS

4.1 CATION RESIN - synthetic insoluble chemicals that remove cations from solutions and give up hydrogen ions.

4.2 ANION RESIN - synthetic insoluble chemicals that remove acids by replacing the anion with hydroxyl ion.

4.3 BACKWASH - water that flows upward through the cation and anion beds of resin at a controlled rate. This loosens and classifies the resin to aid the regeneration process. At the same time, dirt and fine particles of the resin are passed off to the drain.

4.4 REGENERATION - the process of flowing caustic or acid through a backwashed resin bed to replace anions or cations with hydroxyl or hydrogen ions. An acid solution is passed through the cation resin to remove the ions picked up by the resin during the run portion of the cycle. The cation resin is thereby returned to the hydrogen form for the next run cycle. Similarly, caustic solution is passed through the anion resin bed to remove the anions picked up during the run cycle and place the anion resin in a regenerated condition ready for the next run cycle.

10pp.

4.0 DEFINITIONS (cont)

4.5 RINSE - the resin beds are first rinsed with plain water at a slow flow rate which slowly displaces the regenerated chemical solutions. During this slow rinse period, the resins are still in contact with the regenerated solutions. This slow rinse is important to allow sufficient contact time between the resins and the chemicals. Finally, a fast rinse removes regenerated products and any excess chemicals remaining in the columns.

4.6 RUN (commonly called SERVICE) - the use of the resin bed to purify water. Waste products are removed from the resin beds by rinsing for a short period. The ion exchange capacity will be at its peak of efficiency and the water produced is directed to service. The run is continued until the resistivity of the water falls below predetermined standards.

4.7 RESISTIVITY - with a two bed demineralizer, the resistivity of the processed (deionized) water will usually fall between 50,000 ohms-cm. at the low end to a high of 3,000,000 ohms-cm. This corresponds to a total dissolved solids level of roughly 0.8 ppm to 8.0 ppm when expressed as sodium chloride (NaCl).

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

5.1 Acid regeneration container.

5.2 Caustic regeneration container.

5.3 Service connections - regeneration containers to demineralizer.

5.4 Hose.

5.5 A retention tank of sufficient volume to hold regeneration waste water.

5.6 13 pounds of 50% liquid caustic with 10 pounds of water.

5.7 33 pounds 13 ounces (20% Baume) Hydrochloric Acid-undiluted.

6.0 SAFETY REQUIREMENTS

6.1 When handling chemicals, wear chemical goggles or full face shield, rubber gloves, aprons, boots, and respirator.

6.2 Ensure the room is adequately ventilated.

6.3 Avoid splashing solutions.

6.4 Ensure all piping connections are tight prior to regeneration.

6.5 Do not add water to Hydrochloric acid.

6.6 Do not release regeneration liquids to the floor drains or environment.

7.0 PROCEDURES

7.1 Prepare to regenerate.

When the purity of the processed water drops to 100,000 ohms-cm., the unit should be regenerated by a qualified irradiator operator using the following:

NOTE: Failure to regenerate when necessary may result in water which may be extremely corrosive to certain metals.

7.1.1 Contact QA and obtain a sample from the demineralizer outlet to check for radioactivity and pH.

7.1.2 Do not proceed until the results of the sample are obtained and are within specifications.

7.1.3 Ensure that the retention tank is on line to receive the discharge of solution from the backwash, regeneration and rinse.

7.2 Backwash the charcoal bed.

7.2.1 Shut off pump.

PROCEDURES (cont)

7.2.2 Shut valves A and B.

7.2.3 Open valves C and D.

7.2.4 Turn on pump and regulate water pressure with valve D. A slow water flow is desired.

7.2.5 Shut off pump when charcoal particles appear in sight glass.

7.2.6 Shut valves C and D.

7.2.7 Open valves A and B.

7.2.8 Turn on pump.

NOTE: The charcoal backwash is used to decrease the displacement pressure within the charcoal bed.

7.3 Backwash the cation resin.

7.3.1 Shut off pump.

7.3.2 Shut all valves including R & D and cell pool input valve. Check the discharge valve and the sampling station valve are closed on the retention tank.

7.3.3 Open valves A, B, and inlet valve.

7.3.4 Open valve #5.

7.3.5 Open valve #4.

7.3.6 Simultaneously open valve #18, raw water inlet and energize pump.

7.3.7 Regulate the water flow with valve #4 for maximum backwash, approximately 3 to 5 gallons per minute (GMP).

7.3.8 Backwash cation resin bed for 10-15 minutes.

7.3.9 Shut off pump.

PROCEDURES (cont)

7.3.10 Shut all valves, except A, B and inlet valve.

NOTE: Send all water discharge to the retention tank.

7.4 Regenerate the cation resin bed.

7.4.1 Thirty-three pounds thirteen ounces of (20° Baume) Hydrochloric Acid - undiluted is poured into the acid regeneration container.

7.4.2 Ensure resistivity meter is turned off.

7.4.3 Shut off pump.

7.4.4 All valves should still be in shut position from backwash.

7.4.5 Open valves #8 and #12.

7.4.6 Open valve #7, chemical metering valve, after ensuring proper hook up with acid regeneration container.

7.4.7 Energize pump while simultaneously opening raw water make up valve #18.

7.4.8 Adjust the chemical metering valve by setting the shorter pointer to 45 and watching the rate at which the solution is drawn up, no GPM indication should be noted.

NOTE: The chemical metering valves have two scales, one from 0-90, the other from 90-180. As the valve is opened, the shorter pointer moves from 0-90. As the valve is opened further, the longer pointer moves from 90-180. The higher the number, the greater the valve opening.

7.4.9 Suction of acid product should take approximately 30 minutes.

7.4.10 Note valve settings for future regenerations.

PROCEDURES (cont)

7.4.11 Regulate flow with metering valve #7.

7.4.12 The pressure gauge should read approximately 30 psig.

7.4.13 Shut valve #7 after the acid has been drawn into the column and the acid regeneration container is empty.

7.4.14 Add 1 gallon of water to empty acid regeneration container.

7.4.15 Open valve #7 and draw water from acid regeneration container in approximately 30 minutes.

7.4.16 Log the water pressure for proper draw-up rate in the supervisor log.

7.4.17 Ensure all contents have drained to the retention tank.

7.4.18 Shut valve #7 when water has been completely drawn up.

7.5 Slow rinse cation bed.

7.5.1 Ensure valve #7 is closed.

NOTE: Valves #8, #12, A, B, and inlet valves should still be in the open position from cation bed regeneration.

7.5.2 Slow rinse should be maintained at 1.5 GPM, this adjustment can be made with the rotation of valve #8.

7.5.3 Slow rinse should run for approximately 20 minutes.

7.5.4 Slow rinse contents are drained to the retention tank.

PROCEDURE (cont)

7.6 Fast rinse cation bed.

7.6.1 Shut all valves except A, B and inlet valves and valve #18.

7.6.2 Open valve #8, then valve #1.

7.6.3 Valve #8 should be fully open to ensure maximum flow rate.

7.6.4 Continue this cycle for 10 minutes.

7.6.5 Send all fast rinse contents to the retention tank.

7.7 Backwash anion resin bed.

7.7.1 Shut off pump.

7.7.2 Shut all valves except valves A, B, and inlet valve.

7.7.3 Open valves #6, #11 and #4.

7.7.4 Simultaneously open valve #18 and energize pump.

7.7.5 Regulate water flow with valve #4 for maximum backwash flow rate of 0.3 GPM.

7.7.6 Backwash anion resin bed for approximately 10 minutes.

7.7.7 Shut all valves.

7.7.8 Shut off pump.

7.8 Regenerate anion resin bed.

7.8.1 Mix thirteen pounds of 50% liquid caustic with ten pounds of water in the caustic regeneration container.

7.8.2 Open valves A, B and inlet valves.

PROCEDURES (cont)

7.8.3 Open valve #13.

7.8.4 Open valve #3.

7.8.5 Open valve #1.

7.8.6 Ensure proper hook up of caustic suction line to valve #9 from caustic solution regeneration tank.

7.8.7 Simultaneously open valve #18 and energize pump.

7.8.8 Adjust chemical metering valve #9 so suction of caustic solution takes 25-30 minutes.

NOTE: Pressure gauge should read approximately 30 psig.

7.9 Slow rinse anion resin bed.

7.9.1 Ensure valves #3, #13, and #1 are open.

7.9.2 Regulate valve #13 so flow rate is approximately 1.5 GPM and the pressure gauge reads 30 psig for 45 minutes.

7.9.3 Send all contents to the retention tank.

7.10 Final Rinse.

7.10.1 Shut all valves and turn off pump.

7.10.2 Open valve #1, #3, #10, A, B and inlet.

7.10.3 Simultaneously open valve #18 and energize pump.

7.10.4 Turn on conductivity meter.

NOTE: Processed water outlet initial resistance reading will be low and will gradually climb during service run.

PROCEDURES (cont)

7.10.5 Send all regeneration water to the retention tank.

7.10.6 Adjust flow to desired service flow rate 4.0 GMP.

NOTE: This final rinse should be continued until the resistivity of the processed water increases above the minimum desired valve as indicated by the conductivity meter.

7.10.7 Shut valve #3.

7.10.8 Open valve #2 when processed water has reached acceptable limits on conductivity meter of >100,000 ohms/cm, when achieved system is ready for service run.

NOTE: If the unit does not come up to the desired level of resistivity, the rinse may be continued. This should not be necessary as the resistivity should increase rapidly if the regeneration steps are performed as outlined.

NOTE: It is not uncommon that two complete regenerations are needed before the required resistivity is achieved.

7.11 Place demineralizer in service.

7.11.1 Open valves #1 and #10.

7.11.2 Shut valve #3.

7.11.3 Open valve #2.

NOTE: The demineralizer is now in service. The water flow is now to the distribution system.

7.12 Prior to release of regeneration solutions the following actions will be taken:

7.12.1 Operations personnel will check pH with pH paper to adjust waste water to neutral.

PROCEDURES (cont)

7.12.2 Notify QA to sample the contents of the retention tank for radioactivity and pH.

7.12.3 Confirm with QA that radioactivity and pH analysis readings are within established limits for release.

7.12.4 Obtain permission from RSO or RSS prior to releasing contents of retention tank.

NOTE: Following release of retention tank contents, the shift supervisor must check the discharge valve shut and record closure in the Shift Supervisor Log.

8.0 EXHIBIT

None

RTCH: NASDAQ

TELEX: 642948 RNDH
ATTN: RAD TECH

Radiation Technology, Inc.

108 LAKE DENMARK ROAD, ROCKAWAY, N. J. 07866
(201) 625-8400

June 5, 1986

RTI:RGC:86016

U.S. Nuclear Regulatory Commission, Region II
Material Radiation Protection Section
101 Marietta Street, Suite 2900
Atlanta, GA 30323

RE: Renewal of License Number 29-13613-02

Gentlemen:

Enclosed are two (2) copies of the entire completed application (NRC Form 313) for renewal of license number 29-13613-02 and a check for $930.00 to cover the license fee.

Sincerely,

Robert G. Cockrell

Robert G. Cockrell, Ph.D.
Vice President Operations and Engineering

RGC:jat
Enclosures - Application for Material License (2 copies)
Check in the amount of $930.00

'86 JUN 12 A10:25

License Fee Information on application.

"OFFICIAL RECORD COPY"
ML10 1[illegible]5620

8606170546

4p.

6/5/86

Hand delivered

NRC FORM 313
(9-82)
10 CFR 30, 32, 33, 34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires 8-31-87

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.

FEDERAL AGENCIES FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS. IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIAL SECTION B
631 PARK AVENUE
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
MATERIAL RADIATION PROTECTION SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
MATERIAL RADIATION PROTECTION SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

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 JURISDICTION.

1. THIS IS AN APPLICATION FOR (Check appropriate item):

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [X] C. RENEWAL OF LICENSE NUMBER 29-13613-02
  In its entirety

2. NAME AND MAILING ADDRESS OF APPLICANT (Include Zip Code)

Radiation Technology, Incorporated
108 Lake Denmark Road
Rockaway, NJ 07866

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED:

108 Lake Denmark Road
Rockaway, NJ 07866

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Dr. Robert G. Cockrell

TELEPHONE NUMBER: 201-625-8400

SUBMIT ITEMS 5 THROUGH 11 ON 8½ 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 AND EXPERIENCE

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES (See 10 CFR 170 and Section 170.31):
FEE CATEGORY: 3G
AMOUNT ENCLOSED: $ 930

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, 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.

SIGNATURE/CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Robert G. Cockrell	Dr. Robert G. Cockrell	Vice President Operations & Engineering	6/4/86

14. VOLUNTARY ECONOMIC DATA

LANDAUER FEE TO:

- [ ] < $250K
- [ ] $250K – $500K
- [ ] $500K – $750K
- [ ] $750K – 1M
- [ ] $1M – 2.5M
- [ ] $2.5M – 7M
- [ ] $7M – 10M
- [ ] > $10M

a. NUMBER OF EMPLOYEES (Total for entire facility excluding outside contractors): 40

b. NUMBER OF BEDS: n/a

c. WOULD YOU BE WILLING TO FURNISH COST INFORMATION (dollars and/or staff hours) ON THE ECONOMIC IMPACT OF CURRENT NRC REGULATIONS OR ANY FUTURE PROPOSED NRC REGULATIONS THAT MAY AFFECT YOU? (NRC regulations permit it to protect confidential commercial or financial proprietary information furnished to the agency in confidence.)

- [ ] YES
- [X] NO

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
Renewal	Jun. 10 I	3E, 3G	"OFFICIAL RECORD COPY" ML18 105820	
AMOUNT RECEIVED	CHECK NUMBER			DATE
$930/$170	19375 / 19480			6/25/86

PRIVACY ACT STATEMENT ON THE REVERSE

4099

8608050549

Item 5 Radioactive Material

Licensed material will be metallic cobalt-60 sealed sources doubly encapsulated in stainless steel. No single source will exceed twenty thousand curies in total activity. The total activity in the facility at any one time will not exceed three million curies. RTI proposes loading the irradiator with any of the following cobalt-60 source models:

Neutron Products Models:

12-S-3, NPI 12-C-3, 10-C-3,
10-S-3, 12-C-3, 11-S-2, 11-C-2,
12-CC-5, 24-CC-5, NPI-77-351 thru
NPI-77-358, NPI-77-361 thru NPI-77-364,
353, 752, 853, Model Drawing 200243, Rev. D

Atomic Energy of Canada Models:

C-188, Types 1,2,3,4;

General Electric Company Models:

GEP-916, GEPR-183, GE-SR-187

In the future as other source models become available, RTI may add to the irradiator any sealed cobalt-60 source that has been listed in the NRC Registry of Sealed Sources and Devices. RTI will provide thirty (30) days advance written notice to the U.S. Nuclear Regulatory Commission, Region I, 631 Park Avenue, King of Prussia, Pennsylvania 19406, prior to the initial installation of such sources.

These sources will be used in Radiation Technology, Inc. Irradiator Model NO. RT2102.

Additionally RTI will have the following sources available for use in instrument checking and calibration and for special projects:

AECL Cobalt-60 sealed source Model C-160
320 Curies

Tracerlab Strontium-90 sealed source Model RA-2A
120 milliCuries

Victoreen Strontium-90 sealed source Model RA-2A
30 microCuries

Eberline Strontium-90 sealed source
0.3 microCuries

Item 6 Purposes For Which Licensed Material Will Be Used

Licensed material will be used in programs involving the irradiation of medical products, pharmaceuticals and cosmetics for sterilization or microbial reduction; radiation effects studies and irradiation of foodstuffs. Irradiated foodstuffs to be used in the U.S. shall be done under applicable regulations of the Food and Drug Administration, U.S. Department of Health and Human Services.

Explosives will not be irradiated. RTI will not irradiate flammable or corrosive materials. For this purpose, flammable will mean any material with a flash point at a temperature below the temperature RTI expects irradiated products to reach during irradiation. However, in no case will any material with a flash point below 145 degrees Fahrenheit be irradiated. For this purpose, corrosive will mean any material with a pH less than 4.0 or greater than 10.0. These materials will not be processed unless they are in approved DOT packages or if visable damage is observed that could result in a breach of integrity.

Item 7 Individuals Responsible For Radiation Safety Program

Whenever the irradiator is in operation there shall be a supervisor on duty and available to the facility. Said individual will have, as a minimum, the training outlined in Item 8 of this application and four months of experience in operating the type of irradiator he is supervising. The shift supervisor is responsible for seeing that operations are conducted in a safe manner including strict adherence to the radiation safety procecedures and the license commitments. The plant superintendant has training consistant with that of the shift supervisors and generally more than a year's experience at operating an irradiator of the type of which he is the superintendent . He is also the Radiation Safety Supervisor and acts with full authority in routine radiation matters in the absence of the Radiation Safety Officer.

The Radiation Safety Officer is Robert G. Cockrell, PhD.

Item 8 Training Provided To Other Users

The Operations Manager is in charge of all operations functions of the plant. In matters of radiation safety, the Radiation Safety Officer can override the Operations Manager. The Assistant Operations Manager and/or the Plant Superintendent report to the Operations Manager and is responsible for the day to day activities at the plant. The Shift Supervisors report to the Plant Superintendent and are responsible for supervising operation on their shifts. The Shift Supervisor may be assisted by additional Certified Operators on any shift who would report to him. The Material Handlers are responsible for loading and unloading products for the irradiator. They report to the Shift Supervisor on their shift.

Item 8 Training Provided To Other Users (cont)

Training is provided to all employees commensurate with the requirements for their positions. The company's philosophy regarding training is that Material Handlers will be given on the job training (OJT) in their duties and in radiation protection during their orientation on the job. This training will be ongoing in that practical experience will provide most of their training. (Material Handlers that demonstrate consistant superior performance may be considered for training as operators. Operator management applicants are also selected outside the company on basis of prior education/experience.) For operator certification the following formal training is required:

8.1 Formal Training

Formal training is the responsibility of the Radiation Safety Officer. He may be assisted in this activity by designated individuals who are qualified by training and experience RSO retains responsibility for assuring that quality training is provided.

1. Basic Radiation Theory (4 hours)

   Structure of Matter
   Nature of Radioactivity
   Absorption of Radiation
   Radiation Units and Terminology

2. Effects of Ionizing Radiation on the Body (4 hours)

   Chronic and Acute Exposures
   Somatic and Genetic Effects
   Radiation Sickness
   Accidents in Irradiation Facilities

3. Federal/State Regulations (4 hours)

   Standards for Protection Against Radiation
   Notices, Instructions, Reports and Inspections
   Requirements of State Regulations
   Regulatory Guide 8.29

4. Personnel Radiation Exposure Control Techniques and

   Responsibilities (4 hours)
   Application of Time, Distance and Shielding to Minimize Exposure
   Shielding Materials
   Exposure Limits
   Radiation Surveys
   Personnel Radiation Monitoring
   Rules of Thumb
   Personnel Responsibilities

8.1 Formal Training (cont)

5. Radiation Monitoring Devices (4 hours)

Fundamentals of Radiation Detecting Devices
Portable Survey instruments Operation
Counter/Scaler Operation
Area Monitor Operation
Practical Demonstrations

6. Radioactive Contamination (4 hours)

Loose Surface Contamination
Fixed Contamination
Waterborne Contamination
Airborne Contamination
Contamination Control

7. Facilities Review (8 hours)

Irradiator Construction and Operation
Demineralizer Plant Construction and Operation
Conveyor Operation
Effects of Irradiation on Materials
Irradiation Techniques
Radiation Dosimetry Systems
Production Irradiation

8. Operating Procedures Review (8 hours)

Byproduct Material License
Operating Instruction
Emergency Prodedures Review

8.2 Typical Final Examination for Operator Certification

The following is a list of typical examination questions and their answers. A score of 80 percent is required to pass the examination. Persons who fail the exam will receive additional training in the areas which the examination demonstrates their knowledge to be deficient and be given a repeat examination with different questions.

1. Name the three common atomic particles of which atoms are composed. (proton, neutron, electron)

2. In the term cobalt-60 the 60 is the atomic _____. (weight)

3. Name the three most common types of radioactive decay emissions. (alpha, beta, gamma)

4. Cobalt-60, a radioisotope of cobalt emits highly penetrating _____ radiation. (gamma)

8.2 Typical Final Examination for Operator Certifictation (cont)

5. The radiation from cobalt-60 (Check all correct answers.)

(a) can cause exposed materials to become radioactive.
(b) can cause damage to human beings.
(c) will not penetrate human skin.
(d) can be turned off when not in use.
((b))

6. The time it takes a radioactive material to be reduced to half of its activity is known as its _____. (half life)

7. If I have a million Curies of cobalt-60 now, how much will I have 10 1/2 years from now? (250,000 Curies)

8. Radioactive particles or fluids which escape from confinement will cause _____. (contamination)

9. The plant area limited to "authorized employees only" is called a _____. (unrestricted area)

10. An accessible area where the major portion of the body can receive greater than 100 millirems in five days is called a _____. (radiation area)

11. What sign (wording) must be on all containers or rooms containing licensed quantities of radioactive material? (Caution Radioactive Material)

12. An area in which a major portion of an individual's body can receive in excess of 100 millirems in one hour is called a _____. (high radiation area)

13. One Curie of radioactivity is defined as _____ disintegrations per second. (3.7×10^{10})

14. Define a rad. (That amount of radiation which will result in the absorption of 100 ergs/gm in any material.)

15. According to federal regulations, what is the maximum time period between leak checks on sealed sources? (six months)

16. True or False? For cobalt-60 gamma radiation, 1 rad equals 1 rem. (true)

17. Your survey meter does not have a thin window on the detector tube. Will you detect the beta radiation from cobalt-60? (no)

8.2 Typical Final Examination for Operator Certification (cont)

18. Exposure to relatively low levels of ionizing radiation over an extended period is known as _____ radiation exposure and is the basis for radiation exposure limits. (chronic)

19. What is the source of the higher background levels found at high altitudes? (cosmic rays)

20. State three generally accepted methods for controlling radiation exposures. (time, distance, shielding)

21. If your hands were in a field of 10 millirem/hour while working, and you estimate that it will take two hours to complete the job, what would the total exposure to your hands be? (20 millirem)

22. If you perform a smear survey of an unrestricted area, the company action limit is _____. (200 dpm)

23. If the dose rate measured at three feet from a point source is 100 rem/hr, what would be the dose at 10 feet? (9rem/hr)

24. A customer would like us to sterilize a load of nitric acid for hospital use. Can we do it? (no!)

25. When must a film badge be worn? (whenever on duty)

26. Will a film badge indicate your exposure to alpha radiation? (no)

27. Federal regulations limit whole body exposure to ionizing radiation in an unrestricted area to _____ rem per year. (0.5)

28. A routine survey of the demineralizer with a portable survey meter indicates a reading of 0.5 millirem/hr above background. Is this significant? Why? (Yes, it may be an indication of a leaking source pencils.)

29. In what range of total doses are ferrous sulphate (Fricke) dosimeters generally useful? (3,000 to 40,000 rads)

30. Federal regulations limit whole body exposure to ionizing radiation in a restricted area to _____ rem per quarter. (1.25)

31. The maximum radiation dose rate allowable in an uncontrolled area is _____ millirem/hr. (2)

32. In what total dose range are red Perspex (Harwell) dosimeters generally useful? (500 krads to 5 megarads)

8.2 Typical Final Examination for Operator Certification (cont)

33. One milliCurie of cobalt-60 will result in a dose rate of approximately _____ millirem at one meter from the point source. (1)

34. Given equal thicknesses of water and steel which would be a better shield for cobalt-60 radiation? (steel)

35. Who is responsible for your personal exposure to ionizing radiation? (I am)

36. What common plastic is particularly suseptible to the effects of cobalt-60 radiation? (teflon)

37. What safety precautions must be taken prior to entering the radiation room after completion of a product run? (Check the maze radiation monitor on the console, check that the source down indication is given, perform a maze radiation survey, visually check that the source is down.)

38. True or False? Food which has been irradiated is radioactive. (false)

39. One purpose of the irradiator ventilation system is to prevent the spread of any radioactive contamination. The other is to reduce the concentration of _____ formed during the irradiation of air to levels within Federal guidelines. (ozone)

40. What happens if the air compressor fails to provide sufficient air pressure? (The irradiator shuts down.)

41. Under what conditions is it permissible to bypass a safety interlock while the irradiator is in operation? (none)

42. At what pool water resistivaty must the demineralizer be regenerated? (50,000 ohm-cm)

43. List all items which will activate the irradiator safety circuits causing the source to automatically lower. (interruption of the input conveyor light screen, interruption of the output conveyor light screen, opening the maze personnel door, conveyor malfunction, emergency stop switch actuation, breaking the maze personnel passage photoeye beam, high radiation level in the maze, low air pressure, source hoist malfunction, fire in the radiation room, loss of power, pulling the trip wire in the radiation room, loss of radiation monitor signal)

44. If the heat sensor indicates a fire in the radiation room, what two things will happen? (The irradiator will shut down and an alarm will sound.)

8.2 Typical Final Examination for Operator Certification (cont)

45. Loss of power during irradiator operation will cause what effect on the irradiator? (The product conveyor will stop and the source plaque will be automatically lowered to the fully shielded position.)

46. What are two major reasons for demineralizing and filtering the pool water? (To prevent corrosion and to promote optical clarity for remote operations.)

47. Why is the startup safety switch in the irradiation room located at the farthest point from the radiator room exit? (To insure that the operator knows that all personnel are out of the radiation room prior to startup.)

48. The lab has measured the activity of a water sample as 5×10^{-6} microcurie/ml. Can they pour the water down the drain? (yes)

49. If a person receives a radiation overexposure at which level might he experience nausea and fatigue: 25 rem, 100 rem, 1000 rem (circle one). (100 rem)

50. If you were 25 years old at your last birthday, what is the maximum whole body accumulated dose to which you are limited? (35 rem)

8.3 On-The-Job Training

A minimum of thirty days training shall be conducted by a supervisor with the help of the certified operators in the training of a candidate operator. OJT shall consist of supervised operation of the facilities covering all aspects of the formal training outline above in a practical setting. At the completion of the formal training, OJT and the examination the candidate operator may be certified by the Radiation Safety Officer.

8.4 Course Instructor

The course instructor will be the Radiation Safety Officer, or his designee who is qualified by experience and or training.

8.5 Records of Training

A training folder shall be established for each candidate operator containing the dates that each part of the formal training was completed, the starting and ending dates of the OJT and a copy of his completed exam paper. The trainer shall sign the individual's qualification records as training progresses. The final certification shall be signed by the Radiation Safety Officer. These training records will be maintained for a period of at least three years following resignation of an employee.

8.6 Refresher Training

Refresher training for plant operational personnel will be conducted on an annual basis for at least a four (4) hour period. This training will be given by the Radiation Safety Officer or his designee. Following refresher training a written examination will be administered. Areas where the examination identifies deficiencies will be discussed with personnel following correction of the examinations. Successful completion of annual refresher training will be documented in operators individual training folder.

Item 9 Facilities And Equipment

9.1 Basic Facility Design and Construction

1. The type RTI model 2102 is a self-contained unit surrounded by a ventilated concrete biological shield.

2. The radiation room Biological shield is constructed of reinforced concrete with a density of 147 lb/cu. ft. the shield is attached to the warehouse section of the plant and is designed to reduce the radiation levels to less than 0.25 mrem/hr. on all accessible surfaces when utilizing the maximum licensed quanity of radioactive material.

3. A steel reinforced concrete plug is installed in the roof of the irradiator room above the storage pool. The roof plug can be removed by a yard crane to allow access for receipt and/or shipping radioactive source containers.

4. The storage pool is constructed of poured concrete with a minimum density of 147 lb./cu. ft. An industrial tile liner is provided on the interior pool walls and a waterproof membrane is provided on the exterior to prevent seepage of pool water into the surrounding earth.

5. Safety systems and control devices

The irradiator control system provides indication and control functions as follows:

(1) Power Switch - key operated switch to control the power supply for the unit and to reset the control circuits.

(2) Start Switch - key operated switch to control irradiator functions.

(3) Radiation Maze Monitor

a. A radiation monitoring device (RMS-II or equivalent) to indicate radiation levels in the maze. This device is operational whether the source plaque is in the "exposed" or "fully shielded" position.

9.1 Basic Facility Design and Construction (cont)

b. The Radiation Maze Monitor will give an indication that the radiation level in the radiation room or maze is excessive when the source plaque assembly is in the "fully shielded" position, indicating a sealed source release from the plaque or a serious contamination problem. The maze personnel door will not open.

c. The Radiation Maze Monitor will give an indication that the radiation level in the maze is abnormal during irradiator operation. This will trigger an irradiator shut down such that a sealed source or serious contamination does not exit the irradiator maze.

(4) Machine Ready - Indication that the irradiator is ready for start-up from the control console. An irradiator start-up can not be initiated without this indication.

(5) Machine On - Indication that the irradiator is operational.

(6) Internal Conveyor - Indication that a tote has failed to execute its command, irradiator shutdown function.

(7) Exhaust Fan - Indication that the exhaust fan is energized.

(8) Low Water Level - Indication that the irradiator pool water level is low.

(9) High Water Level - Indication that the irradiator pool water level is high.

(10) Filtration Pump Running - Indication that water filtration pump is functional.

(11) Source Up - Indication that the source plaque assembly is in the irradiate position.

(12) Source Down - Indication that the source plaque assembly is in the "fully shielded" position.

(13) Safety - The safety circuit has been activated by (a) the emergency cable being pulled inside the radiation room, (b) the stop button on the console has been pressed, or (c) an entry interlock has been violated. Any of these will result in an irradiator shutdown.

(14) High Temperature - Indication that the temperature inside the irradiator room has reached a temperature designed to cause an irradiator shutdown.

9.1 Basic Facility Design and Construction (cont)

(15) Low Air Pressure - Indication that the control air pressure has dropped below that required to operate the irradiator. This will result in an irradiator shutdown.

(16) Source Rack - Indication that the source plaque did not travel the required distance in the specified time. This will result in an irradiator shutdown.

(17) Stop - Push button on the control console which activates the safety circuit and causes the source to lower to the fully shielded position. This will result in an irradiator shutdown.

(18) Personnel Door - Indication that the maze personnel access door is open. This will result in an irradiator shutdown.

(19) Lower Conveyor Access - Indication of access through the lower conveyor. This will result in an irradiator shutdown.

(20) Upper Conveyor Access - Indication of access through the upper conveyor. This will result in an irradiator shutdown.

(21) Door Access Permissive - Indication that the irradiator is safe for personnel access and that the personnel door will unlock with the key.

The irradiator incorporates the following safety features to protect product and personnel.

(1) Emergency Cable - Safety cable along the walls of the radiation room which, when pulled, will actuate the safety circuit, and cause the source plaque assembly to lower to the fully shielded position.

(2) Stop Button - Switch on the control console which, when activated, will actuate the safety circuit, and cause the source plaque assembly to lower to the fully shielded position.

(3) Maze Personnel Door Interlock - Switch on the maze personnel access door which, when activated by opening of the door, will actuate the safety circuit, and cause the source plaque assembly to lower to the fully shielded position.

(4) Access Maze Backup Safety Interlock - Electrical eye beam located in the maze corridor past the personnel access door which, when activated, will actuate the safety circuit and cause the source plaque to lower to the fully shielded position.

9.1 Basic Facility Design and Construction (cont)

(5) Temperature Sensing Device - Temperature sensor located inside the radiation room detects excessive temperatures and, when activated, actuates the safety circuit and causes the source plaque to lower to the fully shielded position.

(6) Source Pass Interlock - Indication of failure of the source pass mechanism to complete one full cycle of shuffles within the preset time period which causes the source plaque to lower to the fully shielded position.

(7) Source Hoist Mechanism - This feature requires that the source plaque assembly travel from the down shielded position to the up unshielded position in a prescribed period of time. If the source plaque assembly does not meet prescribed travel in specified time in either direction a shutdown signal is generated and source is lowered to shielded position. The operator is provided with an indication of the problem so appropriate corrective action may be taken.

(8) Source up - This feature requires that the source plaque assembly be raised to the fully exposed position and be in a level configuration in order to achieve a source up indication, if not, the source plaque will lower to the fully shielded position.

(9) Radiation Alert - This feature warns personnel and prevents personnel access to the irradiator when there is an excessive radiation level in the irradiator following shutdown. The irradiator maze personnel access door will not open in a high radiation condition.

(10) Maze Personnel Door - The maze personnel access doors are electrically locked shut and may be opened only when the following conditions exist: (a) the irradiator is shut down, (b) the source is indicated in the down (fully shielded) position, and (c) no radiation alarm is present. A key is required to open the door at all times from the outside but never from the inside. This feature satisfies the requirements of Section 20.203(c)(i) of 10 CFR 20.

(11) High Radiation In Maze - This feature provides the operator with a warning that the radiation level in the maze is excessive during irradiator operation. This could mean that the source has been damaged and that source material has been conveyed into the maze area. This is a highly improbable situation. This feature will cause an irradiator and conveyor shutdown so that source material could never exit the irradiation room. This feature satisfies the requirements of Section 20.203(c)(6)(viii) of 10 CFR 20.

9.1 Basic Facility Design and Construction (cont)

(12) Startup Safety Delay - This feature requires;(1) that all irradiator safety features be clear; (2)the operator has entered the radiation room and checked it to be clear of personnel, and has actuated a switch within the radiation room prior to irradiator startup; (3)the operator then has 90 seconds to start the irradiator or he must re-enter the radiation room and start the sequence again. This feature satisfies the requirements of Section 20.203(6)(v) of 10 CFR 20.

(13) Conveyor Door Interlock - This feature incorporates an electric switch which will be activated when the door is opened while the source plaque assembly is in the up position. This will in turn actuate the safety circuit and cause the source plaque to lower to the fully shielded position.

(14) Source Hoist Control - This feature is inherent to the irradiator design and function. The source plaque assembly will lower to the fully shielded position by its own weight if air pressure is not supplied through the source hoist control valve to the source hoist. The source hoist control valve must be continuously energized with electrical power to accomplish this. Therefore, loss of electrical power or air pressure to control the irradiator operation will result in the source lowering to the fully shielded position. The source hoist is failsafe.

(15) Maze Monitor Failure - The maze monitor detector signal is monitored and if this signal should fail while the source is up the system will shut down automatically.

(16) Source In Motion Alarms - This feature causes a distinctive horn to be sounded and lights to be flashed in and out of the irradiation room at any time that the source plaque is in motion up or down. The horn warns anyone in the cell that the source is in motion and allows time for an emergency cable switch to be actuated if need be. This feature satisfies the requirements of Section 20.203(c)(6)(iv) of 10 CFR 20.

Maze Access Control

The Model R2102 irradiator maze access is controlled to prevent entry of personnel during irradiator operation. (It should be noted that no system is undefeatable and that protection against a deliberate entry attempt by an individual who is cognizant of the irradiator's entry protection devices is possible.) The maze access control systems consist of three independent control functions: (a) maze personnel access door control, (b) upper conveyor access control and (c) lower conveyor access control. Violation of any one of the three functions will result in an immediate irradiator shut down. The maze personnel access door control system consists of the following: (a) the maze personnel access door must be in the closed position in order to accomplish an irradiator startup, (b) the maze personnel access door is provided with an electric latch which locks the door shut while the irradiator is in operation (c) the maze personnel access door is monitored by a switch which will initiate an irradiator shut down function if the door is opened during irradiator operation, (d) the maze personnel access door must always be opened with a key, which is the same key required for operation of the irradiator. The key may not be removed from the control console switch unless the switch is in the off position. Additionally the personnel access door will not open if the radiation monitor indicates a high radiation field in the maze even using the key. Maze access control is further guaranteed by the access maze back-up safety interlock.

The upper and lower conveyor access control function consists of the following: (a) A photo eye beam is provided across the entrance area for the upper and lower conveyor. If the photo eye beam is blocked, an immediate irradiator shutdown function is generated. (b) A group of proximity switches are arranged on the upper and lower conveyor such that as a tote approaches the entrance to the cell the entrance proxmity switch station activates to close a holding circuit which prevents the breaking of the photo eye beam by the tote from causing a shutdown. As the tote leaves the entrance proximity switch station before the photo eye can remake the circuit, the holding function is transferred to the exit proximity station. If the tote does not pass the proximity switch stations in a preset time period the photo eye beam is activated and a shutdown function is initiated.

9.2 Other Safety Considerations

1. a. The irradiator pool is equipped with a demineralizer system that circulates the water through a polishing loop and has the connections to provide makeup water as is necessary. The demineralizer has a conductivity meter installed as part of the system. This meter is routinely monitored and the system surveyed for radioactivity.

Maze Access Control (cont)

b. Water is not automatically replenished to the system to preclude a faulty solenoid valve from flooding the irradiator. Instead the water level is continuously monitored with a level gauge and a signal is generated at a low level (approximately one foot below normal water level) and the irradiator is shutdown. This allows for an inspection to be made to determine that water depletion is from normal means and not from a major leak. Assuming normal conditions, water is then made up through the demineralizer system.

c. The Radiation Technology, Inc. Model RT-2102 irradiator is provided with a deionization system which is capable of deionizing the irradiator pool water and necessary makeup water to maintain pool water at the proper conductivity and water level. The deionization system is used to fill the pools initially and whenever maintenance may require the pool to be drained. The system consists of a dual bed of HOH resin. All water supply passes through a carbon filter prior to entering the system to remove undesirable residues. The conductivity of the outlet water is monitored on a continuous basis to indicate when resin regeneration is required. Pool makeup water is supplied from the deionizer as required to maintain water level. The water is continuously circulated by the system through the pools at the nominal rate of 2-5 gpm. The system is also designed to maintain an effluent productivity of 10 micromhos/cm. When the conductance drops to50,000 ohm-cm the columns are regenerated.

Regeneration is performed by first backwashing each column with water then washing the cation column with strong acid, followed by a slow rinse and a fast rinse. The anion column is washed with a strong base, again followed with a slow and a fast rinse. A water analysis for radioctivity is conducted prior to and following regeneration to ensure that activity meets the prescribed standards for release to sanitary sewer system. After the effluents are all collected in drums the pH is measured, the solution is neutralized and then released to the sanitary sewer. This procedure is only done when necessary as indicated by the drop in pool water conductance.

d. The water purification system is continuously monitored for radioactive contamination by using a low range, portable radiation survey meter.

e. There are no plugged holes or pipes through the bottom of the pool. The demineralizer return lines extend to near the bottom of the pools to increase the efficiency of the water flow pattern and to provide some cleaning of the pool bottoms. These return lines are equipped with appropriate syphon breakers.

Maze Access Control (cont)

f. The demineralizer system is a closed loop system such that municipal water is not normally open to the system. Only when makeup water is added to the system is the municipal line manually opened. The municipal water line has a backflow double check valve installed to prevent any possible migration of the pool water back into this line.

2. The Radiation Technology, Inc. Model RT-2102 irradiation room is equipped with a ventilation system which is capable of a maximum air turnover rate of 20 times per hour in the cell. The system is also adaptable to air conditioning as necessary to reduce irradiator room air temperature. Tests conducted by the manufacturer indicate that this system will maintain ozone levels below OSHA limits at all times when the radiation room is accessible to personnel. Ozone concentrations shall be measured periodically to verify actual concentrations. The ventilation system contains two high efficiency filters which may be used to remove radioactive particles in the event of airborne radioactivity due to a source rupture. The filters are installed parallel to the primary system and used if a leaking source is identified or during other abnormal circumstances when airborne contamination is suspected. Normal pressure drop across the HEPA filters is 0.7 inch WG. They will be replaced when the pressure drop reaches 1.4 inch WG.

3. In case of a fire the radiation room is equipped with a heat sensing device that automatically sounds an alarm, gives a light indication in the control room, and shuts down the irradiator.

4. A manually operated sprinkler system is provided in the radiation room. A manually operated system provides more flexibility than an automatic system in handling the types of fires that might occur without the attendant contamination of the pool and possible ruination of large quantities of product.

5. Products for irradiation are loaded into totes which are carried into the irradiator on a conveyor. Neither the totes nor the products ever touch the source. As an additional protection, the source plaque is drawn up into a frame to ensure that nothing can come in contact with the source plaque itself or prevent it from being able to drop down into the shielding pool during an emergency or normal shutdown.

9.3 R and D Pool Irradiator

1. The irradiator is a typical under water type, having a fixed source residing near the pool bottom and a guiding arrangement for moving closed containers into and out of the pool.

9.3 R and D Pool Irradiator (cont)

The irradiator uses rigid tracks to provide positive guidance of a container into an irradiation position near the source. The track locations and the container dimensions provide positive assurance that the container can not interfere with the source structure.

2. The R and D irradiator pool is a stainless steel tank installed in the ground. The tank is 8' in diameter by 19' deep and is fabricated of 3/16", 304 stainless steel, butt welded inside and out.

3. The ground condition around the tank is solid rock. The hole into which the tank was placed was created by blasting. After the tank installation the hole was backfilled with lean concrete and compact soil.

4. Two 6" diameter stainless steel pipes connect the tank to the irradiator pool to allow transfer of sources between the R and D pool and the irradiation room cell pool.

5. An area radiation monitor near the R and D pool will sound an alarm in the event of a high radiation level.

9.4 Amergy Portable Irradiator

1. The irradiator is a portable lead shielded unit with the upper unit containing the Cobalt 60 source and the lower unit containing the irradiation chamber.

2. Irradiation of various materials is conducted by placing the material in the chamber and locking the chamber doors. The source cannot be removed from its shielded position during operations but may be manually lowered with the proper use of keys. This lowering operation can only occur when the chamber shield doors are locked. A red flashing light indicates the source is in the irradiate position.

3. The upper storage section of the irradiator is designed to serve as a shipping container. A special shipping cover and skid is provided. External dose rates are in compliance with the Federal shipping regulations for radioactive sealed source.

Item 10 Radiation Protection Program

All operations shall be conducted with due regard to maintaining the occupational radiation exposure to each employee as low as reasonably achievable. The elements of the program are directed toward satisfaction of the ALARA objective.

A. General Rules of Radiation Safety

1. The Radiation Safety Officer or his designee is responsible for all operations involving radioactive sealed sources including the approval of all procedures involving the irradiator.

2. All operations are to be conducted in strict compliance with the "Standards for Protection Against Radiation" 10 CFR 20.

3. All personnel working in restricted areas shall be instructed as to the nature of radiation hazards, the functions and use of safety devices and general rules of radiation safety.

4. All personnel shall be instructed to report any unsafe conditions to their supervisor. Workers are informed of the reporting procedures by the posting of 10 CFR 19.

5. All personnel who routinely work in a restricted area will be assigned a film badge which shall be worn at all times while in the restricted area.

6. All visitors or others requiring entry into a restricted area will be assigned film badges or pocket dosimeters unless the particular area has been surveyed as directed by the Radiation Safety Officer or they fall under the control of another organization's radiation safety program and have their own monitoring device.

7. All persons who are unfamiliar with the facility will be advised as to the restrictions and be accompanied by an employee who has completed the operator training program. Such persons entering the radiation room must be accompanied by a certified operator.

8. Each individual assigned a film badge shall wear only that particular numbered badge assigned to him.

9. Film badges should not be removed from the facility.

10. The restricted area of the facility shall be surveyed quarterly with portable survey meters and smear tests. Records of these surveys will be kept for inspection.

Item 10 Radiation Protection Program (cont)

11. Pool water shall be sampled for radioactivity monthly. Pool filters shall be surveyed weekly with a portable survey meter. Records of these activities shall be kept for inspection.

12. A qualified, authorized individual carrying a portable survey meter shall survey the radiation room during each irradiator initial entry. This procedure satisfies the requirements of Section 20.203(c)(6)(vi) of 10 CFR 20.

13. Radiation warning signs shall be posted in accordance with Section 20.203 "Standards for Protection Against Radiation".

14. Eating, drinking or smoking shall not be permitted within a restricted area.

15. All operations involving the handling of sealed source material, source receipt or shipment shall be under the direct personal supervision of the Radiation Safety Officer or the Radiation Safety Supervisor.

16. Maintenance or repair of any equipment or controls which involve radiation safety shall be authorized and approved by the Radiation Safety Officer.

17. All changes to the facility shall conform to this license and be approved by the Radiation Safety Officer.

18. Any changes in facility operations shall be done by procedures which have been reviewed and approved by the RTI management. These changes shall have the prior approval of the Radiation Safety Officer.

19. No items which have been in contact with radioactive materials shall be removed from the restricted area of the facility without being surveyed.

20. Operational procedures require that interlocks be checked before the startup of the irradiator on any day that operations are not continuous from the previous day. A record must be kept in a log recording date, time and results of such interlock tests. This procedure satisfies the requirements of Section 20.203(c)(6)(vii) of 10 CFR 20.

B. ALARA Program

1. The ALARA program is a commitment on the part of RTI to maintain exposure to ionizing radiation of personnel employed by RTI as low as reasonably achievable for operation of the facility. The ALARA program also applies to the company's commitment to maintain the radioactivity released in effluents at the lowest possible levels.

2. The design of the facility is such that the whole body radiation dose received by employees is extremely low and no radioactivity shall be available to be released from the facility. The likelihood of source capsule failure is very small so the operation of the RTI Model RT-2102 irradiator will provide an extremely clean and safe operation.

3. The ALARA program shall be responsibility of the Radiation Safety Officer.

C. Protected and Restricted Areas

1. A protected area has been established at the boundaries of the perimeter fence enclosing the facilities and surrounding property for security purposes. The fence is closed except for necessary access points, which provide limited access points to the property. The perimeter fence access points are closed and locked when the facility is not staffed. Located within the protected area are restricted areas for which access is controlled for radiological purposes. These areas are the radiation room, demineralizer area, R&D pool and the radiation room roof with the source exposed.

2. The personnel access points to the restricted area are contained within a company controlled access area. Entrance into the controlled access area is limited to company employees and escorted visitors. The entrances to the controlled access area are maintained locked against entry except as necessary for plant operations. The controlled access area shall be locked at all times when not occupied by operations personnel.

D. Radiation and Contamination Limits

There are established "company action limits" that are below the maximum limits allowed by the regulations. Exceeding an action limit will prompt a review by the Radiation Safety Officer and appropriate company personnel. Exceeding a maximum limit will prompt appropriate changes in procedures, and equipment. In this event the NRC shall be notified and approvals for corrective modifications should be requested.

1. Radiation exposure limits shall be in accordance with Section 20.101 of Standards for Protection Against Radiation. Company action limits shall be established as follows:

   a. Whole body exposure - 40 mrem/mo
   b. Skin exposure - 250 mrem/mo
   c. Hands and forearms, feet and ankles - 625 mrem/mo.

2. Loose surface contamination limits shall not exceed 1000 dpm/100 square cm. in restricted areas. Company action limits shall be established at 200 dpm/100 square cm. If the company action limit is exceeded the Radiation Safety Officer shall review the findings with appropriate company personnel. If the maximum contamination level is exceeded, procedures, and equipment will be changed if necessary to assure that contamination levels are returned to ALARA conditions.

3. Maximum water borne concentrations of cobalt-60 shall be in accordance with Section 20.106 of Standards for Protection Against Radiation in restricted and unrestricted areas. Company action limits for cobalt-60 in water have been established at 5×10^{-6} microcuries/ml in restricted and unrestricted areas.

4. Maximum airborne concentrations of cobalt-60 shall be in accordance with Section 20.106 of Standards for Protection Against Radiation in restricted and unrestricted areas. The company does not anticipate any airborne radioactivity based on its limits for loose surface and waterborne radioactivity.

E. Routine Radiation and Contamination Surveys

1. During initial entry into the radiation room after irradiator operation a radiation survey shall be conducted by a certified operator with a low range gamma survey meter. The purpose of this survey is to verify that the irradiation source is in the fully shielded position and a high radiation area no longer exists. This survey need not be recorded.

2. Prior to removal of any material from the shielded volume of the irradiator pool which has been in close proximity to sealed sources a radiation survey shall be conducted by a certified operator to verify that source material or contamination is not being removed from the pool. This survey need not be recorded.

E. Routine Radiation and Contamination Surveys (cont)

3. Prior to removal of any material from the shielded volume of the R and D pool which has been in close proximity to source material a radiation survey shall be conducted by a certified operator to verify that source material is not being removed from the pool. This survey need not be recorded.

4. A weekly radiation survey shall be conducted of the irradiator deionizer piping and resin beds by a certified operator to determine if radioactivity is being released into the shielding pool water. The results of this survey shall be recorded on an appropriate survey form and retained for record purposes.

5. A quarterly radiation and contamination survey shall be conducted of the restricted area of the facility and areas adjacent to the restricted area by a certified operator or health physics technician. This procedure shall also be done at times when there is an increased potential for contamination. The survey shall consist of approximately twenty five swipe samples taken randomly throughout the restricted area and areas adjacent to the restricted area which may be likely to concentrate loose surface contamination. Particular attention shall be concentrated on access and exit traffic areas to the restricted area. Swipes shall be taken over a 100 square cm. area where possible. Radiation surveys shall be conducted within the radiation room with the irraditor shutdown and external to the irradiator shield including the roof area with the irradiator in operation. Swipe samples shall be analyzed with a counter scaler and its associated detector. Survey results shall be recorded on an appropriate survey form and retained on file.

F. Notification of Personnel and Posting of Restricted Areas

1. Notices, instructions and reports to workers shall be in accordance with 10 CFR 19, Notices, Instructions and Reports to Workers; Inspections.

F. Notification of Personnel and Posting of Restricted Areas (cont)

2. Posting of restricted areas shall be in accordance with Section 20.203 of Standards for Protection Against Radiation.

G. Personnel Monitoring

1. Personnel monitoring shall be conducted in accordance with Section 20.401 of Standards for Protection Against Radiation, utilizing film badges.

2. Film badge and dosimetry issue shall be controlled by the Radiation Safety Officer or his designee.

3. Records of personnel exposure to ionizing radiation shall be maintained by the Radiation Safety Officer in accordance with Section 20.401 of Standards for Protection Against Radiation.

4. Self reading personnel dosimeters will be available at the facility for monitoring during an accident situation or during non-routine operations where there is potential for increased exposure to radiation exposure such during the loading of cobalt-60 into the irradiator.

10.1 Personnel Monitoring

Film badges will be assigned to all personnel who routinely work in a restricted area. The film badges will be changed once a month and sent to an NVLAP qualified independent laboratory for analysis and reporting. Presently we are using the R.S. Landauer Co. for our dosimetry

10.2 Radiation Detection Instruments

At least one calibrated, operable survey meter with a range up to at least 1R/hr will be available at all times. All instruments used for surveys will be calibrated so that readings that are at least plus or minus 20 percent of the actual values over the range of the instrument are attainable. Each such instrument shall have a calibration label attached that shows the date of the last calibration and the due date of the next calibration. All such instruments will be calibrated at intervals not to exceed 12 months and/or after servicing. Battery changes are not considered servicing. The calibration records will be kept for a minimum of 2 years. The instruments will be calibrated by a service authorized by the NRC or Agreement State to provide such service or by Radiation Technology, Inc. Currently we are using RAD Services, Inc., NRC license #37-17010-02 to calibrate our instruments.

10.3 Leak Testing

The sealed source array will be leak tested by weekly monitoring of the ion exchange system for radioactivity with a calibrated radiation survey meter. If activity is detected above background the facility will be shut down and water surrounding source modules shall be sampled to determine which module is leaking using Operations Procedure 9.500. The leaking pencil(s) will be isolated in a stainless steel capsule and stored in the pool until it is decided whether to return it back to the manufacturer for re-encapsulation or send it a licensed burial site for disposal.

9.500 LEAKING IRRADIATOR SOURCE DETERMINATION

1.0 PURPOSE

To establish a method to isolate the leaking irradiator source.

2.0 SCOPE

Applies to all personnel who are qualified to perform lea testing of sealed sources in the pool of the radiation room.

3.0 REFERENCES

None

4.0 DEFINITIONS

None

5.0 EQUIPMENT/MATERIAL REQUIREMENTS

5.1 (50 ft.) clear polyethylene tubing

5.2 Rollflex pump

5.3 Stainless steel closure

5.4 Low range radiation survey meter

5.5 (50) 250 ml. sample bottles

5.6 Standard source handling tools

5.7 Anti-contamination materials

6.0 SAFETY PRECAUTIONS

6.1 Operations will be conducted under the direction of the RSO or RSS.

6.0 SAFETY PRECAUTIONS (cont)

6.2 General rules of radiation safety shall apply.

6.3 All operations will be conducted with the sources located at a depth of greater than 10 feet in the pool.

7.0 PROCEDURE

7.1 If the activity of the pool water or the radiation level on the charcoal filter indicates the presence of CO-60, the following actions should be taken to identify and isolate the leaking source.

7.1.1 Locate sampling test equipment listed in Section 5.0 and establish applicable radiological controls.

7.1.2 Connect the suction end of the tubing to a standard source handling tool and lower it into the pool as far as possible from the source.

7.1.3 Place the discharge end of tubing into the pool near the source and secure.

7.1.4 Start the pump and establish flow through the tubing.

7.1.5 Place the detector of a low range survey instrument adjacent to the tubing.

7.1.6 Establish a background radiation level.

7.1.7 Move the suction end of the tubing directly adjacent to the source in the first module and monitor the survey meter for an increase in reading.

NOTE: Allow sufficient time for sample transit before moving on to the next sample location.

NOTE: If a source has obviously been damaged due to an accident or equipment failure, the source or sources which have visual damage should be tested first.

7.1.8 If a noticeable increase in radiation level is determined in the area of a module, move from the plaque and place on the table.

7.1.9 Move the tubing to the table and repeat the sampling.

NOTE: This will ensure the leaking module has been removed.

7.1.10 Remove the sources one at a time and sample tests each to determine the leaking source.

7.1.11 Place the leaking source in stainless steel enclosure, in preparation for disposal or repair.

7.2 If the source leak rate is too low to allow detection using the above procedures, an alternate method is:

7.2.1 Draw a 250 milliliter sample at the pump discharge.

7.2.2 Count the sample using the standard liquid sampling techniques.

7.3 If the alternate method of detection does not prove effective due to a very low leak rate:

7.3.1 Place each source in the stainless steel enclosure for an 8 hour period of time.

7.3.2 Sample the water from the enclosure.

7.3.3 Perform a radioactivity analysis of water sample.

7.3.4 Continue this process until the source is isolated.

7.3.5 Place the leaking source in a stainless steel enclosure.

7.3.6 Snip off site for repair or disposal per RTI procedure 9.401.

10.4 Operating and Emergency Procedures

Enclosed is the table of contents of the procedures manual available to each operator. The operating procedures provide instructions for personnel monitoring loading/unloading of Cobalt-60, startup, shutdown and precautions to be taken before startup. Instruction in performing radiation surveys to ensure compliance with the provisions of Section 20.203(c)(6) of 10 CFR 20 are given in both the training program and the procedures manual. Instruction in what emergencies to expect and what actions to take are included both in the training program and the procedures manual. All instruction stresses that the Radiation Safety Officer and/or Radiation Safety Supervisor are to be notified immediately in case of an emergency. Instruction is also provided to operators in all associated irradiator operations both in the training and the procedures. Copies of the operating and emergency procedures shall be distributed and properly implemented by all applicable R.T.I. personnel.

Radiation Safety Procedures

Operating Procedures

Leak Test Certification

10.5 Hospital Arrangements

For radiation overexposures, arrangements have been made with the St. Barnabas Hospital. A letter of commitment from the hospital's management is enclosed.

Item 11 Waste Management

Disposal of the licensed material will be in accordance with Section 20.301(a) of 10 CFR 20.

SAINT BARNABAS
MEDICAL CENTER

RONALD J. DEL MAURO
President and Chief Executive Officer

JOHN D. PHILLIPS, M.H.A.
Executive Vice President

June 3, 1986

Robert Cockrell, Ph.D.
Vice President of Operations & Engineering
Radiation Technology, Inc.
108 Lake Denmark
Rockaway, New Jersey 07866

Dear Doctor Cockrell:

This is to confirm that Saint Barnabas Medical Center agrees to accept as patients persons who have been overexposed to radiation in the course of their occupation.

At this medical center we have the capability both hematologically and oncologically to manage such patients.

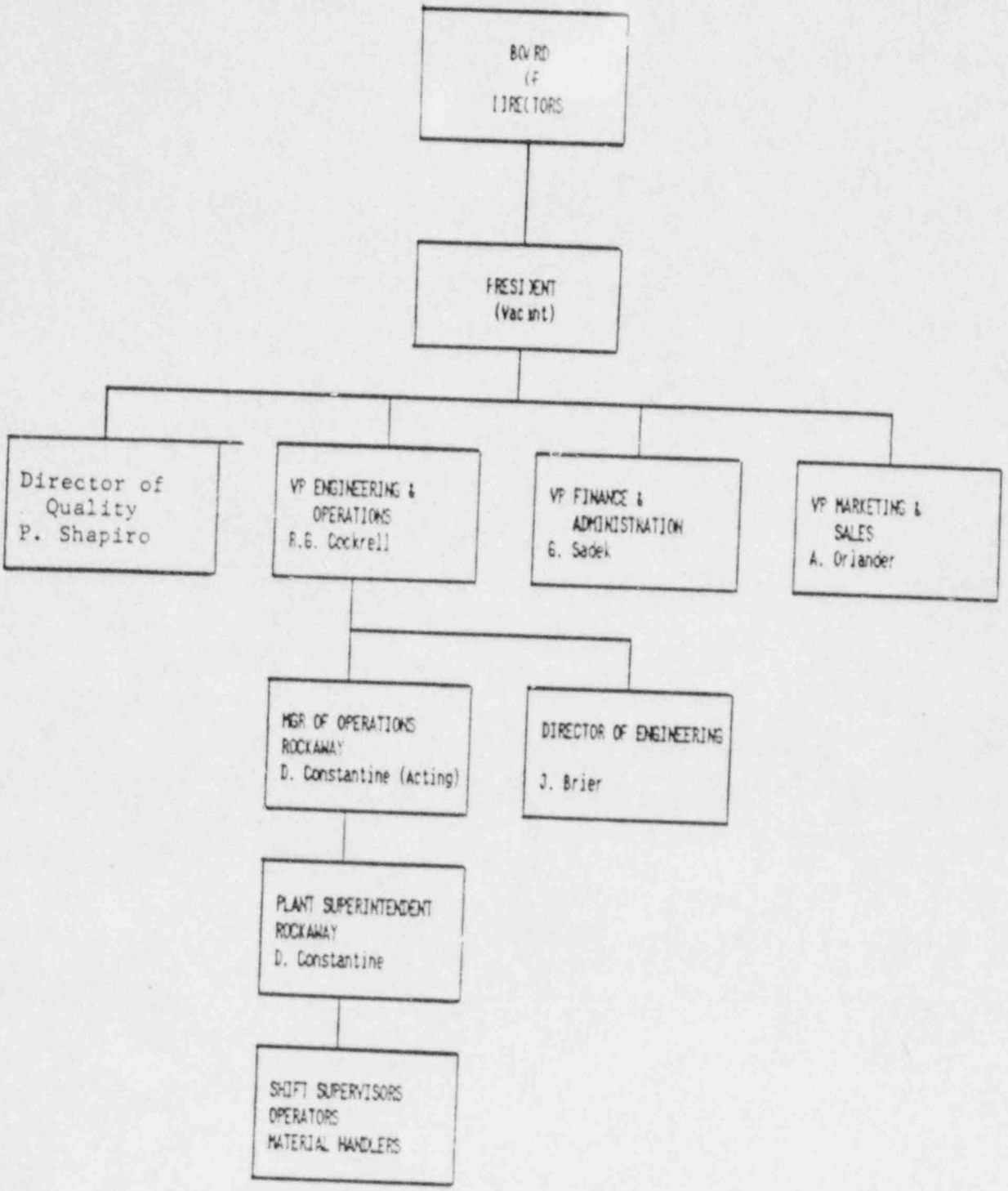
Sincerely,

Harvey E. Nussbaum, M.D., F.A.C.C. F.A.C.P.
Chairman, Department of Medicine
Saint Barnabas Medical Center

Clinical Professor of Medicine
UMDNJ/New Jersey Medical School

HEN/ct

cc: John D. Phillips
Flora Barlotta, M.D.
Medical Staff Office
Z. Schrader, M.D.



ORGANIZATIONAL CHART
OPERATIONS - ROCKAWAY FACILITY
RADIATION TECHNOLOGY, INC.

Robert G. Cockrell

PROFESSIONAL RESUME

EDUCATION

Doctor of Philosophy (1965)
Major: Nuclear Engineering — University of Florida
Minors: Physics and Math — Gainesville, Florida

Master of Science (1963)
Major: Nuclear Engineering — University of Florida
Minors: Physics and Math — Gainesville, Florida

Bachelor of Science with Special Distinction (1962)
Major: Engineering Physics — University of Oklahoma
Minor: Math — Norman, Oklahoma

REGISTRATION

Professional Engineer #11039 (North Carolina)

NATIONALITY

U.S. Citizen[redacted]

AREAS OF EXPERTISE

Adult Training and Education

Developed and taught training programs to industry personnel and college courses to university students both live and on television.

Public Relations

Dynamic speaker on technical and non-technical topics before all age groups in person and on television. Experienced with news media and hostile audiences.

Technical Management

Project Manager of a multi-billion dollar project. Engineering Manager responsible for design and licensing of five power plants. Project manager for construction and startup of a food irradiation facility. Project Manager for decommissioning of a nuclear reactor.

Quality Assurance

Developed a QA program at a major private utility including staffing, procedure preparation, training, and implementation. Served on national committees. Chaired a national QA conference.

State and Federal Energy Regulations

Major responsibility in the licensing/permitting of ten energy facilities relative to construction, operation, and decommissioning. Taught a university course on licensing and regulation of nuclear power plants.

PROFESSIONAL EXPERIENCE

May 1983 to Present

President, Cockrell & Associates, Inc., Burlington, N.C.

Major Responsibilities: Technical Consultant. Provide technical management services and resources for high technology industries, including those associated with the use of nuclear radiation as a primary energy source. Provide education and training of technical and management personnel. Perform Quality Assurance audits and assist in the development and implementation of QA programs. Prepare licensing documentation for the operation of nuclear radiation facilities and assist in meetings with regulatory authorities.

August 1980 - May 1983

Director of Nuclear Reactor Program and Associate Professor of Nuclear Engineering, North Carolina State University, Raleigh, N.C.

Major Responsibilities: Directed the operation of a 1 MW research reactor and the operation of associated nuclear measurements and analysis laboratories. Taught courses in nuclear engineering, power plant design, and licensing & environmental impact of power plants. Decommissioned a 10 kw research reactor including preparation of project plan, interfacing with State and Federal regulatory authorities, resolution of waste disposal problems, and overall project management. Taught videotaped 3 credit hour college course to operations personnel at Brunswick Nuclear Station. Consulted with Carolina Power & Light Company on educational courses for operations personnel. Directed a feasibility study for providing educational courses to nuclear power plant operators at Virginia Electric Power Company. Taught radiation courses to civilian employees of the US Navy. Taught Nuclear Radiation workshops to high school juniors. Presented technical seminars, including a power plant design course to employees at the General Electric Nuclear Fuel Plant.

May 1977 - August 1980

Manager of Engineering Division, Washington Public Power Supply System, Richland, Washington

Major Responsibilities: Responsible for all engineering activities at WPPSS, including design, construction and licensing of five nuclear power plants and a 40,000 square foot office building. Professional staff of 130 engineers. Represented WPPSS in meetings with NRC and on AIF, EEI, APPA and Owner's Group Committees. Made technical presentations to the Board of Directors. News media spokesman on technical matters including impact of TMI on WPPSS plants.

July 1973 - April 1977

Quality Assurance Manager, Florida Power & Light Company, Miami, Florida
Major Responsibilities: All QA activities in the areas of design, construction, procurement, and operation of Turkey Point and St. Lucie nuclear power plants. Initially, the QA Department had four inexperienced personnel and no program. Two years later the QA Department had 45 personnel, a well established program recognized by utilities across the nation, and representatives on the major QA policy setting committees (e.g. ANSI N45-2 plus 5 subcommittees and ASME Section III) Chaired ASQC National Conference in 1976.

Project General Manager, South Dade Project, FPL
Major Responsibilities: Responsible for all activities related to design, procurement, licensing, and construction of two 1140 MWe Westinghouse PWR nuclear power plants. Interfaced with Bechtel Power Division, Gaithersburg on plant design. Prepared project budgets and plans. Interfaced with licensing agencies. To satisfy need for more nuclear engineers, set up an intensive 14-week course taught by the University of Florida to provide the fundamentals of nuclear power plant design to 53 employees.

Strategic Planner on the President's Staff, FPL
Major Responsibilities: Performed studies in the area of power generation planning. A principal area of study was coal-fired power generation and its associated environmental problems.

November 1967 - July 1973

Project Coordinator in the Reactor Engineering Section, Westinghouse Advanced Reactors Division, Waltz Mill, Pa.
Major Responsibilities: Coordinated the engineering analyses on the fuel irradiation program and the 1000 MWe liquid Metal Fast Breeder Reactor (LMFBR).

Manager of Safety and Licensing for LMFBR, WARD
Major Responsibilities: Developed and/or made operational more than 20 computer codes for analyzing reactor malfunctions from the postulated initiating condition to the final consequences. Established accident evaluation criteria. Developed principal design criteria. Founded the ANS-24 (Now ANS 54) Committee for development of LMFBR safety criteria.

Manager of Refueling and Service Systems, WARD
Major Responsibilities: Responsible for design of reactor auxiliary systems, refueling systems and containment. Represented WARD as liaison with architect-engineers (Ralph M. Parsons Co. and Burns & Roe) on overall plant layout and arrangement. Significant contributor to the effort that resulted in the award of the Clinch River Breeder Project to Westinghouse.

July 1966 - November 1967

Lead Engineer, Nuclear Rocket Propulsion Group, Boeing Aerospace Division Huntsville, Alabama
Major Responsibilities: Developed digital computer code for simulation of the thermal-hydraulic and nuclear kinetics of the NERVA nuclear rocket engine. Made operational shielding codes for evaluating nuclear heating of the rocket propellant. Taught a company course in nuclear rocket propulsion.

July 1965 - July 1966

Assistant Professor, Nuclear Engineering, University of Florida, Gainesville, Florida
Major Responsibilities: Taught courses in reactor physics, nuclear rocket propulsion, and radiological safety. Also, taught a 3-week course in Nuclear Power Plant Technology to the management personnel of Florida Power & Light Company. Performed research in reactor kinetics.

February 1962 - July 1965

Graduate Assistant and Atomic Energy Commission Fellow, University of Florida, Gainesville, Florida
Major Responsibilities: Taught "Introduction to Nuclear Engineering" and "Radiological Safety." Performed computer analyses of experimental data and analytical studies in the area of reactor kinetics.

SELECTED PUBLICATIONS AND PRESENTATIONS

"Decommissioning of the R-3 Reactor at North Carolina State University," paper presented at 1982 ANS Winter Meeting and project report to United Nuclear Corp.

"Feasibility Study for Providing Educational Courses to Nuclear Power Plant Operators," report completed December 15, 1982, under VEPCO contract #99-00-82-006.

"Quality Assurance, a Traditional Approach to Management," Sixth Annual National Energy Division Conference of the American Society of Quality Control, September, 1979.

"Communicating Technical Information in a Non-Technical Manner," Mexican-American Engineering Society Fourth National Symposium on Engineering, California State University, Fullerton, March, 1980.

"Florida Power and Light Nuclear Power Engineering Training Program," Transactions American Nuclear Society Eighth Biennial Topical Conference on Reactor Operating Experience, August, 1977.

PROFESSIONAL ASSOCIATIONS

National Society of Professional Engineers
Professional Engineers of North Carolina
American Nuclear Society

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9.500 PREVENTATIVE MAINTENANCE

1.0 PURPOSE:

To describe the preventative maintenance program in place at the Rockaway Facility.

2.0 SCOPE:

Applies to the irradiator operators at the Rockaway Facility.

3.0 REFERENCES:

NRC license

4.0 DEFINITIONS:

4.1 Preventative Maintenance Checklist - a permanent record of completed maintenance items.

4.2 Daily Schedule - a calendar schedule for a period of one day listing maintenance items to be completed during the day.

4.3 Weekly Schedule - a calendar schedule for a period of one week listin maintenance items to be completed during the week.

4.4 Monthly Schedule - a calendar schedule for a period of one month list maintenance items to be completed during the month.

4.5 Semi-annual Schedule - a calendar schedule for a semi- annual period time listing maintenance items to be completed during a six month per

4.6 Annual Schedule - a calendar schedule for a period of one year listin maintenance items to be completed during the year.

4.7 Technical Manuals - descriptive manuals which provide a reference source for maintenance items to be completed.

5.0 EQUIPMENT/MATERIAL REQUIREMENTS:

Specified in for each task.

6.0 SAFETY PRECAUTIONS:

None

7.0 PROCEDURE:

7.1 The plant superintendent or his designee will develop an annual maintenance schedule using the Preventative Maintenance Check List.

7.2 The Plant superintendent or his designee will develop procedures for performing the maintenance activity using the equipment technical manual.

NOTE: This applies only if the activity is of sufficient detail to benefit from a procedure.

7.3 The annual schedule will be broken into annual, semi-annual, quarterly, monthly, weekly, and daily schedules.

7.3 The Plant superintendent or his designee will assign tasks to the individual shifts on a daily basis.

7.4 The activities will be performed and signed off by the shift daily on the Preventative Maintenance Check List, Exhibit 8.1.

NOTE: If a scheduled activity can not be completed on the assigned shift, the Plant superintendent and his designee will reassign the activity.

7.5 The Plant superindent and designee shall coordinate the conduct of maintenance activities with the Manager of Operations to prevent conflict in committments.

7.6 The preventative maintenance program shall be audited by quality assurance at least monthly.

8.0 EXHIBITS

8.1 Preventative Maintenance Check List

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ROCKAWAY IRRADIATOR FACILITY
MAINTENANCE SCHEDULE

SYSTEM	MAINTENANCE DESCRIPTION	DATE INITIA
	DAILY CHECKS	
AS	Check air compressor oil level	
AS	Drain the Expansion tank	
AS	Drain air water seperators	
AS	Check air exit temperature does not feel warm	
AS	Check water flow to after coolers	
AS	Fill air line lubricators	
IR	Perform interlock test	
DE	Log resistivity of the input and output on demineralizer	
DE	Log demineralizer flow rate	
IR	Log the pool level,test functionality of level indicators	
SE	Perform plant security checks	
CO	Check conveyor system for abnormal noises with motor on.	
CO	Perform a visual check of the guide bars	
GE	Housekeeping	
GE	Perform tote inspection	
	WEEKLY CHECKS	
DE	Check d/p on charcoal filter	
R/D	Check water quality on P/D pool	
AS	Check solenoid board for air/oil leaks	
AS	Check air lines and pistons in the cell for leaks	
AS	Check the source hoist penthouse for air system leaks	
CE	Check condition of microswitches	
CE	Check for exposed or frayed wiring	
CE	Check for the proper operation of the in-cell conveyor	
CE	Grease elevator rails and unistrut rails	
CE	Sweep down the cell	
CE	Clean the in-cell conveyor	
CE	Check in-cell lighting	
DE	Perform a radiological survey of the demineralizer	
CO	Clean the conveyor system	
CO	Tighten and reposition guide bars	
GE	Check condition of stretch wrapper including wiring	
GE	Check the condition of the cold locker	
GE	Check plant lighting	
CE	Check the condition of the manual conveyor track at the loading and unloading area.	
GE	Replace temperature strip chart	
GE	Check pest traps and change if neccessary	
	MONTHLY CHECKS	

AS	Check compressor pressure switch
AS	Check compressor for leaks
AS	Clean air filters on compressors
CE	Check time stroking speed for all pistons
FF	Perform monthly fire extinguisher checks
FF	Check the fire sprinkler main pressure gauges
CO	Check power unit chain
CO	Check chain tension on upper conveyor
CO	Check loading elevator hydraulic oil level and screen
GE	Clean and lube forklift chains
GE	Check water level in forklift batteries

QUARTERLY CHECKS

AS	Confirm outside inspection of compressor has occured
AS	Ensure all repairs and service completed
AS	Wash down the radiator for Kellog compressor
AS	Replace diaphram on the quick exhaust valves
AS	Check pistons for air leakage
IR	Check source hoist and guide cables
GE	Check emergency lights
WW	Perform well water sampling
WW	Check pumps P2,P3,P6 for volatile organic compounds
WW	Check P2 for coliform
VE	Check the conditions of belts and the belt tension exhaust fan
VE	Lubricate exhaust fan bearings
VE	Check the d/p on the Hepa filter
IR	Vacuum the control console internals
CE	Check the condition of the rollers
GE	Check the condition of the wiring on the source hoist
GE	Check the condition of the vacuum lift
CO	Check the oil level in the conveyor unit gearcase
CO	Align the chain and sprokets of drive rollers
CO	Check tighness of the sprocket set screws

SEMI-ANNUAL CHECKS

EL	Perform a ground wire check
EL	Perform a plant wiring check
CO	Drain conveyor motor gearcase and add new lubricant
CO	Inspect the clutch assembly
CO	Lubricate sensor valve and pivots of upper conveyor
CO	Lubricate drive rollers
CE	lubricate cell rollers
CO	Check/replace upper conveyor clutch assemblies
VE	check vent exhaust dampers flow

ANNUAL CHECKS

AS	Change compressor sump oil and filter elements
GE	Clean and inspect air conditioners
GE	Inspect and oil chain and hoist, main plant/back room

GE Perform the fire test in cell
GE Perform test on high temperature alarm
DE Perform inspection on charcoal in filter

Note: Record on permanent record any abnormal condition found, and the actions taken to correct the condition.

JUN 23 1986

Radiation Technology, Inc.
ATTN: Robert G. Cockrell, Ph.D.
V.P. Operations & Engineering
108 Lake Denmark Road
Rockaway, NJ 07866

Gentlemen:

This refers to your application dated June 4, 1986, for renewal of Materials License 29-13613-02.

We received your check for $930 in payment of the renewal fee specified in fee Category 3G of §170.31 of the enclosed 10 CFR 170. Your application, however, is also subject to a renewal fee of $170 as specified in fee Category 3E of §170.31. Payment of the additional $170 should be made to the U.S. Nuclear Regulatory Commission and mailed to my attention at our Washington, D.C. address.

Your application will be processed by the Region I Licensing staff located at 631 Park Avenue, King of Prussia, Pennsylvania 19406. The additional fee, however, is required prior to issuance of the renewal. When submitting the fee, please refer to CONTROL NUMBER 105620.

Sincerely,

Original Signed By
Glenda Jackson

Glenda Jackson
License Fee Management Staff
Office of Administration

Enclosure:
10 CFR 170

c: Region I

DISTRIBUTION:
Pending Fee File
Weekly Reading File
Material Reading File
DW/REJ/RTI

OFFICE:	LFMS:ADM	LFMS:ADM
SURNAME:	SKimberley:rej	GJackson
DATE:	6/20/86	6/20/86

8610070550 2pp.

CONVERSATION RECORD

TIME: 10:30 | DATE: 6/24/86

TYPE: ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☒ INCOMING ☐ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Dr. Robert Cockrell	Radiation Technology	201-625-8400 / 201-989-0043

ROUTING

NAME/SYMBOL	INT

SUBJECT: Addl fee for 6/5/86 renewal app for 29-13613-02 (Control No. 105620)

SUMMARY

Dr. Cockrell returned my call. I told him of the additional fee requested in my letter of 6/23/86 (A170-3E). He stated that he would express mail a check to my attention today.

ACTION REQUIRED: Call RI when check is rec'd (shown on grant costello)

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
	B Jackson	6/24/86

ACTION TAKEN: Rec'd check 6/25/86 & RI was notified

SIGNATURE	~~TITLE~~	DATE
	Glenda Jackson	6/25/86

U.S. G.P.O. 1983-381-526/8346

RTCH: NASDAQ

TELEX: 642948 RNDH
ATTN: RAD TECH

Radiation Technology, Inc.

108 LAKE DENMARK ROAD, ROCKAWAY, N. J. 07866
(201) 625-8400

June 24, 1986

RTI:RGC:86021

License No: 29-13613-02

Nuclear Regulatory Commission
Air Rights III Building
4550 Montgomery Avenue
Bethesda, MD 20814

ATTENTION: Ms. Glenda Jackson

Dear Ms. Jackson:

RE: License #29-13613-02 - Self Shielded Irradiator - 3E

In response to your telephone call on June 24, 1986, enclosed is a check for $170.00 to cover the fee for licensing of the Shelf Shielded Irradiator - 3E which is listed in our license renewal application submitted to the NRC on June 5, 1986.

Sincerely yours,

Robert G. Cockrell

Robert G. Cockrell, Ph.D.
Vice President
Operations and Engineering

RGC:jat
Enclosure

8610070553