

**ENCLOSURE 1**

**Appendix B**  
***Staffing Analysis Forms***

**Staff Need / Resource Analysis**

**Instructions**

Address all Major Program Areas. Note that the following is representative and may not be a complete list of technical staff activities for any particular program.

**A. Need Analysis**

1. In the Licensing and Inspection Program Areas: For each License Category, enter the number of licenses (not licensees) your program will have. See the sample "NEED ANALYSIS" form, attached.
2. Estimate the average number of licensing actions (new, renewal, amendments, and terminations) you expect to receive per year per license in that category. For estimate assistance, talk to your NRC Region and the existing Agreement States about their experience.
3. Estimate the number of staff days you need to process an average action.
4. Multiply the estimates in steps 2 and 3 to derive an estimate of the number of staff days you will need to process the expected licensing actions for that category.
5. Repeat steps 2, 3 and 4 for inspections. Include reactive inspections, and consider preparation, travel, on-site, and report writing time.
6. Conduct a similar analysis for the other Major Areas of your Program. You should consider: regulation development; decommissioning (including SDMP sites); response to incidents and allegations; contingencies and unanticipated work; and supervisory functions (including inspector accompaniments).

**B. Resource Analysis**

1. Enter staff member ID in blank boxes on top row. See the sample "RESOURCE ANALYSIS" form, attached.
2. In the Licensing and Inspection Program Areas: For each License Category the individual is qualified to inspect, enter the number of days the individual will be available for inspections of those licensees.

3. For each License Category the individual is qualified to review licenses, enter the number of days the individual will be available for reviewing actions of those licensees.
4. For each License Category, sum the days available over all inspectors and enter on the Balance Analysis. Sum the days available over all license reviewers and enter on the Balance Analysis.
5. Conduct a similar analysis for the other Major Program Areas.

#### C. Balance Analysis

1. In the Licensing and Inspection Program Areas: For each License Category, compare the estimated number of days needed and days available for licensing and inspections. The number of days available **must be at least equal** to the number of days needed.
2. In the other Program Areas: For each Program Area, compare the estimated number of days needed and days available. The number of days available **must be at least equal** to the number of days needed.

# STAFF NEEDS ANALYSIS

License Category	Number of Licenses	Licensing actions / yr	Staff days per action	Licensing staff days	Inspections per year	Staff days / inspection	Inspection staff days
Academic							
Broad Scope Academic							
Nuclear Med - Uptake, etc							
Nuclear Med - Imaging							
Nuclear Med - therapy							
Bone Mineral							
Brachytherapy							
Teletherapy							
Medical - Broad Scope							
Nuclear Pharmacy							
Fixed Gauge							
Portable Gauge							
Industrial - other							
Broad Scope Industrial							
Industrial Radiography							
Well Logging							
LLW broker							
LLW site							
U mill							
SS&D							

# STAFF RESOURCE ANALYSIS

Staff Member											Total	
License Category	Insp	Lic	Insp	Lic								
Academic												
Broad Scope Academic												
Nuclear Med - Uptake, etc												
Nuclear Med - Imaging												
Nuclear Med - therapy												
Bone Mineral												
Brachytherapy												
Teletherapy												
Medical - Broad Scope												
Nuclear Pharmacy												
Fixed Gauge												
Portable Gauge												
Industrial - other												
Broad Scope Industrial												
Industrial Radiography												
Well Logging												
LLW broker												
LLW site												
U mill												
SS&D												

# STAFF BALANCE ANALYSIS

License Category	Inspection staff days		Licensing staff days	
	Needed	Available	Needed	Available
Academic				
Broad Scope Academic				
Nuclear Med - Uptake, Dilution, and Excretion				
Nuclear Med - Imaging				
Nuclear Med - Therapy				
Bone Mineral Analysis				
Brachytherapy				
Teletherapy				
Medical - Broad Scope				
Nuclear Pharmacy				
Fixed Gauge				
Portable Gauge				
Industrial - other				
Broad Scope Industrial				
Industrial Radiography				
Well Logging				
LLW broker				
LLW site				
U mill				
SS&D				

**ENCLOSURE 2**

# **CRITERIA FOR AN ADEQUATE RADIATION CONTROL PROGRAM**

This Combined Criteria document  
incorporates the following into one document:

*Interim Criteria for Adequate Radiation Control Programs (Radon)*

*Criteria for Adequate Radiation Control Programs (Environmental Monitoring and Surveillance)*

*Criteria for Adequate Radiation Control Programs (Nonionizing)*

*Criteria for Adequate Radiation Control Programs (Radioactive Materials)*

*Criteria for Adequate Radiation Control Program (X-Ray)*

Prepared by James E. Hickey

April 1999

Published by  
Conference of Radiation Control Program Directors, Inc.  
205 Capital Avenue  
Frankfort, Kentucky 40601

This publication was supported in part by grant number FD-U-000005 from the Food and Drug Administration.

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The information contained in this document is for guidance. The implementation and use of the information and recommendations contained in this document are at the discretion of the user. The implications from the use of this document are solely the responsibility of the user.

This document has been developed by the Conference of Radiation Control Program Directors, Inc. (CRCPD) and accepted by the Board of Directors for publication. The contents contained herein, however, may not necessarily represent the views of the entire membership of the CRCPD or any federal agency supporting the work contained in this document. The mention of commercial products, their sources, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products by the CRCPD or any federal agency.

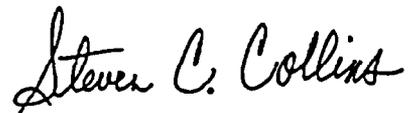
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## FOREWORD

The Conference of Radiation Control Program Directors, Inc. (CRCPD) is an organization made up of the radiation control programs in each of the 50 states (except Wyoming, which has no radiation control program), the District of Columbia, and Puerto Rico, and of individuals, regardless of employer affiliation, with an interest in radiation protection. The primary purpose and goal of CRCPD is to assist its members in their efforts to protect the public, radiation worker, and patient from unnecessary radiation exposure. CRCPD also provides a forum for centralized communication on radiation protection matters between the states and the federal government, and between the individual states.

One method of providing assistance to the states, as well as to other interested parties, is through technical and administrative publications. Most technical publications of CRCPD are written by various committees, task forces, or special working groups. Most administrative publications are written by staff of the Office of Executive Director (OED).

This publication, *Criteria for an Adequate Radiation Control Program*, is intended to provide program managers a tool for evaluating program activities using consensus criteria that are well defined and represent the hallmarks of an adequately functioning radiation control operation. The document also serves as an authoritative reference when questions arise regarding the importance of specific program components or standards of practice.



Steven C. Collins, Chairperson  
Conference of Radiation Control  
Program Directors, Inc.

## PREFACE

This document was developed for the CRCPD by James E. Hickey, former program director of the Rhode Island Radiation Control Program. This criteria document is an incorporation of five separate documents into one combined document. The documents that are incorporated here are:

*Interim Criteria for Adequate Radiation Control Programs (Radon)*, CRCPD Publication 90-8;

*Criteria for Adequate Radiation Control Programs (Environmental Monitoring and Surveillance)*, CRCPD Publication 86-4;

*Criteria for Adequate Radiation Control Programs (Nonionizing)*, CRCPD Publication 85-2;

*Criteria for Adequate Radiation Control Programs (Radioactive Materials)*, CRCPD Publication 82-2; and

*Criteria for Adequate Radiation Control Program (X-Ray)*, DHHS Publication (FDA) 81-8160.

This document responds to a need to update the previously published criteria, to add new program areas for low-level waste and non-reactor emergency response, and to consolidate and integrate the criteria for all program areas into one combined document.



Charles M. Hardin, Executive Director  
Conference of Radiation Control  
Program Directors, Inc.

## ABSTRACT

Hickey, James E., *Criteria for an Adequate Radiation Control Program*. CRCPD Publication 99-2 (April 1999) (52 pp).

This document provides consensus criteria that are well defined and represent the hallmarks of an adequately functioning radiation control operation. The document also serves as an authoritative reference when questions arise regarding the importance of specific program components or standards of practice.

# CONTENTS

FOREWORD .....	iii
PREFACE .....	iv
ABSTRACT .....	v
INTRODUCTION .....	1
RCP ADMINISTRATION .....	2
ORGANIZATION .....	2
Jurisdiction .....	2
Letters of Agreement .....	2
Organization Chart .....	2
MANAGEMENT .....	2
Management Structure and Philosophy .....	2
Radiation Control Program Director .....	2
Supervision .....	3
Coverage .....	3
Management Plan .....	3
Policies .....	3
Technical and Administrative Procedures .....	3
Enforcement Options .....	4
Enforcement Philosophy .....	4
Enforcement Procedures .....	4
Enforcement Communications .....	4
Complaint Procedures .....	4
Public Information .....	5
Record Formats and Maintenance .....	5
Electronic Recordkeeping and Client Submissions .....	5
Field Procedures Quality Assurance .....	5
RCP AUTHORITIES .....	6
LEGISLATION .....	6
Suggested State Legislation .....	6
Additional Wording .....	6
Specific Content .....	6
REGULATIONS .....	7
Consistency and Compatibility .....	7
Comprehensiveness .....	7
Revisions .....	8

Reviews .....	8
Adoption Procedures .....	8
RCP RESOURCES .....	9
PERSONNEL .....	9
Staffing Pattern .....	9
Compensation .....	9
Career Development .....	9
Job Descriptions .....	9
Staff Training Plan .....	9
Performance Reviews .....	10
Training Materials .....	10
Problem Intervention .....	10
Employees Conduct Manual .....	10
Disciplinary Action .....	11
External Personnel .....	11
Personnel Radiation Safety .....	11
Discrimination Policy .....	11
FINANCIAL .....	11
Funding Sources .....	11
Budgeting .....	12
Accounting .....	12
EQUIPMENT .....	12
Adequacy and Suitability .....	12
Inventory .....	12
Calibration .....	12
Repair and Maintenance .....	13
SUPPORT SERVICES .....	13
Legal .....	13
Analytical .....	13
Computer .....	13
RCP OPERATIONS .....	14
ELECTRONIC PRODUCT RADIATION — X-RAY .....	14
Subprogram Scope .....	14
Staffing .....	14
Facility Registration .....	14
Registration of Services .....	14
Inspection Scheduling .....	15
Inspection Assignment and Tracking .....	15
Inspection Procedures .....	15

Inspection Measurements .....	15
Inspection Reports .....	16
Inspection Review and Correspondence .....	16
Non-RCP Inspectors .....	16
NEXT Surveys .....	16
Quality Assurance .....	16
Mammography .....	17
Operator Certification .....	17
User Education and Assistance .....	17
<b>ELECTRONIC PRODUCT RADIATION — NONIONIZING .....</b>	<b>17</b>
Subprogram Scope .....	17
Staffing .....	17
Nonionizing Radiation Source Registration .....	18
Inspection Scheduling .....	18
Inspection Assignment and Tracking .....	18
Inspection Procedures .....	18
Inspection Measurements .....	18
Inspection Reports .....	19
Inspection Review and Correspondence .....	19
Outside Inspectors .....	19
User Education and Assistance .....	19
<b>RADIOACTIVE MATERIALS .....</b>	<b>20</b>
Subprogram Scope .....	20
Staffing .....	20
Review of License Applications .....	20
Content of License Applications .....	20
Licensing Guides .....	21
License Document .....	21
License Amendments .....	21
License Renewal .....	21
Registration of Devices Under General License .....	21
Termination of Licenses .....	21
Surety .....	22
Source and Device Evaluations .....	22
Inspection Scheduling .....	22
Inspection Assignment and Tracking .....	22
Inspection Procedures .....	22
Inspection Measurements and Samples .....	23
Inspection Reports .....	23
Inspection Review and Correspondence .....	23
Quality Assurance .....	23
User Education and Assistance .....	23

RADON .....	24
Subprogram Scope .....	24
Staffing .....	24
Measurement Contractors .....	24
Mitigation Contractors .....	24
Inspections .....	25
Radon Concentration Guidance .....	25
Mitigation Practices .....	25
Surveys and Research .....	25
Public Information .....	25
Technology Transfer .....	26
Schools and Public Buildings .....	26
External Strategies .....	26
 ENVIRONMENTAL RADIATION SURVEILLANCE .....	 26
Subprogram Scope .....	26
Staffing .....	26
Ambient Monitoring .....	27
Source Oriented Monitoring .....	27
Emergency Response Monitoring .....	27
Laboratory Procedures Manual .....	27
Field Procedures Manual .....	28
Recording Analytical Results .....	28
Quality Assurance .....	28
Annual Reports .....	29
Surveillance Guidance .....	29
 LOW-LEVEL RADIOACTIVE WASTE (LLW) .....	 29
Subprogram Scope .....	29
Staffing .....	29
LLW Verification Program .....	30
Licensee LLW Inspections .....	30
Transport Monitoring .....	30
Broker Monitoring .....	30
Compact Administration .....	30
LLW Siting Activities .....	30
LLW Site Regulation .....	31
Environmental Monitoring .....	31
Risk Communication Activities .....	31
 NON-REACTOR EMERGENCY RESPONSE .....	 31
Subprogram Scope .....	31
Staffing .....	32
Response Planning .....	32
Response Personnel .....	32
Communications .....	32

Transportation .....	32
Field Equipment .....	33
Interagency Coordination .....	33
Exercises .....	33
Interstate Assistance Agreements .....	33
Federal Agency Support .....	33
Consultants .....	33

## APPENDICES

APPENDIX A. MANAGEMENT PLAN GUIDANCE .....	34
APPENDIX B. JOB DESCRIPTIONS .....	36
APPENDIX C. PROFESSIONAL/TECHNICAL STAFFING GUIDANCE .....	40
APPENDIX D. SCHEDULING GUIDANCE .....	41
APPENDIX E. SURVEILLANCE GUIDANCE .....	42

## INTRODUCTION

For almost four decades, state and local radiation control programs have been evolving along similar lines, incorporating regulations, procedures, and activities that are quite uniform. During this period the Conference of Radiation Control Program Directors, Inc. (CRCPD), the national organization of the managers and the staffs of these programs, has served as an agent to promote consistency and excellence in governmental radiation control programs. Among its many activities, CRCPD has previously published documents addressing criteria for adequate programs in five specific areas of radiation control: x-ray, nonionizing radiation, radioactive materials, radon, and environmental monitoring and surveillance. This document responds to a need to update the previously published criteria, to add new program areas for low-level waste and non-reactor emergency response, and to consolidate and integrate the criteria for all program areas into one combined document.

This document is intended to provide program managers a tool for evaluating program activities using consensus criteria that are well defined and represent the hallmarks of an adequately functioning radiation control operation. The document also serves as an authoritative reference when questions arise regarding the importance of specific program components or standards of practice. The criteria contained in this document will be used by CRCPD as the basis for program reviews conducted at the request of program management.

This document addresses:

Administration: organization and management,

Authorities: legislation and regulations;

Resources: personnel, financial, equipment, and support services, and

Radiation control program operations.

For purposes of this document, the overall radiation control activities are referred to as the Radiation Control Program (RCP) and the seven operational areas referred to as subprograms are:

Electronic Product Radiation — X-Ray,

Electronic Product Radiation — Nonionizing,

Radioactive Materials,

Radon,

Environmental Radiation Surveillance,

Low-level Radioactive Waste,

Non-reactor Emergency Response.

For simplicity, the RCP is assumed to be a single agency incorporating all subprograms within a jurisdiction, a concept that CRCPD supports. However, CRCPD recognizes that some jurisdictions apportion radiation control functions among two or more agencies. In such cases each agency should meet those criteria applicable to those subprograms for which it has responsibility, and the state or local entity should meet all criteria.

# **RCP ADMINISTRATION**

## **ORGANIZATION**

### **Jurisdiction**

All major radiation protection subprograms that are applicable to a particular jurisdiction (state/region/local) should ideally be within the primary radiation control program (RCP). Major subprogram areas include the following: electronic product radiation, which is composed of two subprograms, ionizing and nonionizing; environmental surveillance and monitoring; radon; low-level radioactive waste; radioactive materials; and non-reactor radiological emergency response.

### **Letters of Agreement**

When radiation protection subprograms are divided among agencies within a jurisdiction, letters of agreement designed to maximize cooperation and minimize duplication of effort should be in place. The agencies should meet periodically (e.g., quarterly) to discuss interagency issues.

### **Organization Chart**

The RCP should have an organization chart or other description that identifies the RCP's position within the larger governmental hierarchy. It should also identify each major subprogram and position within the RCP, and delineate the chain of authority and responsibility by position within the RCP. The organization description should clearly identify and explain jurisdiction, authority, and management responsibility among state level, regional level, and local offices within the same jurisdiction. The description should also include support staff, contract services, and advisory bodies.

## **MANAGEMENT**

### **Management Structure and Philosophy**

The responsibilities for the achievement of objectives and the authority to approve assignments and work products within the RCP, whether for continuing programs or short-term projects, are traditional management roles that should be well defined and understood by all RCP staff. To this end the concept of management (e.g., line authority, shared governance, etc.) should be discussed in some detail in the RCP's Management Plan.

### **Radiation Control Program Director**

Ideally, the RCP should be a separate and identifiable entity under the authority of a single individual. In jurisdictions where radiation control subprograms are apportioned among two or more

agencies, each agency should clearly designate which individual has ultimate responsibility and authority for radiation control activities and decisions.

### **Supervision**

Personnel performing radiation control activities should be under the supervision of the equivalent of a Radiation Control Supervisor as describe in Appendix B. Those performing part-time or temporary duties and not directly under RCP supervision should be evaluated periodically and the results formally communicated to the appropriate supervisor.

### **Coverage**

Essential functions within each subprogram area should be assigned to more than one person to assure continuous subprogram coverage in case of sickness, resignation, or other cause of a principal's unavailability.

### **Management Plan**

The RCP should have a written management plan to guide its activities that includes each of the operating subprograms. The plan should follow the format and include the topics identified in Appendix A. The plan should be reviewed and revised on a periodic basis and whenever major changes in operating subprograms are made.

### **Policies**

The RCP should maintain for review by staff and other interested parties written statements of policy decisions addressing interpretations of administrative and technical procedures or official rulings made by the RCP.

### **Technical and Administrative Procedures**

The RCP should develop and maintain written documents with step-by-step procedures to be followed by staff when conducting official activities of an administrative or technical nature. Such activities include reviewing materials submitted in support of applications, conducting surveys, inspections, and other field activities, and performing compliance activities. Current versions of application formats, procedure manuals, and regulatory guides developed and/or endorsed by CRCPD and federal agencies should be adopted whenever available to promote consistency in data collection and evaluation.

## **Enforcement Options**

The range of enforcement options available for response to regulatory noncompliance should include: administrative letters of agreement with licensees and registrants; management conferences; field notices of violation; orders of abatement; civil and administrative penalties; modification, suspension, and revocation of licenses and registrations; impoundment of sources of radiation; and referral for criminal prosecution.

## **Enforcement Philosophy**

The philosophy behind enforcement options, actions, and procedures should be documented. The following issues should be addressed: progressively escalated enforcement actions, preference for early and voluntary compliance, compliance assistance, and the bases for implementing various types and levels of enforcement action.

## **Enforcement Procedures**

The RCP should have a document giving the step-by-step procedures for implementing each type of enforcement action. In addition, the following should be clearly stated: the enforcement actions to be taken at increasing levels of seriousness of noncompliance; the remedies available to persons cited, e.g., enforcement conferences, administrative hearings, etc.; and the on-site compliance procedures to be followed by inspectors in case of imminent hazard situations that cannot be handled through normal compliance channels.

## **Enforcement Communications**

Inspection findings should be clearly communicated to the licensees and registrants. Standard wording and data formats, which have been reviewed by legal counsel, should be used in all enforcement communications with licensees, registrants, and others to promote uniformity and minimize legal error. Enforcement correspondence above the level of voluntary compliance should not be combined with reports of inspections results and other field activities and should always be signed by senior program management, preferably the program director. Outstanding enforcement actions and RCP responses thereto should be maintained in a time sensitive, secure, limited access filing system and closely followed by the responsible supervisory personnel until all enforcement matters are resolved.

## **Complaint Procedures**

Complaints from the public, patients, or employees of licensees and registrants should be recorded in standard format and promptly evaluated by supervisory personnel for response in accordance with a written protocol. Inspections resulting from complaints should be targeted to the

areas cited in the complaint, but otherwise handled as routine compliance inspections. Identity of complainants should be kept confidential.

### **Public Information**

The RCP should promote itself as a resource and authority on technical matters related to radiological health through contacts with the media, legislature, professional groups, educational institutions, use of the Internet, and through participation in public forums. Regulations, procedures, educational materials (pamphlets, audio-visual presentations, etc.), and other useful information should be advertised and made available to the public. Ideally, substantial information of this type should be available in electronic format and posted to the Internet. Materials in RCP files, as well as reports and communications based on these files, should be made available for public access in accordance with the jurisdiction's public records' statutes. A written policy should clearly indicate what records are open to the public and the procedures to be followed in providing information.

### **Record Formats and Maintenance**

The RCP should use uniform and standardized formats for collecting information and technical data during its official activities. This information should be maintained in a readily accessible system of files that facilitates use by staff preparing for inspections and surveys, preparing statistical and other reports, and following-up non-compliances. Due consideration should be given to the protection of sensitive personal information and proprietary information. A system for culling, discarding and/or archiving computer and written files and records at preset intervals should be in place.

### **Electronic Recordkeeping and Client Submissions**

The RCP should make maximum use of computers and telecommunication modalities to facilitate storage of information and the development of statistical reports for review by management in planning and evaluating progress toward program objectives. A manual should be available that includes a list of databases, and for each database: the software format, the collector and custodian, the updating frequency, the primary sources of the data, the variables that can be used for sorting, and who may access for updating, editing, and extracting data. Clients should have the option of submitting application, enforcement, and other information electronically.

### **Field Procedures Quality Assurance**

The RCP should have a mechanism for early identification of faults in its field procedures and their implementation by staff. Accompanied visits by supervisory staff and targeted feedback (i.e., questionnaires) from clients should be included. Problems identified should be analyzed and addressed without delay.

## RCP AUTHORITIES

### LEGISLATION

#### Suggested State Legislation

The RCP should have comprehensive basic enabling legislation modeled after the Council of State Governments' *Suggested State Legislation*, 1983 Edition, Volume 42, which has been extended to include activities introduced after the 1983 model legislation.

#### Additional Wording

In major subprogram areas not specifically addressed in the 1983 *Suggested State Legislation*, principally nonionizing radiation sources, radon, radiological emergency response, low-level radioactive waste, and environmental monitoring and surveillance, the RCP should either include specific wording in the basic enabling legislation, or identify authority contained in other statutes, e.g., general public health legislation, to provide a statutory basis for these subprograms.

#### Specific Content

The basic enabling legislation should authorize the RCP to:

- a. Register or license owners and users of radiation producing machines;
- b. Register radioactive materials sources, and license owners and users of radioactive materials sources;
- c. Register owners and users of nonionizing radiation sources;
- d. Issue regulations governing the possession, manufacture, distribution, use, and disposal of radiation sources and standards for protection against exposure to radiation;
- e. Inspect persons who own, possess, or use radiation sources as well as those who are licensed and/or registered with the RCP, and take enforcement action in cases of noncompliance with regulations;
- f. Collect fees for any service, such as registering, licensing, issuing certificates, inspecting, conducting surveys, performing personnel and environmental monitoring, and emergency response activities;
- g. Require surety arrangements of certain radiation source users;
- h. Assess civil and administrative penalties for noncompliance with regulations and standards;
- i. Appoint advisory committees and specify members' expertise, duties, and term;
- j. License or otherwise credential individual operators of radiation producing machines and individual users of other radiation sources;
- k. Require the prompt correction of items of noncompliance with regulations;
- l. Suspend, revoke, or otherwise curtail radiation related activities found to be inimical to public health or to be in willful noncompliance with regulations;

- m. Impound radiation sources under circumstances found to be necessary for public health protection;
- n. Enter into interstate and federal/state arrangements for mutual assistance in control of radiation hazards;
- o. Enter into agreements with federal agencies to assume regulatory jurisdiction and/or provide specific services relating to control of ionizing and nonionizing radiation;
- p. Accept funding, equipment, training, personnel assistance, and other forms of assistance from private entities and federal agencies in support of cooperative federal/state subprograms;
- q. Grant reciprocity to persons authorized under similar provisions of other state and federal radiation control legislation and regulations;
- r. Set qualifications and require registration and/or licensure of private consultants, medical and health physicists, and radiation safety officers who provide inspections, surveys, repairs, and information upon which the RCP determines compliance with regulations (applicable only to states using outside inspectors);
- s. Require that radiation sources meet design and construction specifications;
- t. Require that radiation measurement equipment meet design and performance specifications;
- u. Set requirements for adequate radiation safety programs and procedures;
- v. Set requirements for adequate training programs for radiation users and radiation safety personnel;
- w. Set requirements for maintenance of records and submission of reports relating to the safe use of radiation sources;
- x. Grant exemptions and variances from regulatory requirements providing public health and safety is not adversely affected.

## REGULATIONS

### Consistency and Compatibility

To promote consistency among state radiation control regulations, the RCP should have regulations modeled after and closely tracking the *Suggested State Regulations for Control of Radiation (SSRCR)*, published by the CRCPD for each major subprogram area where such regulations apply. Agreement states should have radioactive materials regulations that are compatible with United States Nuclear Regulatory Commission (NRC) regulations in each area where compatibility is indicated by the NRC.

### Comprehensiveness

Regulations should address each radiation source authorized to be regulated in the RCP's enabling legislation and should include activities addressing each area of radiation control specifically authorized in enabling legislation. RCP activities not specifically conducted under legally adopted regulations should be clearly explained as voluntary to participants.

## **Revisions**

Regulations should receive a formal review on a schedule of two to five years and be revised as needed depending upon the area under review and the number and significant regulatory issues that have occurred as a result of *SSRCR* changes, new NRC compatibility requirements, new or revised state legislation, and technological developments since the last revision.

## **Reviews**

Draft regulations, including proposed amendments and changes, should be reviewed by the RCP's Advisory Board during the drafting process. Affected groups and individuals should have an opportunity to review and comment on proposed rules or rule changes.

## **Adoption Procedures**

Regulations should be formally adopted in accordance with the provisions of the state's Administrative Procedures Act, providing a period of time for public comment prior to adoption.

## **RCP RESOURCES**

### **PERSONNEL**

#### **Staffing Pattern**

The RCP should have a staffing pattern that provides sufficient professional, technical, and administrative positions, as well as legal, accounting, computer, and other support personnel to carry out the activities in each major subprogram area. The number and types of staff required will depend upon the size and technical complexity of the activities involved. Specific guidance on staffing patterns is contained in Appendix C. The staffing pattern should provide for increasing levels of job categories that reflect the supervisory responsibilities, technical skills, educational level, and specific types of experience required for each position.

#### **Compensation**

The total annual compensation (salary plus benefits) for each position should be comparable to that provided for employment in similar positions in the private and public sectors. The compensation scheme should provide for cost of living increases with length of employment based on a consumer index.

#### **Career Development**

A clear career ladder should exist within the RCP that allows employees to progress to positions of higher responsibility and technical skill when vacancies occur.

#### **Job Descriptions**

There should be an accurate and up-to-date description of each position in the RCP that describes the required responsibilities and tasks, the level of education and experience, and any special licenses or certifications. Appendix B contains recommended education and experience for various radiation control program positions.

#### **Staff Training Plan**

The RCP should have a written staff training plan that specifies the content and length of formal and on-the-job training programs to be completed by newly assigned personnel, and the in-

service and continuing education programs expected for experienced staff. The written training plan should include:

- a. The general orientation and initial technical training required for all professional and technical personnel;
- b. Specific subprogram training required to be completed by newly assigned staff before working in a subprogram area without close supervision, including training in personal safety equipment and procedures necessary for personal protection;
- c. The continuing education required for experienced staff and the acceptable options available for meeting the requirements;
- d. For each training entity cited, either reference to specific outside courses provided by universities, federal agencies, CRCPD, etc., or detailed training content descriptions and methods of evaluating successful completion.

### **Performance Reviews**

The RCP should have a system for reviewing the performance of each employee on a periodic basis (at least annually). The system should include a conference with each employee to discuss progress toward established goals for quality and quantity of output as well as personal plans for further development of knowledge and skills.

### **Training Materials**

The RCP should have available in a readily accessible system, for each subprogram area, copies of reference books, journals, federal publications, audio visual presentations with necessary equipment for viewing, and educational computer programs for use by staff in continuing education efforts.

### **Problem Intervention**

The RCP should have a system for early identification of stresses that are interfering with an employee's job performance and for referral for appropriate internal or external assistance, as necessary.

### **Employees Conduct Manual**

The RCP should have a manual that provides a standard of conduct that must be followed by RCP employees involved in regulatory activities. Each employee should receive a copy of the manual and orientation in its content and use. The manual should cover any existing state legislation and regulations pertaining to employee conduct, as well as any prevailing written directives on employee conduct from higher authority within the organizational structure.

## **Disciplinary Action**

The RCP should have a written disciplinary action program consistent with civil service procedures that includes warnings, counseling, right to hearing, specification of actions short of termination, and causes for termination.

## **External Personnel**

If the RCP authorizes external personnel to conduct compliance or other activities in lieu of RCP personnel, the RCP should have in place a system for evaluating credentials prior to initial authorization, for periodic evaluation of performance as a condition of reauthorization, and for termination of authorization.

## **Personnel Radiation Safety**

The RCP should provide appropriate personnel dosimeters for each staff member likely to be exposed to ionizing radiation at or above 10 percent of the occupational dose limit. Recording and reviewing exposure records and investigating unusually large doses should be in accordance with regulatory requirements. The annual occupational dose should be reported to each individual in a timely manner.

## **Discrimination Policy**

The RCP should have in place safeguards to ensure that the applicable state and federal laws regarding discrimination are enforced.

## **FINANCIAL**

### **Funding Sources**

RCP general expenses and expenses for each specific subprogram area should be supported by a secure funding source tied to: budgeted general funds; dedicated funds supported by legislative authority; dedicated user and/or other fees collected under legislative authority and regulatory schedules; federal funding pursuant to grants, cooperative agreements, or other arrangements provided by federal law and regulations; and/or other funding consistent with state and federal statutes.

## **Budgeting**

RCP management should be a party to the budget preparation process of the higher level organization with a fair opportunity to compete on the basis of merit and need for discretionary funds. Wherever appropriate, budget proposals should justify activities undertaken and their funding based on statistical and risk based analyses.

## **Accounting**

There should be an accounting system in place within the RCP or supporting agency that provides recording, tracking, disposition, responsibility, and accountability for all funds received, including fees, state funds, federal funds and any other funds. Likewise, all expenditures should be properly approved, charged against appropriate accounts, properly reconciled, and verified as to the value of services or products received. Periodic external financial audits should be conducted.

## **EQUIPMENT**

### **Adequacy and Suitability**

The RCP should have equipment in sufficient numbers, types, and technical capabilities to allow staff to properly conduct their activities in a timely manner.

### **Inventory**

The RCP should maintain an updated list of equipment that includes a detailed description, specific identifier, and assigned storage location for each item. A physical inventory should be conducted at least annually.

### **Calibration**

Each item of laboratory measurement equipment used in RCP activities should be checked for accuracy and precision against an appropriate standard traceable to a National Institute of Standards and Technology (NIST) or international standard. Each item of field measurement equipment used in RCP activities should be checked for accuracy and precision by a laboratory or test facility traceable to NIST or international standard measurements. The total uncertainty from NIST or international true value should be known and included in the measurement or calibration report. Calibrations should be performed at a frequency that is appropriate to the type of equipment and its use, and that is at least as often as is required of the regulated community. The calibration interval for each item of equipment should be stated in a written policy and the policy should include procedures to remove equipment from use when the interval is exceeded. Necessary repairs and/or adjustments resulting from calibration should be made promptly. The date of calibration and any correction factors should be affixed to the equipment.

## **Repair and Maintenance**

The RCP should have a maintenance schedule that includes each item of equipment, especially emergency equipment, and, as a minimum, checks batteries, checks response against a radiation source, and completes any other periodic tests and servicing required for proper functioning. An established mechanism for obtaining timely diagnostic work and major repair services should be in place.

## **SUPPORT SERVICES**

### **Legal**

The RCP should have clearly identified legal counsel that is readily available and responsive to legal questions, review of legislative and regulatory issues, assistance with RCP compliance procedures, and any other legal matter.

### **Analytical**

The RCP should have its own analytical laboratory or a contractual arrangement with an analytical laboratory that provides competent and timely analyses of samples collected in connection with its activities. Criteria for an adequate laboratory should include a detailed written quality assurance program, participation in outside performance analytical testing programs, a safety and health program conforming with OSHA standards, and a radioactive materials and waste storage and handling program conforming to regulatory requirements.

### **Computer**

The RCP should have its own computer specialist or other established mechanism for obtaining computer services to ensure that essential data handling, technical analyses, and recordkeeping functions are continually available, and to upgrade and troubleshoot hardware and software as necessary.

## **RCP OPERATIONS**

### **ELECTRONIC PRODUCT RADIATION — X-RAY**

#### **Subprogram Scope**

Activities should address all uses of x-ray producing equipment including the following areas: diagnostic and therapeutic medical, chiropractic, podiatric, dental, and veterinary x-ray, including fluoroscopy and mammography; therapeutic medical use of particle accelerators; and industrial, academic and governmental x-ray, and fluoroscopy, including analytical x-ray equipment, security equipment and particle accelerators.

#### **Staffing**

Personnel requirements for registration, inspection, and enforcement should be approximately one full-time equivalent (FTE) per 500 unit (tube) inspections per year for dental. For activities under the Mammography Quality Standards Act of 1992 (MSQA) the ratio should be one FTE per 100 x-ray unit (tube) inspections per year. For all other x-ray activities the ratio should be one FTE per 300 x-ray unit (tube) inspections per year. Small programs should assign responsibility between two persons to ensure continuous coverage and continuity in case of sickness, resignation, etc. (See Appendix D for guidance in scheduling inspections.)

#### **Facility Registration**

An efficiently functioning system should process registration of facilities with x-ray equipment prior to operation and after review of information submitted as required by regulations. As a minimum, information should identify the facility location and owner, a facility supervisor with appropriate credentials, the requested x-ray equipment and procedures, and a facility radiation survey. Updating of changes to facility information and periodic renewal of registrations should be an integral part of the system.

#### **Registration of Services**

An efficiently functioning system should process registration of commercial firms that offer services to x-ray facilities prior to operation and after review of information submitted as required by regulations. Services requiring registration should include consulting physicists, installation and repair, and personnel dosimetry. As a minimum, information should identify the service office location and owner, credentials of servicing staff, and types of services. Updating of changes to information and periodic renewal of registrations should be an integral part of the system. The RCP should make lists of persons providing various services available to the regulated community.

## **Inspection Scheduling**

There should be a written policy discussing the scheduling and frequency of initial, follow-up, and routine compliance inspections. The inspection scheduling policy should emphasize the following: setting frequencies based on potential patient and personnel exposure, using limited inspections and screening programs to identify problem facilities, combining inspections with special surveys whenever possible (NEXT, mammography certification, etc.), considering workload and previous violation history of a facility or class of facilities in altering frequency, ensuring that new facilities are inspected within a reasonable time of becoming operational, and assigning more complex inspections to senior staff members. The policy should be reviewed annually and adjusted to reflect changes in program objectives and resources. Appendix D contains guidance on inspection frequencies.

## **Inspection Assignment and Tracking**

An inspection assignment schedule should be developed at least quarterly, actual inspection frequencies should be tracked statistically, and any significant backlog should be addressed promptly. More complex and special category inspections (e.g., MQSA) should only be performed or directly supervised by staff members who are fully qualified for the type of inspection involved.

## **Inspection Procedures**

Inspections should be conducted in accordance with written procedures that provide guidance for the following inspection components: an entrance interview with management; visits to x-ray use and image development areas where interviews with workers and measurement data can be obtained for compliance assessments and where programs, procedures, equipment and facilities can be examined; review of records on equipment quality control and maintenance, patient logs, employee exposure, employee training, area monitoring, and image quality; and an exit interview with management to summarize preliminary findings. Standard forms and checklists should be used to record observations and measurement data.

## **Inspection Measurements**

Tests and measurements to evaluate compliance with regulatory standards should be performed using appropriately sensitive instruments with current calibration, and procedures consistent with CRCPD and United States Food and Drug Administration/Center for Devices and Radiological Health (FDA/CDRH) guidance. Standard forms and formats should be used to record measurement data and perform on-site calculations and interpretations. Electronic calculators and portable computers should be used whenever possible to promote standardization and minimize calculation errors.

## **Inspection Reports**

The inspector should prepare a report of each inspection that follows a uniform format and allows for timely (no later than 30 days after inspection) communication of results to the registrant. Reports should summarize the inspection scope, include measurement data with appropriate interpretation, clearly list and categorize as to the severity each item of noncompliance, set a reasonable date for correction of each item, and require a plan for corrective action that includes submission of evidence that corrections have been performed and are effective. Reports completed by inspectors and left with the registrant should not be used as official notification of violations intended as the bases for subsequent enforcement actions.

## **Inspection Review and Correspondence**

Each inspection report should be reviewed by supervisory staff prior to preparation of enforcement and/or other inspection related correspondence with the registrant. See Enforcement Communications under Management in the section on RCP Administration.

## **Non-RCP Inspectors**

RCPs that accept reports of private consultants in lieu of inspections by RCP personnel should specify: minimum acceptable credentials for consultants, written report formats to be used, items to be assessed for compliance, measurements to be made, measurement protocols to be followed, and calibrated instruments to be used. There should be a program for periodic field review of consultants' work and a mechanism for decertifying consultants for good cause.

## **NEXT Surveys**

Staff should participate in the Nationwide Evaluation of X-Ray Trends (NEXT) surveys, administered through CRCPD, as an important outside quality assurance mechanism for survey activities, as well as a good source of state-of-the-art equipment, training, and survey procedures.

## **Quality Assurance**

The RCP should provide, either independently or as part of its inspection visits, assessment of and assistance with quality assurance procedures at healing arts facilities. The assessments and assistance should build on materials and procedures developed by CRCPD and federal agencies that emphasize use of normalized exposures and image quality evaluation tools by facilities.

## **Mammography**

The RCP's participation in activities under the *Mammography Quality Standards Act of 1992* should be guided by regulations at least as stringent as those issued under that Act.

## **Operator Certification**

All healing arts x-ray machine operators should be required to demonstrate a level of knowledge consistent with standards of national accrediting bodies. Either regulations should require operators to have appropriate national certification, or there should be a state certification program with equivalent requirements.

## **User Education and Assistance**

Routinely during compliance and other survey activities, staff should provide information and assistance on regulatory requirements and procedures, radiological health risks, methods for reducing patient and worker doses, methods of improving image quality, and other topics of interest within their competence. As new regulations and issues arise, the program should provide, through meetings and targeted literature, adequate opportunity for the regulated community to become better informed.

# **ELECTRONIC PRODUCT RADIATION — NONIONIZING**

## **Subprogram Scope**

Regulatory activities should address the following sources of nonionizing radiation: industrial radiofrequency (RF) heaters, industrial microwave (MW) ovens, fixed laser light shows, and industrial and medical laser installations. User education and assistance programs should address the following: transient laser light shows, ultraviolet (UV) exposure from mercury vapor lamps, UV exposure from commercial tanning facilities, ultrasound devices, medical magnetic resonance imaging (MRI) systems, RF communications systems, radar systems and navigational aids, low voltage power line and 60 hertz electrical consumer products, high voltage transmission lines, medical MW uses, and noncoherent optical sources.

## **Staffing**

Personnel requirements for regulatory activities will depend upon the number and type of regulated sources. Guidance is provided in Appendix C. A minimum of 1.0 FTE should be allotted for public education and assistance programs. Small programs should assign responsibility between two persons to ensure continuous coverage and continuity in case of sickness, resignation, etc.

## **Nonionizing Radiation Source Registration**

An efficiently functioning system should process registration of sources after review of information submitted as required by regulations. As a minimum, information should identify the source, its maximum power and frequency range, its location and owner, a facility supervisor, and the specific process or procedure in which the source is used. Updating of changes to source information and periodic renewal of registrations should be an integral part of the system.

## **Inspection Scheduling**

There should be a written policy discussing the scheduling and frequency of initial, follow-up, and routine compliance inspections. The inspection scheduling policy should emphasize the following: setting frequencies based on type of installation, variability of exposure and potential hazard to patients, workers and the general public; inspecting new facilities and installations within a reasonable time of becoming operational; considering workload and previous inspection history in extending frequency. The policy should be reviewed annually and adjusted to reflect changes in program objectives and resources.

## **Inspection Assignment and Tracking**

An inspection assignment schedule should be developed at least semi-annually; actual inspection frequencies should be tracked statistically; and any significant backlog should be addressed promptly.

## **Inspection Procedures**

Inspections should be conducted in accordance with written procedures that provide guidance for the following inspection components: an entrance interview with management; visits to use areas where interviews with workers and measurement data can be obtained for compliance assessments and where programs, procedures, equipment and facilities can be examined; review of records on equipment quality control and maintenance, employee exposure, employee training, and area monitoring; and an exit interview with management to summarize preliminary findings. Standard forms and checklists should be used to record observations and measurement data.

## **Inspection Measurements**

Tests and measurements to evaluate compliance with regulatory standards should be performed using appropriately sensitive instruments with current calibrations, and procedures consistent with guidance from CRCPD, relevant federal agencies, the National Council on Radiation Protection and Measurement (NCRP), and the American National Standards Institute (ANSI). Standard forms and formats should be used to record measurement data and perform on-site

calculations and interpretations. Electronic calculators and portable computers should be used whenever possible to promote standardization and minimize calculation errors.

### **Inspection Reports**

The inspector should prepare a report of each inspection that follows a uniform format and allows for timely (no later than 30 days after inspection) communication of results to the registrant. Reports should summarize the inspection scope, include measurement data with appropriate interpretation, clearly list and categorize as to the severity each item of noncompliance, set a reasonable date for correction of each item, and suggest what evidence of corrective action is acceptable.

### **Inspection Review and Correspondence**

Each inspection report should be reviewed by supervisory staff prior to preparation of enforcement and/or other inspection related correspondence with the registrant. See Enforcement Communications under Management in the section on RCP Administration.

### **Outside Inspectors**

RCPs that accept reports of private consultants in lieu of inspections by RCP personnel should specify: minimum acceptable credentials for consultants, written report formats to be used, items to be assessed for compliance, measurements to be made, measurement protocols to be followed, and calibrated instruments to be used. There should be a program for periodic field review of consultants and a mechanism for decertifying consultants for good cause.

### **User Education and Assistance**

Routinely during compliance and other survey activities staff should provide information and assistance on regulatory requirements and procedures, radiological health risks, methods for reducing exposure, and other appropriate topics within their competence. As new regulations and issues arise the program should provide, through meetings and targeted literature, adequate opportunity for the regulated community to become better informed. For sources not regulated, the agency should develop and provide information to users for safe operation and respond to requests from users for on-site assessments and assistance.

# **RADIOACTIVE MATERIALS**

## **Subprogram Scope**

RCPs with NRC Agreement State programs should address all radioactive materials [by-product radioactive material, naturally occurring and accelerator-produced radioactive material (NARM) and naturally occurring radioactive material (NORM)]. Other programs should address radioactive materials (NARM) not otherwise regulated under the Atomic Energy Act, preferably through the CRCPD Licensing State Program. Regulated practices should include: diagnostic and therapeutic use of radioactive materials in the healing arts and veterinary medicine; use of radioactive materials in governmental, academic and industrial environments; manufacture and distribution of radioactive sources, and kits and devices containing radioactive materials, including consumer products; use of devices under general license; and any other activity involving radioactive material specified by regulations. Criteria for operating programs addressing radon, environmental exposure to radioactive materials, and low-level radioactive waste disposal are presented separately.

## **Staffing**

Professional/technical personnel requirements for licensing, inspection, and enforcement should be 1.0 to 1.5 FTE per 50 uncomplicated licenses. Additional professional/technical staff would be required for unusually large and time consuming licenses such as a major manufacturer, waste processor, or uranium mining and milling. Small programs should assign responsibility between two persons to ensure continuous coverage and continuity in case of sickness, resignation, etc.

## **Review of License Applications**

An efficiently functioning system should provide an adequately detailed technical review of license applications submitted for possession, use, manufacture, and distribution of radioactive materials, as well as any other associated activities requiring licensing by regulations (e.g., decontamination services) prior to approval for possession and/or operation. Contacts with applicants during the review process should be adequately documented through review letters and memoranda. For major operations, prelicensing visits to examine facilities and equipment may be in order.

## **Content of License Applications**

License applications should identify the facility location and owner, a person responsible for radiation safety with appropriate credentials, the types and quantities of proposed radioactive material, and proposed uses of the radioactive material. Information should be obtained and reviewed for technical adequacy on training of personnel, radiation safety procedures, equipment and facilities, operating and emergency procedures, environmental control equipment, personal protective equipment, and any other matters deemed necessary to evaluate whether a licensee can operate safely and in compliance with regulations and license conditions.

## **Licensing Guides**

Licensing guides, checklists, and policy guides should be used in the application review process to promote thoroughness, technical quality, and uniformity.

## **License Document**

The license document should be issued over the signature of a senior program manager and include: the type of radionuclides, the forms of radioactive materials and the quantities authorized; the specific uses authorized; any conditions attached to the license; and the time period (e.g., five years) for which the licensed activities are authorized.

## **License Amendments**

The licensing program should require licensees to obtain license amendments for any significant change in authorized radioactive materials, uses, and operations. The amendment review process should be equivalent to the license application review. An amendment document detailing all changes should be issued over the signature of a senior program manager.

## **License Renewal**

A complete technical review and reauthorization of active licenses comparable to the original licensing process should be required at a frequency based on the type of facility, materials authorized, and/or activities authorized.

## **Registration of Devices Under General License**

The RCP should register certain devices containing large quantity or otherwise hazardous sealed sources of radioactive material that are generally licensed under its regulations. The registration program should record the identity (serial number) of the device, information included in the NRC Registry of Radioactive Sources and Devices, the owner, the principal user, and the permanent use and/or storage locations.

## **Termination of Licenses**

Licensees should be required to notify the RCP in advance of intention to cease operations under a license. RCP procedures should require assurances on authorized disposition of radioactive materials and, if there is a significant potential for contamination, evidence of adequate decontamination of the site, facilities, and equipment.

## **Surety**

For large quantity licensees with substantial potential for contamination of facilities, equipment, and the environment, the RCP should require as part of the licensing process that an acceptable financial commitment in the form of a bond or other instrument be executed to be used for decontamination, if needed.

## **Source and Device Evaluations**

Agreement State programs should evaluate new by-product and NARM sealed sources and devices for radiation safety in accordance with procedures for entry into the NRC Registry of Radioactive Sealed Sources and Devices. This includes independent review by two qualified staff members. Non-agreement states should identify and obtain necessary information on unevaluated NARM sources and devices. Evaluations in these states may be conducted by qualified program staff or through outside assistance from FDA/CDRH.

## **Inspection Scheduling**

There should be a written policy discussing the scheduling and frequency of initial, follow-up, and routine compliance inspections. The inspection scheduling policy should emphasize the following: setting frequencies based on potential patient and personnel exposure, inspecting new facilities within six months of becoming operational, assigning inspections of more complex licenses to senior staff, and providing input on inspection needs from licensing staff. The policy should be reviewed annually and adjusted to reflect changes in program objectives and resources.

## **Inspection Assignment and Tracking**

An inspection assignment schedule should be developed at least semi-annually; actual inspection frequencies should be tracked statistically; and any significant backlog should be addressed promptly.

## **Inspection Procedures**

Inspections should be conducted in accordance with written procedures that provide guidance for: an entrance interview with management; visits to use, storage, and disposal areas where interviews with workers, compliance measurements and samples can be obtained and programs, procedures, equipment, and facilities can be examined; review of inventory, patient, training, employee exposure, monitoring, disposal and other pertinent records; and an exit interview with management to summarize preliminary findings. Standard forms and checklists should be used to record observations.

## **Inspection Measurements and Samples**

Measurements to evaluate compliance with regulatory standards should be conducted using appropriately sensitive instruments with current calibrations, and procedures consistent with CRCPD and NRC guidance. Samples collected for subsequent laboratory analysis should be obtained, packaged, marked, and safeguarded according to a written protocol consistent with CRCPD and NRC guidance that is designed to ensure chain of custody, sample integrity, and analytical accuracy. Standard forms and formats should be used to record measurement data and perform on-site calculations and interpretations. Electronic calculators and portable computers should be used whenever possible to promote standardization and minimize calculation errors.

## **Inspection Reports**

The inspector should prepare a report of each inspection that follows a uniform format and allows for timely (no later than 30 days after inspection) communication of results to the licensee. Reports should summarize the inspection scope, include measurement data with appropriate interpretation, clearly list and categorize as to the severity of each item of noncompliance, set a reasonable date for correction of each item, and require a plan for corrective action that includes submission of evidence that corrections have been performed and effective.

## **Inspection Review and Correspondence**

Each inspection report should be reviewed by supervisory staff prior to preparation of enforcement and/or other inspection related correspondence with the licensee. See Enforcement Communications under Management in the section on RCP Administration.

## **Quality Assurance**

The program should provide, either independently or as part of its inspection visits, assessment of and assistance with quality assurance procedures at healing arts facilities. The assessments and assistance may build on materials and procedures developed by CRCPD and federal agencies that emphasize accurate patient dose administration and optimum image quality by facilities.

## **User Education and Assistance**

Routinely during compliance and other survey activities, staff should provide information and assistance on regulatory requirements and procedures, radiological health risks, methods for reducing patient and worker doses, methods of improving image quality, and other appropriate topics within their competence. As new regulations and issues arise the program should provide, through meetings and targeted literature, adequate opportunity for the regulated community to become better informed.

# **RADON**

## **Subprogram Scope**

There should be a registration/certification and/or licensing component for measurement and mitigation contractors. In other activities the RCP role should be: conducting surveys and research to locate and characterize areas of elevated radon, formulating and issuing guidance, providing public information, assisting with technology transfer to contractors, and overseeing and evaluating radon measurement and mitigation efforts in schools and other public buildings.

## **Staffing**

Personnel requirements for regulatory activities should be at least 0.5 FTE and at a rate of 0.5 FTE per 100 contractors. Staffing for nonregulatory activities, since it will depend upon the extent and degree of the radon problem within the jurisdiction, should be at least 0.5 FTE with additional staff commensurate to that needed for the regulatory activities. Small programs should assign responsibility between two persons to ensure continuous coverage and continuity in case of sickness, resignation, etc.

## **Measurement Contractors**

An efficiently functioning system should process registrations/certifications or licenses for persons offering to collect samples and make laboratory or field measurements for the evaluation of radon and radon progeny in air and/or drinking water prior to their operation and after review of information submitted as required by regulations. As a minimum, information should identify: the facility location and owner, a facility supervisor with appropriate credentials, individual testers' qualifications and training, the services to be offered (diagnostic, screening, etc.), sample collection, field measurement and/or laboratory procedures with appropriate quality control program, and specific field and laboratory equipment to be used. Successful participation in a state approved measurement proficiency program should be required. Updating of changes to facility information and periodic renewal of registrations/certificates/licenses should be an integral part of the system. Periodic contractor reports or other means should be used to monitor the number, types, and results of testing activities.

## **Mitigation Contractors**

An efficiently functioning system should process registrations/certifications or licenses for persons offering to provide radon mitigation services prior to their operation and after review of information submitted as required by regulations. Services requiring registration should include design, supervision, and installation of systems in new and existing structures for the reduction of radon and radon progeny. As a minimum, information should identify the office location and owner, credentials of design and supervisory staff, training of installation staff, the worker protection program for radon, and the types of mitigation services offered. Updating of changes to information

and periodic renewal of registrations should be an integral part of the system. Successful participation in a state approved contractor proficiency program should be required. Periodic contractor reports or other means should be used to monitor the number, types, and results of mitigation activities.

### **Inspections**

Program staff should conduct random inspections of the work of both measurement and mitigation service providers, including, for mitigation contractors, verification of the degree of reduction in levels achieved. Inspection should be performed against the quality assurance programs of the service providers and state regulations. There should be a minimum criteria for performance and regulatory authority to take action against service providers not meeting minimum criteria.

### **Radon Concentration Guidance**

The RCP should adopt and promote consensus guidance for concentrations of radon and progeny in indoor air and for radon concentrations in drinking water. Guidance should include details on the method for evaluation of concentration (e.g., screening with charcoal canisters), the associated health risk, and the relationship of test results to the need for mitigation.

### **Mitigation Practices**

The RCP should adopt and promote consensus standards for mitigation methods for elevated levels of radon and progeny in indoor air and for elevated radon concentrations in drinking water. Guidance should be developed and issued describing the methods, their applicability to particular types of structures and concentrations, and their associated cost.

### **Surveys and Research**

The RCP should conduct and/or participate in EPA sponsored measurement surveys designed to characterize the location, extent, and degree of elevated indoor radon and progeny and/or elevated concentrations of radon in drinking water within its jurisdiction. The information from these surveys, together with research on geology and other factors, should be used in the planning of public information and other efforts.

### **Public Information**

The RCP should employ various strategies to inform and motivate the public regarding elevated radon concentrations in indoor air and drinking water. Strategies should include: making general and targeted mailings of information brochures, publicizing and staffing a telephone assistance service, issuing press releases and actively seeking other media opportunities, providing lists of approved contractors, and participating in public meetings and training forums.

## **Technology Transfer**

The RCP should facilitate transfer of information regarding pros and cons of current mitigation methods and techniques, improvements that can be made, and newly recommended mitigation approaches and methods. Potential RCP activities in technology transfer include: setting standards for qualifications and practice, requiring continuing education for contractor personnel and approving the training courses, revising regulations to account for technology changes, and using communications techniques (e.g., the Internet) to transfer pertinent information.

## **Schools and Public Buildings**

The RCP should actively participate in overseeing radon surveys, measurements, and mitigation efforts for public schools and other public buildings. This participation may include design of surveys and evaluation of results, review of contracts and methods, information meetings and training sessions with building officials and staff, and inspection of mitigation work. The RCP should develop and include in regulations protocols for school and public building measurement based on EPA School Measurement protocols.

## **External Strategies**

The RCP should develop strategies for exerting influence on external processes and entities engaged in radon related activities. For instance, the RCP should develop and include in regulations protocols for radon measurements in real estate transactions. Also, the RCP should actively participate in training local governmental inspectors and updating building codes to include recommended radon prevention systems in new construction.

# **ENVIRONMENTAL RADIATION SURVEILLANCE**

## **Subprogram Scope**

Activities should include a field sampling and measurement component, a laboratory analysis component, and a data analysis and report component. Activities should be directed toward three areas: ambient background characterization; surveillance of major facilities, e.g., reactor sites, uranium mills, processors of large quantities of loose materials, low-level radioactive waste processing and disposal facilities, and U.S. Department of Energy facilities; and emergency response for rapid evaluation of unplanned or unusual radiation exposures or releases of radioactive materials.

## **Staffing**

The base staff time requirements, including management, health physics, laboratory, and field personnel time, should be from 1.0 to 3.0 FTEs, depending on the size of the jurisdiction. An additional 1.0 to 2.0 FTEs are required if the state is impacted by a major facility. For two to five

major facilities, the program will need an additional 1.5 FTE per facility. For each major facility above five, the program will need an additional 1.0 FTE. Staffing recommendations are summarized in Appendix C.

### **Ambient Monitoring**

There should be a network of strategically located stations at which ambient measurements are taken and samples collected for analyses to characterize variations in natural ambient background radiation and levels of radioactive materials within the RCP's jurisdiction. The schedule for measurements and samples, along with the types of media sampled (air, water, food, wildlife, vegetation, etc.) should be planned to include variations in environmental conditions and to reflect significant pathways for current or future human exposure and environmental contamination.

### **Source Oriented Monitoring**

There should be a program of exposure measurements, sample collection, and analysis for surveillance of each major facility within the jurisdiction. The program should include independent sample analysis and measurements by the RCP, as well as close scrutiny of facilities' surveillance efforts. The agency should actively participate in the planning of the facilities' surveillance programs, including: location of sampling stations; technical equipment to be used; and procedures for field measurements, sample collection and laboratory analyses. The RCP should regularly review and evaluate the data and reports from the facilities' surveillance programs.

### **Emergency Response Monitoring**

A written plan should be in place for rapid response and evaluation for accidents and/or emergencies involving real or potential radiation exposure to nonradiation workers or unscheduled releases of radioactive materials to the environment beyond regulatory standards. The plan should draw upon the capabilities of the routine environmental surveillance program and should include: identification and responsibilities of key personnel; a notification system for key personnel; dedicated equipment for personal protection, transport, communications, and anticipated measurement and sampling situations; contact telephone numbers for major facilities, outside consultants and support government agencies; and sampling and measurement procedures to be followed with emphasis on contamination prevention and radiation safety of field personnel. See also Nonreactor Emergency Response in this section.

### **Laboratory Procedures Manual**

There should be a reference laboratory procedures manual containing, for each analytical procedure in use; detailed step-by-step procedures for preparing representative analytical specimens, the instrumental settings and adjustments to be employed during the analytical process; and the methods for acquisition, recording and interpreting the data produced. Whenever possible, analytical

procedures should reflect those developed by NIST or other recognized standards development bodies.

### **Field Procedures Manual**

There should be a field procedures manual detailing the steps to be followed in collecting field samples, operating and maintaining field monitoring equipment, and acquiring and interpreting data from field monitoring equipment.

### **Recording Analytical Results**

There should be an efficient system, preferably computerized, for recording, tracking, and reporting the results of each specific laboratory and field measurement test. The system should enable staff to quickly identify specific samples, the test conducted, and the calculations and interpretations applied thereto.

### **Quality Assurance**

A written quality assurance program governing field and laboratory activities should be in place and regularly reviewed and revised, as necessary. The program's goal should be to ensure that measurements and analytical results are sufficiently accurate and that they reflect actual conditions. A single person should be responsible for quality control. At least 10 percent of the environmental surveillance program effort should be allocated for quality control. The following areas should be addressed:

- a. Sample collection and receipt, including proper identification and tracking of samples, and maintenance of chain of custody;
- b. Sample preparation and analysis, including accuracy, precision, and lower limit of detection;
- c. Health physics issues, including surveys of incoming samples and regular laboratory contamination surveys;
- d. Calibration of instruments with standards traceable to NIST;
- e. Quality control, including blind, spiked, and duplicate samples for each type of analysis at least quarterly, outside performance testing, and quality control charts and records;
- f. Data analysis and analytical reports, including evaluating anomalous results and reporting measurement error with analytical results;
- g. Preventive maintenance schedules for equipment;
- h. Storage of samples and cross-contamination control;
- i. Disposal of hazardous and radioactive waste.

## **Annual Reports**

There should be a comprehensive report published at least annually that describes the scope and purpose of the environmental surveillance program and contains meaningful summaries of the analytical data. Discussion of summaries should clarify variations in background levels, secular trends of long-term sources, and changes due to the impact of temporary phenomena such as nuclear testing and/or accidental releases. Plans for any new activities should also be discussed.

## **Surveillance Guidance**

Appendix E provides guidance for the number and types of specific samples, measurements, and laboratory analyses recommended for various surveillance situations.

## **LOW-LEVEL RADIOACTIVE WASTE (LLW)**

### **Subprogram Scope**

Components will depend upon the LLW site status as follows: Category 1 - neither LLW site nor expecting LLW site; Category 2 - preparing for LLW site, proposed or anticipated; Category 3 - active LLW site; or Category 4 - closed LLW site. The status of the RCP's regulatory responsibility is also a factor. For Categories 2, 3 and 4, non-agreement state RCPs and Agreement State RCPs not assuming regulatory authority should nevertheless take an active interest in all radiation protection activities relating to the site. Agreement State RCPs in Category 1 should engage in activities designed to monitor the scope of LLW, encourage generators to reduce LLW and handle shipments properly, monitor brokers and transporters, participate in Low Level Radioactive Waste Policy Act compact deliberations, and maintain a public information program. In addition to the activities of Category 1, regulatory RCPs in Category 2 should participate in site characterization activities and have a comprehensive licensing and environmental monitoring program. Regulatory RCPs in Category 3 should have, in addition to the licensing and environmental monitoring program activities, the components of inspection, investigation, emergency response, and a program to independently verify that generators/shippers properly package, transport, and handle LLW. Regulatory RCPs in Category 4 should monitor institutional controls and maintain an active environmental monitoring program.

### **Staffing**

Staffing levels depend upon the scope of an RCP's LLW responsibilities. A Category 1 Agreement State RCP should devote between 0.25 to 0.5 FTE per million population. Category 2 RCPs with regulatory responsibility should devote between 6.0 to 8.0 FTEs per site for characterization and pre-licensing activities. Category 3 RCPs with regulatory responsibility should devote from 4.0 to 6.0 FTEs per site, depending upon the stage of operation, the level of direct oversight of site operations, and the degree of administrative responsibility for the site. Category 4 RCPs should devote from 0.5 to 1.5 FTE, depending on site stability.

## **LLW Verification Program**

At least bi-annually the RCP should independently verify by type the amounts of LLW generated, treated (e.g., compacted, incinerated, etc.), and shipped to brokers and/or disposal sites from within the jurisdiction. The results should be correlated with similar information produced by outside entities (e.g., LLW compacts, Department of Energy Manifest Information Management System (MIMS), etc.). A report summarizing this information should be produced and made available to interested parties.

## **Licensee LLW Inspections**

During a licensee's inspection, emphasis should be placed on the adequacy of quality assurance programs, procedures, and records relating to treatment, handling, packaging, and transport of LLW. Inspectors should observe LLW activities in progress. RCPs with regulatory responsibility should provide for the conduct and/or coordination of reviews/audits of out-of-jurisdiction licensees who introduce LLW into their jurisdiction.

## **Transport Monitoring**

The RCP should periodically monitor shipments of LLW in transport for compliance with U.S. Department of Transportation (DOT) and RCP regulations on external radiation, contamination, packaging, loading, labeling, and placarding. These inspections should be coordinated with vehicle safety inspections conducted by other agencies.

## **Broker Monitoring**

RCPs with LLW brokers within their jurisdiction should license and inspect these operations in accordance with RCP regulations. See RCP Operations — Radioactive Materials in this section. Host states should regulate all brokers with access to their state's LLW facilities.

## **Compact Administration**

Senior staff of state RCPs should participate (preferably as the Governor's designee) in the state's activities under the Low Level Radioactive Waste Policy Act to provide technical information and assistance, and to represent the RCP's regulatory interests in providing for adequate LLW disposal for licensees.

## **LLW Siting Activities**

RCPs within designated host states or with active LLW disposal site proposals should actively participate in setting criteria for the design of the site, evaluating the environmental monitoring, and

other measures necessary to properly characterize the impact of the site, and in setting the regulatory requirements and license conditions that the site operator will meet.

### **LLW Site Regulation**

RCPs with responsibility for regulation of active LLW sites should have well developed resources. See the section on RCP Resources. Licensing, inspection, and enforcement should be consistent with the criteria outlined for Radioactive Materials in this section. Regulations should be compatible with applicable Parts of the SSRCRs and NRC regulations.

### **Environmental Monitoring**

RCPs in Categories 2, 3, and 4 should provide oversight of the site operator's environmental monitoring program and conduct independent monitoring to confirm results obtained by the operator. Significant staff effort should be oriented toward designing and requiring monitoring programs to detect and characterize potential releases from the site (Category 2). Oversight and independent monitoring should be oriented toward detecting radioactive material releases from the site to off-site locations (Categories 3 and 4). Pre-established contaminant levels should be chosen for early identification of problems so that action can be taken before regulatory limits are approached. The independent monitoring program should be consistent with criteria outlined in Environmental Radiation Surveillance in this section. Where mixed radioactive and hazardous waste are involved, the RCP's effort should be coordinated with environmental chemical surveillance conducted by other regulatory or governmental entities.

### **Risk Communication Activities**

The RCP should employ various strategies to inform the public regarding the health risks as well as the other technical and regulatory issues involved in the disposal of LLW. RCPs in Categories 2 and 3 should have more elaborate public information programs to provide ongoing information about siting and site status. Strategies should include: making general and targeted mailings of information brochures, publicizing and staffing a telephone service, issuing press releases and actively seeking other media opportunities, providing periodic reports on siting and site operations, and participating in public meetings and training forums.

## **NON-REACTOR EMERGENCY RESPONSE**

### **Subprogram Scope**

The RCP should maintain a capability for responding to accidents and incidents involving radioactive materials in transport or at sites other than nuclear reactors. [Criteria for an RCP's participation in nuclear reactor emergency response are detailed in various NRC, EPA and Federal Emergency Management Agency (FEMA) documents]. The RCP's role in emergency response

should be assessing radiation hazards, recommending protective actions, supervising decontamination efforts, supervising source stabilization and/or recovery, communicating, and coordinating with various other local, state, and federal agencies and task forces involved.

### **Staffing**

Staff time devoted to non-reactor emergency response including planning, training, exercises, equipment maintenance, investigations, and response to incidents and accidents should be about 0.5 FTE per million population.

### **Response Planning**

The RCP should have written plans for response to various types of radiation related accidents and incidents (e.g., transportation accidents, industrial radiography incidents, scrap metal incidents, etc.). The plans should: (1) contain policy and procedures regarding securing of the site, assessing the radiation hazards, providing for source stabilization, providing for decontamination, coordinating with other response personnel and communicating protective action recommendations to responsible authorities; (2) identify likely accident and incident situations and provide specific information on the nature and level of response to each; (3) identify designated response personnel and their roles; (4) contain notification procedures; (5) list communications, transport, and equipment resources.

### **Response Personnel**

Specific staff, preferably senior staff with training in emergency response, should be designated for responding to accidents and incidents. Information received should be reviewed by supervisory staff and assignments made according to expertise and availability. A response team composed of several staff under a team leader and including an RCP spokesperson should be designated for response to large scale or highly publicized events.

### **Communications**

A communications network capable of providing notification, command, and control should be available to response personnel for both on-site communications and communication with an RCP emergency response center.

### **Transportation**

Appropriate transport capable of providing rapid deployment and access to various terrain should be available to response personnel.

## **Field Equipment**

Equipment and supplies necessary for response should be available and maintained in operational condition. These include: mobile laboratory vehicles, radiation survey equipment, sample collection equipment, maps, personnel dosimetry, personal protective equipment, decontamination supplies; and reference manuals necessary for procedures and proper equipment functioning.

## **Interagency Coordination**

Procedures should be in place for coordinating a response with other responsible state and federal agencies (FEMA, state emergency preparedness agency, NRC, EPA, etc.) when mixed hazards are involved or where implementation of protective actions requires the authority of other agencies.

## **Exercises**

Periodically the RCP should conduct exercises involving response to a typical radiological incident. The exercise should be made as realistic as possible and the performance of response personnel should be constructively critiqued. The RCP should take every opportunity to participate in emergency response exercises conducted by other agencies as a means of improving coordination of effort during incidents and accidents. The emergency response plan should include emergency response contact names and telephone numbers for all coordinating state and federal agencies.

## **Interstate Assistance Agreements**

In areas where interstate agreements between RCPs for assistance with emergency response are available, the RCP should seek out and enter into such agreements. The emergency response plan should include contact names and telephone numbers for accessing this assistance.

## **Federal Agency Support**

The RCP should be familiar with the capabilities and resources of federal agencies that can provide support during an incident or accident. The emergency response plan should include contact names and telephone numbers for accessing support from these agencies.

## **Consultants**

If the RCP uses private sector persons with appropriate expertise to provide assistance during radiological incidents, they should be properly briefed on their responsibilities and their roles, and their participation should be reflected in the emergency response plan.

## APPENDIX A

### MANAGEMENT PLAN GUIDANCE

#### **Mission**

A mission statement for the RCP should be crafted to identify, define, and clarify the positive outcomes of RCP operations on the community, e.g., improve community health status, enhance sense of community protection against radiation hazards, and discourage unsafe radiation practices. The statement should incorporate the overall purpose and role of the RCP in pursuing its activities.

#### **Issues**

At least one public health, environmental, or other radiation control issue of significant importance should be identified to which each subprogram area responds. Each issue should be well described and justified with information on the extent of radiation sources and exposures, individual and population dose estimates, economic consequences, and, wherever possible, health risk estimates.

#### **Objectives**

Measurable outcomes representing meaningful indicators of short- and long-term success should be identified for each subprogram area.

#### **Strategies and Methods**

The overall strategies (e.g., regulatory approach, educational approach) and the specific methods (e.g., licensing, public information campaign, etc.) for addressing each problem and accomplishing each objective should be identified and discussed. Resources, including funding and support services that are dedicated to each method, should be identified.

#### **Management Structure and Philosophy**

The responsibility for successful implementation of each strategy and the achievement of each objective should be assigned and outlined. The philosophy and structure through which responsibilities for managing these strategies are to be exercised should be discussed. For instance, whether supervisors have absolute decision making authority or whether there is a requirement for meaningful group input on major and routine program decisions and issues should be addressed. References to management texts and treatises should be used when applicable.

#### **Annual Work Plan**

Specific quantitative objectives to be achieved at periodic intervals (e.g., monthly) throughout the year should be formulated addressing each stated objective.

## Evaluation

Specific evaluation methods and their application frequency should be identified. Wherever possible, actual public health impact of activities, e.g., reduction in exposure, dose, and risk, should be highlighted for evaluation. Evaluation methods should include assessments of quality indicators, as well as audits of process and numerical indicators. Reference should be made to specific reports and tools used for evaluation and to action plans initiated by adverse evaluation findings.

## APPENDIX B

### JOB DESCRIPTIONS

The following guidance may be used to develop a description of radiation control positions.

#### **Radiation Control Program Director**

##### Duties and Responsibilities:

- a. Has responsibility for the entire radiation control program in an agency or several subprograms.
- b. Provides overall technical direction and performance oversight of the supervisors of subprograms, including assignment of work, scheduling, performance review, training, and problem resolution.
- c. Leads program policy development, program planning, and program evaluation efforts for agency and/or subprograms.
- d. Is the individual responsible for paperwork and performance on federal agreements and grants to agency and/or subprograms.
- e. If manager of all radiation control activities in an agency, has responsibility for coordinating efforts with higher level management and responding to the higher level agency's requirements.
- f. If manager of all radiation control activities in an agency, has responsibility for coordinating efforts under any interagency agreements and/or activities.
- g. Has key responsibility in personnel appointments, evaluations, counseling, and promotions for agency and/or subprograms.
- h. Prepares, defends, and implements budgets for agency and/or subprograms.
- i. Has fiduciary responsibility for funds collected and disbursed by agency and/or subprograms.
- j. Prepares, reviews, and/or approves compliance correspondence for agency and/or subprograms.
- k. Implements and oversees compliance actions carried out by agency and/or subprograms.
- l. Prepares, reviews, and approves official reports, news releases, and other publicly circulated documents issued by agency and/or subprograms.
- m. Represents the radiation control program to the media and at internal and external meetings and forums public and private. This includes making formal presentations and responding to questions on behalf of the RCP.

##### Education and Experience:

- a. A four year degree with substantial coursework in mathematics and physical science or engineering and supplemental coursework (master's degree preferred) in subjects related to radiation protection (e.g., radiation physics, radiation biology, etc.) and public administration; and
- b. Specific training in the technical aspects of the subprograms managed (i.e., licensing, inspection, and enforcement for radioactive materials); and

- c. At least four years of experience serving in a radiation protection position at the professional level, plus a record of progressive management responsibilities similar to those listed in the position description.

## **Radiation Control Supervisor**

### Duties and Responsibilities:

- a. Supervises activities and staff for one of the subprograms of an agency's radiation control program, including task assignment, scheduling of activities, implementation of routine compliance actions, acquisition, calibration and repair of equipment, and training of staff.
- b. Provides technical supervision and performance oversight for the staff of a subprogram.
- c. Participates in policy development, program planning, and program evaluation for a subprogram.
- d. Has responsibility for adequate performance of federal agreements and grants assigned to a subprogram.
- e. Advises on personnel appointments, evaluations, and promotions for a subprogram.
- f. Participates in budget development for a subprogram.
- g. Supervises and/or coordinates fee collection related to subprogram activities.
- h. Prepares and/or reviews compliance correspondence related to subprogram activities.
- i. Participates in implementation of compliance actions related to subprogram activities.
- j. Participates in preparing and reviewing official reports, news releases, and other publicly circulated documents related to a subprogram.
- k. Conducts performance evaluations, including accompanied field visits, of the activities of subprogram staff; prepares performance evaluation reports; and provides remedial training, where indicated.
- l. As necessary, may conduct technically oriented professional activities (license review, inspections, lab analyses, etc.) assigned to a subprogram during periods of staff shortage.
- m. May be assigned to represent subprogram activities to the media and at internal and external meetings and forums public and private. This includes making formal presentations and responding to questions on activities of the subprogram.

### Education and Experience:

- a. A four year degree in a physical science or engineering that included substantial coursework in physics, chemistry, and mathematics, and supplemental coursework (master's level preferred) in health physics and public administration; and
- b. Specific training in the technical aspects of the subprograms supervised; and
- c. At least four years of experience serving in a radiation protection position at the professional level, including performance of technical duties specific to the subprogram supervised, and supervisory duties similar to those listed in this position description.

## **Professional - Senior Level**

### Duties and Responsibilities:

- a. With minimal supervision conducts the more complex technically oriented professional assignments, as well as the routine technically oriented professional activities, specific to a subprogram within a radiation control program.
- b. May be the lead individual for the implementation of new projects or procedures introduced by the subprogram.
- c. Participates in the training and evaluation of more junior personnel assigned to the subprogram.
- d. As required, may assist the subprogram supervisor in the conduct of his/her duties;
- e. Ensures complex technical equipment is properly functioning.
- f. Uses complex technical equipment to obtain data for regulatory and/or advisory purposes.
- g. Performs analyses of data collected for regulatory and/or advisory purposes and recommends alternative actions on the application of data analyses to regulatory and/or advisory decisions to be made by the subprogram and/or the RCP.
- h. Prepares inspection reports and correspondence, as well as other technical documents resulting from regulatory and/or advisory activities.

### Education and Experience:

- a. A four year degree with coursework in basic subjects relevant to the technical activities of the subprogram, including substantial mathematics and physical science; supplemental coursework (master's degree preferred) in advanced subjects relevant to the activities of the subprogram (e.g., radiation physics, radiation biology, radiochemistry, etc.); and
- b. Specific training (e.g., short courses) in the technical aspects of the subprograms managed (i.e., licensing procedures, inspection procedures, analytical procedures, etc.); and
- c. At least two years of progressive experience at the entry professional level in radiation protection or regulation in governmental, military, or civilian employment.

## **Professional - Entry Level**

### Duties and Responsibilities:

- a. After a suitable orientation period, works independently to conduct technically oriented professional activities specific to a subprogram within a radiation control program.
- b. With experience, may work under supervision to conduct more complex technically oriented professional activities specific to a subprogram within a radiation control program.
- c. Uses complex technical equipment to obtain data for regulatory and/or advisory purposes.

- d. Performs analyses of data collected for regulatory and/or advisory purposes.
- e. Prepares inspection reports and correspondence, as well as other technical documents, based on regulatory and/or advisory activities pertinent to a subprogram's responsibilities.

Education and Experience (General):

- a. A four year degree with coursework in basic subjects relevant to the technical activities of the subprogram including substantial mathematics and physical science; and
- b. At least one year of experience working at the professional level in radiation protection; or at least two semesters of additional coursework beyond the bachelor's level in advanced subjects relevant to the activities of the subprogram (e.g., radiation physics, radiation biology, radiochemistry, etc.).

Education and Experience (Alternatives for x-ray and nonionizing subprograms):

- a. For the x-ray subprogram, graduation from an AMA-approved program in radiologic technology, plus two years job experience in radiologic technology; or
- b. For the nonionizing subprogram, graduation from a two year approved program in engineering or physical science, plus two years job experience in radiation protection activities.

## APPENDIX C

### PROFESSIONAL/TECHNICAL STAFFING GUIDANCE

Program	Regulatory	Nonregulatory
Electronic Product X-ray	Dental: 1.0 FTE per 500 unit (tube) inspections per yr. MSQA: 1.0 FTE per 100 unit (tube) inspections per yr. Other: 1.0 FTE per 300 unit (tube) inspections per yr.	
Electronic Product Nonionizing	FTEs determined by mix of sources on following basis: Fixed laser show - 5 days RF heater, industrial laser, and medical laser - 3 days (1.0 FTE = 225 days)	1.0 FTE
Emergency Response		0.5 FTE per year per million population
Environmental Monitoring and Surveillance		Ambient monitoring - 1.5 to 3.0 FTEs 1 facility - 2.5 to 5.0 FTEs 2 to 5 facilities - additional 1.5 FTEs per facility >5 facilities - additional 1.0 FTE per facility
Low-Level Waste	RCP with licensing responsibility for active site: 4.0 to 6.0 FTEs per site depending upon the stage of operation, the level of direct oversight of site operations, and the degree of administrative responsibility for the site.	Agreement State RCP without proposed or active site: 0.25 to 0.5 FTE per million population.  RCP with proposed site and assuming licensing responsibility: 6.0 to 8.0 FTEs per proposed site for characterization and pre-licensing activities.  RCPs with closed site: 0.5 to 1.5 FTE per site depending upon the stability of site.
Radioactive Materials	1.0 to 1.5 FTE per 50 uncomplicated licenses	
Radon	0.5 FTE per 100 contractors	0.5 plus 0.5 per 100 contractors over 100

## APPENDIX D

### SCHEDULING GUIDANCE

The following guidance pertains to priorities for scheduling x-ray facility inspections.

New Facility	Within reasonable time frame
Hospital or Similar Facility	Annually
Radiology Clinic	Annually
Other Medical Facility	Every two years
Chiropractic Facility	Every two years
Veterinary Facility	Every two years
Industrial Facility	Every two to four years
Dental Facility	Every five years

The following guidance pertains to priorities for scheduling inspections of radioactive materials licensees.

Category	Example	Priority
Specific Institutional	Hospital: a. Nuclear Medicine b. Therapy User c. Educational	a. 2 years b. 1 year c. 1-3 years (use dependent)
Specific Private Practice	Office: a. Nuclear Medicine b. Therapy User	a. 2 years b. 1 year
Specific Gauge	a. Moisture Density b. Level, etc. c. Non-specific	a. 2 years b. 3 years c. 2-3 years
Specific Research		1-3 years
Broad Medical		1 year
Broad Research		1 year
Broad Industrial		1 year
Manufacturer/Distributor (Medical or Non-medical)		1 year
Consultant/Physicist		1-2 years
In vitro General License		4 years
In vivo General License		4 years

## APPENDIX E

### SURVEILLANCE GUIDANCE — FOR THE AMBIENT ENVIRONMENT<sup>1</sup>

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>
Air	5 regional samples	168 hr/month	Fiber particulate Weekly-gross alpha, beta <sup>4</sup> Qtrly-composite gamma <sup>5</sup> pCi/m <sup>3</sup> )	alpha 3.7 E-5 Bq/m <sup>3</sup> (0.001 pCi/m <sup>3</sup> ) beta 3.7 E-4 Bq/m <sup>3</sup> (0. pCi/m <sup>3</sup> ) gamma <sup>6</sup> 1.9 E-4 Bq/m <sup>3</sup> (0.005
Ambient Gamma	5 regional samples	Qtrly	Gamma dose	1.3 E-3 mC/kg/mo (5 mR/mo) <sup>7</sup>
Surface Water	5 regional samples	Qtrly, Grab	Gross alpha, beta tritium	alpha 1.9 E-1 Bq/l (5 pCi/l) beta 1.9 E-1 Bq/l (5 pCi/l) tritium 1.5 E+1 Bq/l (400 pCi/l)
Ground Water	5 regional samples	Qtrly	Gross, alpha, beta tritium	Same as surface water
Soils	1 per year per station in conjunction with air sampling for radon	Annually	Gamma	Ra-226 7.4 E-3 Bq/g (0.2 pCi/g)
Radon	4-5 most probably as identified by geological data. Sample lowest occupied level <sup>8</sup>	Qtrly for 1 year	Passive monitors Radon or working levels	Rn 1.9 E-2 Bq/l (0.5 pCi/l)

*See footnotes at the end of this Appendix.*

## SURVEILLANCE GUIDANCE— FOR CERTAIN FACILITIES

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>	
<b>REACTORS:</b> Ambient Gamma	10 per site; four or 10%, whichever is greater, located jointly with utility; one control. Routinely monitor to 16 km., areas of high population and/or interest to 80 km.	Qtrly	gamma dose	1.3 E-3 mC/kg/mo	(5 mR/mo) <sup>7</sup>
Air Particulate	3 located jointly with utility, including one at highest X/Q and one control <sup>10</sup>	Continuous with weekly filter changes	Weekly-individual filters gross beta; Qtrly-composite gamma	beta 3.7 E-4 Bq/l gamma 1.9 E-4 Bq/l	(0.01 pCi/m <sup>3</sup> ) (0.005 pCi/m <sup>3</sup> )
Air Iodine	3 located jointly with utility	Continuous with weekly filter changes	Weekly-gamma	1-131 2.6 E-3 Bq/m <sup>3</sup>	(0.07 pCi/m <sup>3</sup> )
Surface Water	2 split with utility one up and one down stream	Monthly	Gross alpha, beta tritium, gamma (continuous sampling best for streams; grab samples are of questionable value)	alpha 1.9 E-1 Bq/l beta 1.9 E-1 Bq/l tritium 1.5 E+1 Bq/l gamma 4.4 E-1 Bq/l	(5 pCi/l) (5 pCi/l) (400 pCi/l) (12 pCi/l)
Ground Water	If affected, minimum of one control and one affected well	Qtrly	Gross alpha, tritium, gamma if used for consumption	Same as surface water	

*See footnotes at the end of this Appendix.*

## SURVEILLANCE GUIDANCE — FOR CERTAIN FACILITIES *(Continued)*

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>		
<b>REACTORS <i>(Continued)</i>:</b>						
1-131 in water	1 closest point of use below discharge	Weekly	Chemical separation followed by gamma isotopic	1-131	3.7 E-2 Bq/l	(1 pCi/l)
Drinking water	1 control; up to 3 of nearest water supplies which could be affected	Monthly composite; one split with utility	Monthly-gross alpha, beta; 1-131 if dose projection >0.01 mSv/yr (1 mrem/yr). Qtrly composite tritium	Same as surface water and milk		
Sediments	1 up and 1 down stream in area of settling	Annually, in conjunction with utility	Gamma		3.7 E-3 Bq/g wet weight	(0.1 pCi/g)
Fish	In vicinity of discharge one bottom and one top feeder	Semi-annually	Gamma		3.7 E-3 Bq/g wet weight	(0.1 pCi/g)
Milk	1 near highest X/Q; 1 control	Monthly during grazing	Iodine and gamma		3.7 E-2 Bq/l	(1 pCi/l)
Vegetation	1 sample broad leafy wet weight cover. One of each type vegetable or ground cover produced for commercial distribution within 10 km.	Monthly	Gamma isotopic of edible portion		3.0 E-3 Bq/g wet weight	(0.08 pCi/g)
		At harvest	Gamma isotopic of edible portion		3.0 E-3 Bq/g wet weight	(0.08 pCi/g)
Shell Fish	2 samples near facility, one control	6 months	Gamma		3.7 E-3 Bq/g wet weight	(0.1 pCi/g)

*See footnotes at the end of this Appendix.*

## SURVEILLANCE GUIDANCE — FOR CERTAIN FACILITIES *(Continued)*

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>
<b>URANIUM MINING:</b>				
Radon	1 at highest X/Q plus one at nearest resident <sup>9</sup>	Qtrly	Passive	7.4 E-3Bq/1 (0.2 pCi/1)
Ground Water	Site specific <sup>9</sup>	Qtrly	Unat, Ra-226 Gross alpha, beta	U 7.4 E-3 Bq/1 (0.2 Ci/1) Ra 7.4 E-3 Bq/1 (0.2 pCi/1) alpha 1.9 E-1 Bq/1 (5.0 pCi/1) beta 1.9 E-1 Bq/1 (5.0 pCi/1)
Surface Water	1 up and 1 down stream discharge exists <sup>9</sup>	Qtrly	U, Ra; verify NPDES permit	Same as ground water
<b>URANIUM MILLING:</b>				
Conventional Ambient Gamma	4 at fence line, 1 bkg, 1 at high X/Q, 1 at nearest resident if within 10 km., all co-located with facility. Additional at any place(s) of interest.	Qtrly, less for post operation	Gamma dose	1.3 E-3 mC/kg/mo (5 mR/mo)

*See footnotes at the end of this Appendix.*

## SURVEILLANCE GUIDANCE — FOR CERTAIN FACILITIES *(Continued)*

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>		
<b>URANIUM MILLING <i>(Continued)</i>:</b>						
Air Particulates	1 co-located at nearest resident if within 10 km; else at high X/Q <sup>9</sup>	Continuous (low volume) less for post-operation	Qtrly composite- U, Ra, Th, Pb	U	3.7 E-6 Bq/m <sup>3</sup>	(0.0001 pCi/m <sup>3</sup> )
				Ra	3.7 E-6 Bq/m <sup>3</sup>	(0.0001 pCi/m <sup>3</sup> )
				Th	3.7 E-6 Bq/m <sup>3</sup>	(0.0001 pCi/m <sup>3</sup> )
				Pb	7.4 E-5 Bq/m <sup>3</sup>	(0.002 pCi/m <sup>3</sup> )
Radon	4 stations; 2 co-located <sup>8</sup>	Qtrly	Passive		7.4 E-3 Bq/l	(0.2 pCi/l)
Ground Water	3-4 samples annually to verify operator data	Annually unless elevated levels are observed	U, Ra, Pb, Po, Th, gamma, TDS, Sulfates, Se, Mo	U	7.4 E-3 Bq/l	(0.2 pCi/l)
				Ra	7.4 E-3 Bq/l	(0.2 pCi/l)
				Th	7.4 E-3 Bq/l	(0.2 pCi/l)
				Po	3.7 E-2 Bq/l	(1 pCi/l)
				Pb	3.7 E-2 Bq/l	(1 pCi/l)
				Gamma	1.9 E-1 Bq/l	(5 pCi/l)
				TDS	500 ppm	
				Sulphates	250 ppm	
				Se	0.01 ppm	
Mo	0.05 mg/l					
Vegetation	Select predominant broad leafy and root type vegetables within 2 km. More samples may be necessary based on MILLDOSE	At harvest	U, Ra, Th, Pb, gamma, Se, Mo	U	7.4 E-6 Bq/g	(2.0 E-4 pCi/g)
				Ra(wet wt)	1.5 E-6 Bq/g	(5.0 E-5 pCi/g)
				Th	7.4 E-6 Bq/g	(2.0 E-4 pCi/g)
				Pb	3.7 E-5 Bq/g	(1.0 E-3 pCi/g)
				Se	5 ug/g	
				Mo	10 ug/g	
				Gamma	3.0 E-3 Bq/g	(0.08 pCi/g)

*See footnotes at the end of this Appendix.*

## SURVEILLANCE GUIDANCE — FOR CERTAIN FACILITIES *(Continued)*

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>		
<b>URANIUM MILLING <i>(Continued)</i>:</b>						
Soil	4 co-located with facility	Annually	Th, U, Ra, Pb, gamma	Th	7.4 E-3 Bq/g	(0.2 pCi/g)
				U	7.4 E-3 Bq/g	(0.2 pCi/g)
				Ra	7.4 E-3 Bq/g	(0.2 pCi/g)
				Pb	7.4 E-3 Bq/g	(0.2 pCi/g)
				Gamma	3.0 E-3 Bq/g	(0.08 pCi/g)
HEAP-LEACH:	Water only, site specific	Qtrly	Gamma, U, Ra, Th, Pb, Po, TDS, Sulfates, Se, Mo	Same as uranium milling		
IN-SITU:	Ground water only if above the water table. If associated with a plant/dryer, sample as a conventional mill.	Qtrly	Gamma, U, Ra, Th, Pb, Po, TDS, Sulfates, Se, Mo	Same as uranium milling		
<b>FUEL FABRICATION:</b>						
Air Particulate	1 bkg, 1 high X/Q	Continuous, changed weekly	Individual samples-gross alpha, beta Qtrly-composite-isotopic uranium	alpha	3.7 E-5 Bq/m <sup>3</sup>	(0.001 pCi/m <sup>3</sup> )
				beta	3.7 E-4 Bqm <sup>3</sup>	(0.01 pCi/m <sup>3</sup> )
				gamma	1.9 E-4 Bqm <sup>3</sup>	(0.005 pCi/m <sup>3</sup> )
				U	3.7 E-5 Bqm <sup>3</sup>	(0.001 pCi/m <sup>3</sup> )
Soil	1 bkg, 1 high X/Q	Annually	Isotopic uranium	U	3.7 E-4 Bq/g	(0.01 pCi/g)

*See footnotes at the end of this Appendix.*

## SURVEILLANCE GUIDANCE — FOR CERTAIN FACILITIES *(Continued)*

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>
<b>FUEL FABRICATION <i>(Continued)</i>:</b>				
Surface Water	1 up and 1 down stream or area of discharge	Monthly if associated with drinking water. Qtrly grab otherwise	Isotopic uranium	U      3.7 E-4 Bq/g      (0.01 pCi/l)
Vegetation	1 control; 1 at high X/Q	At harvest	Isotopic uranium	U      3.7 E-1 Bq/kg      (10 pCi/kg)
Sediments	1 up and 1 down stream or area of discharge	Annually	Isotopic uranium	U      3.7 E-3 Bq/kg      (0.1 pCi/g)
<b>WASTE REPOSITORIES:</b>				
Ambient Gamma	Co-locate a minimum of 4 or 10% of licensees, whichever is greater	Qtrly	Gamma dose	1.3 mC/kg/mo      (5 mR/mo)
Air Particulate	1 bkg, 1 co-located at high X/Q, closest resident, at population center if within 5 km.	Continuous with weekly filter changes	Weekly-individual filters-gross alpha, beta Qtrly-composite gamma	alpha      3.7 E-5 Bq/m <sup>3</sup> (0.001 pCi/m <sup>3</sup> ) beta      3.7 E-4 Bq/m <sup>3</sup> (0.01 pCi/m <sup>3</sup> ) gamma      1.9 E-4 Bq/m <sup>3</sup> (0.005 pCi/m <sup>3</sup> )

*See footnotes at the end of this Appendix.*

**SURVEILLANCE GUIDANCE — FOR CERTAIN FACILITIES** *(Continued)*

<u>EXPOSURE MEDIA</u>	<u>NUMBER OF SAMPLES AND SAMPLING LOCATION</u>	<u>SAMPLING FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS<sup>2</sup></u>	<u>LOWER LIMIT OF DETECTION (LLD)<sup>3</sup></u>
<b>WASTE REPOSITORIES: (Continued)</b>				
Air H-3	1 bkg, 1 high X/Q	Qtrly	Qtrly	tritium 1.5 E-6 Bq/ml (4 E-5 pCi/ml)
Surface Water	1 up and 1 down stream split with operator	Qtrly	Gross alpha; beta; gamma; tritium (chemical indicators to include pH, temperature, chloride, iron, color, turbidity, chemical oxygen demand and total organic carbon)	alpha 1.9 E-1 Bq/l (5 pCi/l) beta 1.9 E-1 Bq/l (5 pCi/l) gamma 4.4 E-1 Bq/l (12 pCi/l) tritium 1.5 E+1 Bq/l (400 pCi/l)
Ground Water	4 or 10% of operators, whichever is greater; co-located	Annually	Same as Surface Water	Same as Surface Water
Soil	1 bkg plus 4 others to include major drainage, high X/Q, and 1 co-located and split with operator	Qtrly Annually	Gamma, Sr if Cs is found Sr (if Cs-137 > 3.7 E-2 Bq/g)	Sr-89 3.7 E-1 Bq/g (10 pCi/g) Sr-90 7.4 E-2 Bq/g (2 pCi/g) gamma 3.7 E-3 Bq/g (0.01 pCi/g)
Vegetation	1 sample broad leafy vegetable or ground cover	Monthly	Gamma isotopic of edible portion	gamma 3.0 E-3 Bq/g (0.08 pCi/g)
	1 of each type produced for commercial distribution within 10 km.	At harvest	Gamma	gamma 3.0 E-3 Bq/g (0.08 pCi/g)

*See footnotes at the end of this Appendix.*

## Footnotes for Appendix E

1. The intent of the criteria for the ambient environment is to characterize the state's radiological environment, and not to monitor the same locations every year.
2. Unless otherwise stated, the frequency of analysis is the same as the sampling frequency.
3. As used in this document, LLD has the same definition as that used in U.S. Nuclear Regulatory Commission Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills," Revision 1, April 1980, which is quoted below:

### LOWER LIMIT OF DETECTION

For the purposes of this guide, the Lower Limit of Detection (LLD) is defined as the smallest concentration of radioactive material sampled that has a 95% probability of being detected with only a 5% probability that a blank sample will yield a response interpreted to mean that radioactive material is present. (Radioactive material is "detected" if it yields an instrument response that leads the analyst to conclude that activity above the system background is present.)

For a particular measurement system (which may include radiochemical separation):

$$\text{LLD} = \frac{4.66 S_b}{3.7 \times 10^4 \text{ EVY} \exp(-\lambda \Delta t)}$$

where

- LLD is the lower limit of detection (microcuries per milliliter);
- $S_b$  is the standard deviation of the instrument background counting rate (counts per second);
- $3.7 \times 10^4$  is the number of disintegrations per second per microcurie;
- E is the counting efficiency (counts per disintegration);
- V is the sample volume (milliliters);
- Y is the fractional radiochemical yield (when applicable);
- $\lambda$  is the radioactive decay constant for the particular radionuclide; and
- $\Delta t$  is the elapsed time between sample collection and counting.
- [exp indicates an exponent of the base of the natural logarithms-Ed. note]

The value of  $S_b$  used in the calculation of the LLD for a particular measurement system should be based on the actual observed variance of the instrument background counting rate rather than an unverified theoretically predicted variance.

Since the LLD is a function of sample volume, counting efficiency, radiochemical yield, etc., it may vary for different sampling and analysis procedures. Whenever there is a significant change in the parameters of the measurement, the LLD should be recalculated.

4. Gross alpha and beta analyses are for screening purposes only. If elevated levels are observed, procedures should direct which additional analyses may be required.
5. "Gamma" means gamma isotopic.
6. The LLD for gamma isotopic analyses are to be determined for Cs137 unless stated otherwise.
7. TLD systems should meet the criteria of ANSI Standard N545-1975 and U.S. Regulatory Guide 4.13.
8. The criteria for radon monitoring are interim guidance until the Task Force on Radon Monitoring can make a final recommendation.
9. Sample collection and analysis is desirable, but not required.
10. X is the short-term average centerline value of the ground concentration in Bq/m, and Q is the rate of release of radioactivity in Bq/sec.

The information in Appendix E was previously published in CRCPD Publication 86-4, *Criteria for Adequate Radiation Control Programs (Environmental Monitoring and Surveillance)* as Tables I, II, and Appendix B, on pages 16-22, and page 25.

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**CRCPD's MISSION: A PARTNERSHIP DEDICATED TO RADIATION PROTECTION.**

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The Conference of Radiation Control Program Directors, Inc. (CRCPD) is a nonprofit organization made up of individuals in state and local government who regulate and control the use of radiation sources, and of individuals, regardless of employer affiliation, who have expressed an interest in radiation protection. CRCPD was formed in 1968.

The objectives and purposes of the organization are: to promote radiological health in all aspects and phases, to encourage and promote cooperative enforcement programs with federal agencies and between related enforcement agencies within each state, to encourage the interchange of experience among radiation control programs, to collect and make accessible to the membership of the CRCPD such information and data as might be of assistance to them in the proper fulfillment of their duties, to promote and foster uniformity of radiation control laws and regulation, to encourage and support programs which will contribute to radiation control for all, to assist the membership in their technical work and development, and to exercise leadership with radiation control professionals and consumers in radiation control development and action.

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**ENCLOSURE 3**

**Comparison of Recommendations for Staffing  
Conference of Radiation Control Program Directors  
and  
Bureau of Radiation Control**

**Texas Department of Health  
Bureau of Radiation Control**

**March, 2001**

## INDEX

Personnel.....	1
Support Staff Identified by CRCPD.....	1
Table I - BRC Support Staff.....	2
Programs Not Identified by CRCPD.....	3
Emergency Response for Reactors.....	3
Escalated Enforcement.....	3
Incident Investigation Program - X-ray.....	3
Industrial Radiographer Certification Program.....	3
Mammography Accreditation Program.....	4
Pantex Agreement-in-Principle Grant.....	4
Standards Development.....	4
Texas Radiation Advisory Board Liaison.....	4
Table II - Staff for Programs Not Identified by CRCPD.....	5
Electronic Product Radiation - Ionizing (X-ray).....	6
Staffing.....	6
Registration.....	6
Inspections.....	6
Table III - Registration.....	7
Table IV - Sites/Tubes for Inspection.....	7
Table V - Inspection intervals for x-ray facilities.....	8

Electronic Product Radiation - Nonionizing (Lasers).....	9
Staffing.....	9
Registration.....	9
Inspections.....	9
Radioactive Materials.....	9
Staffing.....	10
Inspections.....	10
Radon.....	10
Environmental Monitoring.....	10
Staffing.....	10
Table VI - Radioactive Material Licenses.....	11
Table VII - Inspection Intervals for Radioactive Material.....	12
Low-Level Radioactive Waste (Disposal).....	13
Summary of Staffing Comparison of the CRCPD Versus the BRC.....	13
Electronic Product - Ionizing (X-Ray).....	13
Electronic Product - Nonionizing (Lasers).....	14
Emergency Response - Nonreactor.....	14
Radioactive Material Program.....	14
Environmental Monitoring.....	15
Table VIII - Comparison Actual BRC Staffing Versus CRCPD.....	16
Table IX - BRC Total Staffing.....	16
Appendix I - Calculations to Determine Full Time Equivalent Positions.....	17
Sources for data.....	19

## **Comparison of Recommendations for Staffing**

The information in this report is a review of the staffing for the Bureau of Radiation Control (BRC). In April, 1999, the Conference of Radiation Control Program Directors, Inc. (CRCPD) published a document entitled "Criteria for an Adequate Radiation Control Program." The BRC staffing is compared to the criteria in the CRCPD report.

### **PERSONNEL**

The CRCPD recommends that radiation control programs have a staffing pattern to fit the size and technical complexity of the program. Staffing should include sufficient professional, technical, and administrative positions, as well as legal, accounting, computer, and other support personnel.

### **SUPPORT STAFF IDENTIFIED BY CRCPD**

The CRCPD indicates that there should be adequate support staff, but makes no recommendation for the number of personnel.

The BRC support staff consists of the bureau chief, division directors, deputy directors, clerical personnel, and personnel in the following areas: records maintenance; human resources; accounting; administrative support (receptionist, purchasing); public information and training; and automation networking. Table I provides details of support personnel at the BRC. As indicated in Table I, organizational changes in December, 2000, realigned FTEs in the Bureau Office. One FTE supervisory systems analyst in the Bureau Automation Networking and Information Office devotes 80% of time to the Automation Networking Program for a total of 3.8 FTEs and 20% to Public Information and Training for a total of 2.2 FTEs. One FTE supervisory accountant in the Bureau Administrative Office allocates 80% of time to the Accounting and Administrative Program and 20% to the Records Maintenance Program.

Legal support is provided through the Office of General Counsel at the Texas Department of Health. While the BRC budgets for three attorneys and two legal secretaries, one attorney is generally assigned to the radiation control program and is available for consultation.

**TABLE I - BRC SUPPORT STAFF**

<b>Position</b>	<b>Number of FTEs (before allocations)</b>	<b>Number of FTEs (after allocations)</b>
<b>Senior Management - Bureau Chief, Division Directors</b>	<b>3.0</b>	<b>2.94<sup>1</sup></b>
<b>Senior Management - Deputy Directors</b>	<b>8.0</b>	<b>5.8<sup>2</sup></b>
<b>Clerical</b>	<b>24</b>	<b>22.6<sup>3</sup></b>
<b>Records Maintenance</b>	<b>6.2*</b>	<b>6.15<sup>4*</sup></b>
<b>Administrative Support, Human Resources, and Accounting</b>	<b>9.01*</b>	<b>8.92<sup>5*</sup></b>
<b>Public Information</b>	<b>2.2*</b>	<b>2.2*</b>
<b>Computer Specialists</b>	<b>3.8*</b>	<b>3.8*</b>
<b>TOTAL</b>	<b>56.21</b>	<b>52.41</b>

\*Reflects organizational changes in the Bureau Administrative Office and Bureau Automation Networking and Information Office effective December 1, 2000

<sup>1</sup> Reflects .06 FTE to Emergency Response for reactors obtained from FY 2000 Salary and Activity Code Report and rosters from emergency response exercises

<sup>2</sup> Reflects 5.8 FTEs administrative duties allocated from Deputy Directors; .29 FTEs to Emergency Response for reactors (from FY 2000 Salary and Activity Code Report and rosters from emergency response exercises); and 1.91 FTEs to technical duties in respective programs. Technical and administrative percentages provided by individual deputy directors.

<sup>3</sup> Reflects .13 FTE to Emergency Response for reactors obtained from FY 2000 Salary and Activity Code Report and rosters from emergency response exercises and 1.25 FTE for remote dental inspection review

<sup>4</sup> Reflects .05 FTE to Emergency Response for reactors obtained from FY 2000 Salary and Activity Code Report and rosters from emergency response exercises

<sup>5</sup> Reflects .09 FTE to Emergency Response for reactors obtained from FY 2000 Salary and Activity Code Report and rosters from emergency response exercises

## **PROGRAMS NOT IDENTIFIED BY CRCPD**

The following BRC programs are not identified by the CRCPD but are an integral part of the operation of the bureau. Staffing for these programs may be found in Table II.

### **Emergency Response for Reactors**

There are two commercial utility reactors in the state and the BRC is responsible for emergency response for these facilities. CRCPD addresses emergency response for reactors in a separate publication.

### **Escalated Enforcement**

The Escalated Enforcement program coordinates and conducts enforcement conferences for registrants and licensees who have failed to respond to, or failed to correct violations that may result in endangering public health and safety.

### **Incident Investigation Program - X-ray**

This portion of the program responds to incidents and complaints involving registrants and ionizing radiation-producing equipment. The remainder of the program is identified by CRCPD as non-reactor emergency response.

### **Industrial Radiographer Certification Program**

The Industrial Radiographer Certification Program has the responsibility for ensuring that individuals working as industrial radiographers in Texas have a basic knowledge of radiation safety practices. The program compiles and administers industrial radiography exams throughout the state and manages and coordinates contracts for the use of the Texas industrial radiography exam by seven other state radiation control programs and certifying entities. In addition to compiling exams, contract obligations include the preparation of educational materials and operational manuals for conducting proctor training for state regulatory personnel.

### **Mammography Accreditation Program**

The mammography accreditation program provides another avenue for accreditation for Texas mammography registrants. While the program has been operational less than a year, currently 124 facilities out of a possible 566 have received accreditation with Texas. Because of the ease of obtaining Texas certification and accreditation in one application process and recent price increases by other accreditation bodies, the number of accreditations is expected to increase accordingly.

### **Pantex Agreement-in-Principle Grant**

The Pantex program provides for the independent evaluation of environmental monitoring data at the Pantex Weapons Disassembly Plant in Amarillo, Texas. The program strives to enhance joint federal, state, and local government emergency preparedness capabilities. To successfully achieve joint objectives, there is frequent contact with the Governor's Energy Office, the Attorney General's Office, Texas Natural Resources Conservation Commission, the Texas Department of Public Safety Emergency Management Division, affected local government jurisdictions, and several citizen focus groups.

### **Standards Development**

Standards Development researches, compiles, and develops radiation rules for submission to the Texas Board of Health for approval. The program also develops regulatory guides for use throughout the BRC. In addition, rule distribution to all licensees and registrants in the state is coordinated by this program.

### **Texas Radiation Advisory Board Liaison**

The Texas Radiation Advisory Board (TRAB) is composed of members appointed by the governor to provide advice to the Texas Board of Health (BOH) and the BRC in the area of radiation policies and programs. The liaison provides a method of interacting with TRAB members and providing information needed in their task of advising the BOH and BRC on rules, policies, and programs relating to the regulation of sources of radiation.

**TABLE II  
STAFF FOR PROGRAMS NOT IDENTIFIED BY CRCPD**

Program	Number of FTEs at BRC
Emergency Response for Reactors	3.45 <sup>6*</sup>
Escalated Enforcement	2.9
Incident Investigation Program for x-ray	.8
Industrial Radiography Certification Program and Legal Action Program	1.9
Mammography Accreditation Program	1.0
Pantex Coop Agreement Special Project	1.0
Standards Development	3.1
Texas Radiation Advisory Board Liaison	0.25
<b>TOTAL</b>	<b>14.4</b>

\* FTEs from FY 2000 Salary and Activity Code Report and rosters from emergency response exercises

<sup>6</sup> Reflects 2 FTEs for two reactor facilities, plus the following FTEs from other programs in the BRC:

- .06 FTEs from senior management (bureau chief, division directors)
- .29 FTEs from senior management (deputy directors)
- .05 FTEs from Records Maintenance
- .13 FTEs from clerical staff
- .09 FTEs from Administrative, Human Resources, and Accounting
- .01 FTEs from Industrial Radiography Certification
- .03 FTEs from Escalated Enforcement
- .03 FTEs from Incident Investigation
- .09 FTEs from Environmental Monitoring and Surveillance
- .42 FTEs from Licensing, Radioactive Materials Compliance and Inspection, including regional inspectors
- .22 FTEs from Registration, X-ray Compliance and Inspection, including regional inspectors
- .03 FTEs from Standards Development

## **ELECTRONIC PRODUCT RADIATION - IONIZING (X-RAY)**

The electronic product ionizing radiation program addresses the use of radiation-producing equipment for diagnostic and therapeutic medical, mammography, chiropractic, podiatric, dental, and veterinary facilities; industrial facilities to include analytical, security, and accelerators; academic facilities; state and county governmental facilities; and companies providing services including installation and repair and personnel dosimetry.

### **Staffing**

While CRCPD staffing for x-ray is based solely on inspections, the criteria indicates that this includes personnel for the registration of facilities with x-ray equipment as well as inspections and enforcement. CRCPD recommendations are one full-time equivalent (FTE) per 500 tube inspections per year for dental; one FTE per 100 tube inspections per year for mammography; and one FTE per 300 tube inspections per year for all other x-ray. See Appendix I for BRC staffing.

### **Registration**

CRCPD recommends registration of equipment prior to beginning operation. The BRC registers accelerators, industrial radiography machines, mammography machines, and radiation services before use. All other radiation machines must be registered within 30 days of beginning use of the equipment. There are currently over 42,000 radiation-producing machines registered in the state. Table III details the number of registrations, sites (facilities), and machines that the BRC Registration program manages.

### **Inspections**

BRC inspection schedules are prepared in advance as recommended by the CRCPD. Reports of the inspections are prepared within approximately 15 days of the date of the inspection and are reviewed by supervisory personnel before being sent to the registrant. An exception to this is a facility issued a Notice of Violations for severity level III violations for equipment performance evaluations and technique charts and severity levels IV and V violations. The inspector produces a copy of the report that is given to the facility on completion of the inspection. The report, however, is later reviewed by supervisory personnel and changes made if necessary. The BRC has over 36,000 tubes and 15,000 sites for inspections. Because of the geographic size of the state, the regional inspectors are frequently called upon to preliminarily investigate situations in their region, such as non-registered equipment or personnel, to avoid the expense of excess travel by Austin staff. See Table IV.

**TABLE III - REGISTRATIONS**

TYPE of REGISTRATION	TOTAL # OF REGISTRATIONS	TOTAL # OF SITES (FACILITIES) INCLUDING SUB-SITES	TOTAL # OF MACHINES
Dental	6,196	6,804	22,522
Mammography	458	566	916
Laser	1,211	1,402	4,161
All Other Registrations	7,102	8,235	14,686
<b>TOTALS</b>	<b>14,967</b>	<b>17,007</b>	<b>42,285</b>

Totals as of 2/1/01 obtained from the Bureau Automation Networking and Information Office

**TABLE IV - SITES/TUBES FOR INSPECTION<sup>7</sup>**

Type of Facility	No. of Sites	No. of Tubes/Site	Total Tubes
Dental	6,824	3.07	20,949
Mammography	566	1.6	905
Other X-ray	8,235	1.8	14,823
<b>Totals</b>	<b>15,625</b>		<b>36,677</b>

Inspection intervals are developed and based on the average severity levels that contain health-related violations. See Table V for inspection intervals.

<sup>7</sup> Calculated from "tubes inspected per facility" from monthly reports of the Division of Compliance and Inspection for 1/1/00 to 12/31/00 and "total tubes at facilities inspected" from inspection reports compiled by the Bureau Automation Networking and Information Office for 1/1/00 to 12/31/00

**TABLE V - INSPECTION INTERVALS FOR X-RAY FACILITIES**

<b>Certificate of Registration - Type of Facility</b>	<b>CRCPD Intervals</b>	<b>BRC Intervals</b>
New Facility	Within a reasonable time frame	3 - 6 months
Hospital or Similar Facility	Annually	(See Medical)
Medical a. 1 - 9 machines per location b. 10 or more machines per location	Annually	a. 3 years b. 2 years
Radiology Clinic	Annually	(See Medical)
Other Medical Facility	2 years	(See Medical)
Chiropractic	2 years	3 years
Podiatric	-----	5 years
Veterinary	2 years	5 years
Mammography system	-----	1 year
Dental	5 years	4 years*
Educational/Academic (Non-Medical)	-----	3 years
Industrial Facility	2-4 years	1 - 5 years
Laser a. Mobile Light Show b. Stationary Light Show c. Other Laser	-----	1 year 5 years 5 years

\* A remote inspection is alternated with a physical inspection every four years.

## **ELECTRONIC PRODUCT RADIATION - NONIONIZING (LASERS)**

The CRCPD recommends a wide array of activities for various nonionizing radiation-producing equipment. The BRC only regulates lasers and laser services and addresses inquiries on other nonionizing equipment, such as radio-frequency heaters and industrial microwave ovens.

### **Staffing**

The CRCPD recommendations for staffing exceed that of the BRC, which is staffed from personnel from the ionizing radiation program. Approximately .2 FTE is devoted to laser registration activities.

### **Registration**

The BRC registers lasers used in medical, dental, podiatric, industrial, and entertainment facilities as well as laser services.

### **Inspections**

Primarily, entertainment lasers are the only nonionizing equipment routinely inspected. Minimal information is obtained and reports are reviewed by supervisory staff.

## **RADIOACTIVE MATERIALS**

The program includes licensing of radioactive material for the following uses: diagnosis and therapy in the healing arts and veterinary medicine; governmental, academic and industrial environments; manufacture and distribution of radioactive sources, kits, and devices containing radioactive materials; use of devices under a general license; sealed source and device evaluation; uranium mining; waste processing; and irradiators.

Within the state of Texas, licensing of all radioactive material is under the authority of the BRC with the following exceptions. Disposal of radioactive material is regulated by the Texas Natural Resource Conservation Commission and disposal of naturally occurring radioactive waste from oil and gas production is under the authority of the Texas Railroad Commission.

## **Staffing**

The CRCPD recommends 1.0 to 1.5 FTE per 50 uncomplicated licenses and indicates that additional personnel may be necessary for complicated licenses. The CRCPD criteria does not contain recommendations for the number of personnel for a complicated license. See Table VI for numbers of licenses and Appendix I for BRC staffing.

## **Inspections**

Inspections are performed as recommended by CRCPD. Following the inspection visit, a report is generated within 15 days and forwarded to the Austin central office for review by supervisory personnel. A report is then sent to licensees. See Table VII for inspection intervals.

## **RADON**

The CRCPD recommends staff based on the number of mitigation contractors. The BRC does not have specific staffing for radon.

## **ENVIRONMENTAL MONITORING**

The program performs field sampling and measurement and data analysis, coordinates sample processing for the Texas Department of Health (TDH) laboratory for analysis, and prepares reports.

## **Staffing**

CRCPD provides extensive criteria for an environmental monitoring program. It appears that there is an assumption that a program would physically collect and process all samples for facilities performing environmental monitoring and perform the laboratory analysis. See Appendix I for BRC staffing.

Because of this, it is difficult to do a valid comparison. There are twenty-one facilities in the state, including commercial and governmental, that do environmental monitoring. Samples are taken from eight of these locations. Two of the eight facilities are power plants that collect their own samples and send them in for laboratory analyses. See Appendix I for BRC staffing.

**TABLE VI - RADIOACTIVE MATERIAL LICENSES**

<b>Types of Licenses</b>	<b>Number of Licenses</b>	<b>Number of Sites</b>
<b>Broad</b>	<b>24</b>	<b>57</b>
<b>Decontamination Service - Fixed</b>	<b>4</b>	<b>5</b>
<b>Decontamination Service - Mobile</b>	<b>13</b>	<b>14</b>
<b>In Vitro Test Kit Manufacturer</b>	<b>5</b>	<b>6</b>
<b>Irradiator - Self Contained</b>	<b>42</b>	<b>53</b>
<b>Irradiator = Unshielded</b>	<b>7</b>	<b>8</b>
<b>Manufacturing &amp; Commercial Distribution - (Manufacturer of Loose Radioactive Material)</b>	<b>4</b>	<b>5</b>
<b>Commercial Distribution Only</b>	<b>20</b>	<b>21</b>
<b>Manufacturing &amp; Commercial Distribution- (Limited Manufacturing)</b>	<b>1</b>	<b>1</b>
<b>Other Manufacturing &amp; Commercial Distribution</b>	<b>15</b>	<b>16</b>
<b>Mineral Recovery - Byproduct Material</b>	<b>1</b>	<b>1</b>
<b>Research and Development</b>	<b>94</b>	<b>121</b>
<b>Uranium</b>	<b>8</b>	<b>16</b>
<b>Waste Processor</b>	<b>3</b>	<b>4</b>
<b>SUBTOTAL COMPLICATED LICENSES</b>	<b>241</b>	<b>328</b>
<b>General License Acknowledgments</b>	<b>322</b>	<b>401</b>
<b>All Other Uncomplicated Licenses</b>	<b>1,249</b>	<b>1,767</b>
<b>TOTAL</b>	<b>1,812</b>	<b>2,496</b>

Totals as of 2/1/01 from the Bureau Automation Networking and Information Office

**TABLE VII - INSPECTION INTERVALS FOR RADIOACTIVE MATERIAL**

<b>Type of License</b>	<b>CRCPD Intervals</b>	<b>BRC Intervals</b>
New license		Six months after becoming operational
Specific - medical Hospital a. Diagnostic Nuclear Medicine b. Therapy  c. Educational	a. 2 years b. 1 year  c. 1-3 years (use dependent)	a. 2 years b. 1 year - sealed source; 2 years unsealed radioactive material c. 2 years
Specific - medical - private practice a. Diagnostic Nuclear Medicine b. Therapy	a. 2 years b. 1 year	a. 2 year b. 1 year - sealed source; 2 years unsealed radioactive material
Specific - gauge a. Moisture density b. Level. etc. c. Nonspecific	a. 2 years b. 3 years c. 2-3 years	a. 2 years b. 3 years (fixed gauge) c. 4-5 years
Specific - research	1-3 years	2 years
Broad - medical	1 year	1 year
Broad - research	1 year	2 years
Broad - industrial	1 year	1 year
Manufacturer/Distributor	1 year	1 year
Consultant/Physicist	1-2 years	5 years
General license - in vitro	4 years	3 years

Information obtained from Inspection Interval Report prepared by the Bureau Automation Networking and Information Office for Compliance and Inspection as of 2/1/01.

## LOW-LEVEL RADIOACTIVE WASTE (DISPOSAL)

The CRCPD makes recommendations for staffing for waste based on the state's population. The population of Texas is rapidly expanding and the staffing recommendation using CRCPD's criteria is 5 to 10 FTEs. Since the state does not have an active low-level radioactive waste site and the authority to dispose of waste lies with another state agency, a staffing comparison is not valid. The BRC does license waste processors. The licensing staff addresses inquiries related to safety and control issues for radioactive waste and the allocation of their time is reflected under the waste category. See Appendix I for BRC staffing.

## SUMMARY OF STAFFING COMPARISON OF THE CRCPD VERSUS THE BRC

A staffing comparison of technical staff shows the BRC is understaffed by 35 to 67 FTEs. Because of the differences in programs, a side-by-side accurate comparison is not possible. Especially noticeable are the CRCPD criteria for low-level waste, environmental monitoring, and emergency response for non-reactors that accounts for the understaffing of 13.42 to 20.15 FTEs. See Appendix I. These areas may not reflect an accurate representation of understaffing at the BRC.

In addition, all employees are required to participate in emergency response exercises for reactors, which is addressed by the CRCDP in a separate publication. BRC employees allocated to emergency response are noted in Table II.

### **Electronic Product - Ionizing (X-ray)**

While staffing for both the Registration Program and the X-ray Compliance and Inspection Program are fairly close to the CRCPD recommendations, the numbers used for the BRC are budgeted positions and do not reflect vacancies. Although the X-ray Compliance and Inspection Nonionizing Program has 17 full time budgeted inspector positions, the program averaged vacancies in 4.5 positions in fiscal year (FY) 2000 because of resignations, retirement, or extended illness. In addition to the difficulty in hiring qualified individuals for the available salary, a new employee is required to attend approximately five months of training and become certified to perform inspections of electronic equipment prior to being available for inspections full-time. The Registration Program likewise has 7.8 technical FTEs when fully staffed, but experienced an average vacancy of 1 FTE in FY2000. Between the two ionizing programs, the BRC actual staffing was 30.75 rather than 36.25 FTEs as indicated in Appendix I.

In an effort to continue to meet the registrant's needs, both programs have instituted major changes within the past one to two years in order to maintain a status quo and overcome the

ramifications of unfilled positions. The Registration Program has eliminated the expiration date for dental, veterinary, and podiatric facilities and expanded the renewal time for all other registrations from five to eight or ten years. This has either removed or increased the time for automatic renewals and thereby requires some registrants to only notify the program if they are adding or deleting equipment. Mammography continues to be a three year renewal as required by Texas law.

The Compliance and Inspection Program has reviewed health-related violations and increased the inspection intervals in many categories. Dental facilities historically have a low percentage of health related violations and comprise the largest number of registrants in the state, therefore dental inspections are now performed every four years alternating between a physical and a remote inspection. These changes have not been in effect a sufficient length of time to evaluate BRC resources. Despite the changes, a large backlog of inspections still exist because of vacancies.

#### **Electronic Product - Nonionizing (Laser)**

There continues to be no funding for this program and staffing is utilized from the ionizing radiation program.

#### **Emergency Response - Nonreactor**

Six FTEs from the Radiological Emergency Preparedness program, including three who work with the Waste Isolation Pilot Plant (WIPP) Program, are in the emergency response nonreactor section. In addition to emergency response, this program performs planning for transportation of radioactive materials throughout the state. Included under this category are shipments of transuranic waste to the WIPP site near Carlsbad, New Mexico. In addition, there is one FTE emergency planner for the Pantex Project, and 2.24FTEs allocated from the Incident Investigation Program.

#### **Radioactive Material Program**

Staffing for licensing falls below that recommended by the CRCPD. Part of the discrepancy may lie in the fact that CRCPD does not delineate the numbers of FTEs per complicated licenses. So the BRC calculations in Appendix I, all licenses and sites were counted as uncomplicated licenses. Because there are licenses with multiple sites spread throughout the state, each site is treated as a separate license for statistical purposes. While some vacancies exist, they are less than that in the electronic product ionizing program.

## **Environmental Monitoring**

Since sampling is done at only eight of the twenty-one facilities in the state, staffing for the BRC is done using these assumptions and also not counting laboratory personnel. (The TDH laboratory personnel involved in performing laboratory analysis on environmental samples are not part of the BRC budget.) CRCPD's criteria appears to include assumptions that an environmental monitoring program physically performs all sampling at all facilities in the state and that the FTEs for the laboratory duties are allocated to the environmental monitoring program. This would account for the fact that BRC FTEs are below that recommended by the CRCPD.

**TABLE VIII - COMPARISON  
ACTUAL BRC STAFFING VERSUS CRCPD RECOMMENDATIONS**

<b>PROGRAM DESCRIPTION</b>	<b># of FTEs RECOMMENDED BY CRCPD</b>	<b>ACTUAL NUMBER OF BRC FTEs</b>
Electronic Product-X-ray	36.25	36.25
Electronic Product Nonionizing - Lasers	4.1	.2
Emergency Response (non-reactor)	10.45	9.24
Environmental Surveillance and Monitoring	12 to 13.5	4.07
Low-level Radioactive Waste	5.22 to 10.45	.94
Radioactive Materials	49.9 to 74.8	31.5
Radon	N/A	-0-
<b>TOTALS</b>	<b>117.92 to 149.55</b>	<b>82.2</b>

**TABLE IX - BRC TOTAL STAFFING**

Technical Staff - Identified by CRCPD	82.2
Support Staff - Identified by CRCPD but no FTE recommendations	52.4
Staff - Not identified by CRCPD	14.4
<b>TOTALS</b>	<b>149.0</b>

**APPENDIX I - CALCULATIONS TO DETERMINE FULL TIME EQUIVALENT POSITIONS**

<b>CRCPD Recommendation</b>	<b>BRC Data</b>	<b>CRCPD Recommended FTEs</b>	<b>BRC Actual FTEs</b>	<b>Net</b>
<b>X-Ray Dental</b> 1.0 FTE per 500 tubes inspected/year	6824 sites x 3.07 tubes/site = 20,949 tubes/8 yr inspection interval = 2618 tubes for inspection/year 2618/500 tubes = 5.24 FTEs	5.24		
Remote dental inspection		NA	1.25	
Mammography 1 FTE per 100 tubes inspected/year	566 sites x 1.6 tubes/site = 905 tubes/1 yr inspection interval = 905/100 tubes = 9.05 FTEs	9.05		
Other X-ray 1 FTE per 300 tubes inspected/year	8235 sites x 1.6 tubes/site = 13,176 tubes/2 yr average inspection interval = 6588 tubes for inspection/year 6588/300 tubes = 21.96 FTEs	21.96		
<b>Subtotal</b>		<b>36.25</b>	<b>35.00</b> <b>36.25*</b>	<b>-0-</b>
<b>Laser</b> Fixed laser light shows - 5 days Medical & industrial laser - 3 days	20 laser light shows x 5 days = 100 1382 sites/5 yr inspection interval = 276.4 x 3 days = 829.2 100+829.2 = 929.2/225 days=4.1	4.1	0.2	<3.9> Cont....

\*May be an underestimate of the real requirement, see pages 13 - 14 for more detail.

<b>CRCPD Recommendation</b>	<b>BRC Data</b>	<b>CRCPD Recommended FTEs</b>	<b>BRC Actual FTEs</b>	<b>Net</b>
<b><u>Emergency Response (non-reactor)</u></b> 0.5 FTE per million population	20.9 million	10.45	9.24*	<1.21>
<b><u>Environmental Monitoring and Surveillance</u></b> Ambient monitoring- 1.5 to 3 FTEs 2 to 5 facilities - additional 1.5 FTE/facility > 5 facilities - additional 1.0 FTE per facility	8 facilities $1.5 + (1.5 \times 5) + (1 \times 3) = 12$ $1.5 + 7.5 + 3 = 12$ $3.0 + (1.5 \times 5) + (1 \times 3) = 13.5$ $3.0 + 7.5 + 3 = 13.5$	12.0 to 13.5	4.07	<7.93 to 9.43>
<b><u>Low-level Radioactive Waste</u></b> State without active site - 0.25 to 0.5 FTE per million population	20.9 million	5.22 to 10.45	.94	<4.28 to 9.51>
<b><u>Radioactive Material</u></b> 1 to 1.5 FTE per 50 licenses	2496 sites/50 licenses = 49.9 x 1 FTE = 49.9 FTEs 2496 sites/50 licenses = 49.9 x 1.5 FTE = 74.8 FTEs	49.9 to 74.8	31.5	<18.4 to 43.3>
<b><u>Radon</u></b> 0.5 FTEs/100 contractors	NA for Texas	NA	0	-0-
<b>TOTAL</b>		117.92 to 149.55	82.2	<35.72 to 67.35>

\*See page 14 for more detail  
Data sources for this chart on page 19

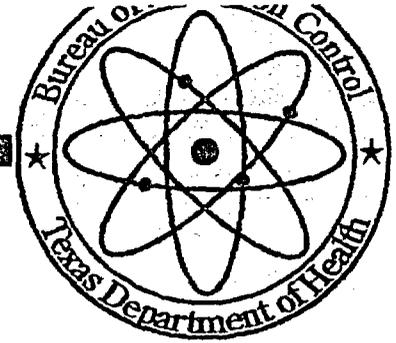
Number of x-ray sites obtained from the Bureau Automation Networking and Information Office as of 2/1/01

Inspection data calculated from "tubes inspected per facility" from monthly reports of the Division of Compliance and Inspection for 1/1/00 to 12/31/00 and "total tubes at facilities inspected" from inspection reports compiled by the Bureau Automation Networking and Information Office for 1/1/00 to 12/31/00.

Number of licenses obtained from the Bureau Automation Networking and Information Office as of 2/1/01

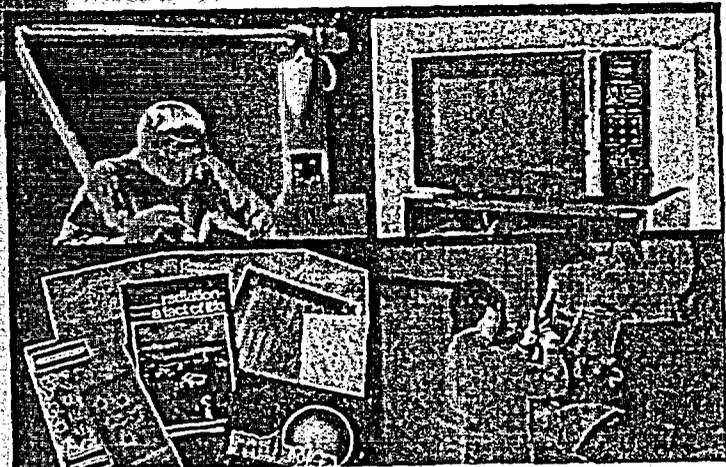
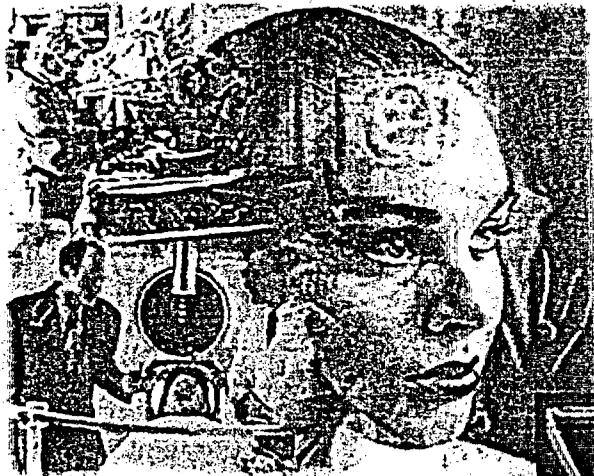
BRC FTE personnel data taken from the bureau organizational chart and the "Detailed Salary Expense Allocation by Employee Report for FY 2000." This report contains hours allocated by activity code.

**ENCLOSURE 4**



# BUREAU OF RADIATION CONTROL

## Program and Budget Information



June 2001

ENCLOSURE 4



## LEGISLATIVE AUTHORITY

The Texas Legislature passed the Texas Radiation Control Act (Article 4590f V.T.C.S.) in 1961. The Texas Radiation Control Act was later recodified under the Texas Health and Safety Code, Chapter 401.

A contractual agreement enabling Texas to regulate was made in 1963 between the U.S. Atomic Energy Commission, now the Nuclear Regulatory Commission (NRC), and the State of Texas. The agreement was made in accordance with the Atomic Energy Act of 1954, as amended in 1959. Texas became an "Agreement State" assuming the powers relinquished by the NRC.

The act mandates a program to regulate the sources and uses of radiation to make certain the health and safety of the public are protected and to protect the environment. It also mandates that the regulatory program permit the maximum use of sources of radiation for peaceful purposes consistent with health protection.

## KEY PROVISIONS OF TEXAS RADIATION CONTROL ACT

- 
- Mandates an effective regulatory program for sources of radiation
  - Provides for compatibility with federal standards and regulatory programs and to the degree possible compatibility with other states' systems
  - Directs the maintenance of a program that permits development and use of sources of radiation for peaceful purposes consistent with public health and safety and environmental protection
  - Designates TDH as the radiation control agency
  - Establishes the Texas Radiation Advisory Board
  - Provides for:
    - Adoption of rules and guidelines
    - Licensing and registration of sources of radiation
    - Training programs of quality TDH personnel to carry out duties of the Act
    - Inspection and enforcement which includes:
      - Authority to enter public or private property at any reasonable time to inspect sources of radiation for compliance
      - Authority to order cease and desist of any unsafe operations using sources of radiation
      - Authority to impound sources of radiation if an emergency exists



**KEY  
PROVISIONS OF  
TEXAS  
RADIATION  
CONTROL ACT  
(continued)**

- License and registration requirements
- Radioactive waste disposal and processing
- Fees for licenses, registrations, and environmental monitoring
- Radiation and Perpetual Care Fund for decontamination, decommissioning, stabilization, and disposal of radioactive material for the protection of public health
- Court proceedings and administrative penalties
- Certification of mammography systems
- Accreditation of mammography facilities
- Uranium recovery and disposal
- Incident investigations and emergency response planning
- Guidelines for transportation and routing of radioactive materials

**ORGANIZATION**

The organization of the Bureau of Radiation Control (BRC) is as follows. A detailed summary and organizational chart of the BRC is included in the appendix of this report.

Bureau of Radiation Control  
Division of Licensing, Registration, and Standards  
Division of Compliance and Inspection  
Bureau Administrative Office

**MISSION  
STATEMENT**

Our mission is to protect and promote the physical and environmental health of the people of Texas. We strive to prevent unnecessary radiation exposure to the public through effective licensing, registration, inspection, enforcement, and emergency response programs. We carry out our mission efficiently, effectively, and professionally with respect and dedication to all Texans.

**ESSENTIAL  
FUNCTIONS**

The BRC's essential functions:

- Responds to emergencies
- Evaluates applications for licenses and registrations
- Issues radioactive material licenses and certificates of registration for radiation-producing machines and certifies and accredits mammography facilities
- Provides testing and certification for industrial radiography
- Develops rules and regulatory guides



**ESSENTIAL  
FUNCTIONS  
(continued)**

- Enforces rules by inspection, education, hearings, environmental monitoring and other enforcement actions
- Investigates accidents and incidents
- Develops emergency response plans
- Provides public information
- Provides training
- Collects fees
- Establishes routing for transportation of radioactive materials
- Maintains records

**KEY  
STAKEHOLDERS  
OF BRC**

- The Texas Radiation Advisory Board
- South Texas Chapter of the Health Physics Society
- Lone Star Chapter of the Sierra Club
- Advocates for Responsible Disposal in Texas
- Texas Medical Association
- Texas Veterinary Association
- Texas Dental Association
- Texas Board of Chiropractic Examiners
- Texas Hospital Association
- Texas Independent Producers and Royalty Owners
- Texas Oil and Gas Association
- TU Electric Services
- South Texas Project
- Association of Energy Service Companies
- American Association of Physicists in Medicine - Southwest Regional Chapter
- Conference of Radiation Control Program Directors
- Organization of Agreement States

**HISTORY AND  
ACCOMPLISH-  
MENTS**

**A** complete history is found in the BRC Summary included in the appendix of this report. The following are highlights of recent events and accomplishments that the BRC has achieved.

1994 A program for certification of mammography facilities was implemented and rules adopted requiring mammography facilities to be certified by the state, to have trained personnel and dedicated equipment and to meet strict quality control and equipment standards.

Also in 1994, the surface remediation of an inactive milltailings sites in Falls City was completed under a cooperative agreement between the Texas Department of Health and the U.S. Department of Energy.

1995 The BRC hosted the 27th Annual Conference on Radiation Control in San Antonio.

1996 A BRC Homepage was developed and put "on-line" under the Texas Department of Health's website on the Internet.



**HISTORY AND  
ACCOMPLISH-  
MENTS**  
(continued)

In June 1996 the BRC cosponsored a Food Irradiation Conference with the Bureau of Food & Drug Safety and Texas A&M University.

In October 1996 the BRC achieved a perfect score for an emergency response exercise at the South Texas Project Electric Generating Station, one of two nuclear power plants in Texas.

1997 The legislature transferred the Uranium recovery regulatory program back to the BRC.

In October 1997 the BRC issued its first Class III waste processing license to a facility in Andrews County.

The site of the surface impoundment containing uranium tailings remediated under UMTRA Title I at Falls City was deeded to the federal government in May 1997.

The Legislature amended the mammography section of the Radiation Control Act to mandate that the Texas Department of Health apply to the U.S. Food and Drug Administration (FDA) to become an accreditation body for mammography facilities under the federal Mammography Quality Standards Act, in addition to the previous requirement that TDH apply for state certifying agency.

1998 BRC totally revised laser rules through a participatory process to address current technologies and hazards.

BRC presented the seventh radiation regulatory conference, which provided more than 440 attendees from the regulated community to network and receive updated information on the use of radiation in science, health care, and industry.

1999 In response to feedback from the previous regulatory conference, BRC initiated the presentation of topical workshops on NORM (Naturally Occurring Radioactive Materials), mammography and industrial radiography.

TDH was approved by the U.S. Food & Drug Administration as an accreditation body for mammography facilities, making Texas the fourth state to be approved.

2000 BRC revised and simplified its dental regulatory program to include all dental rules in one section with easily understood rule explanations along side the rule language.

Dental inspection intervals changed to eight years with self-inspection every four years.

2001 On May 9, 2001, the first Waste Isolation Pilot Project (WIPP) shipment of waste travelled through Texas to the WIPP site in New Mexico.

Legislation passed to allow assessment of surcharges to cover the costs that arise when a licensee cannot pay for the safe handling or disposal of radioactive material.

Legislation passed to allow surcharges and administrative penalties to be placed in the Radiation Perpetual Care Fund.



**PROGRAM,  
INDUSTRY and  
REGULATORY  
TRENDS**

The Bureau of Radiation Control regulates radioactive materials and x-ray and nonionizing sources of radiation at the following number of sites of use throughout Texas:

2534 license sites, which includes 413 generally licensed gauges  
 15,800 registration sites  
 571 mammography sites  
 1029 laser (nonionizing radiation) sites

Virtually every industry in Texas and many educational and medical facilities make use of radioactive material and/or x-ray units for the benefit of Texas citizens. Examples of the beneficial uses of radiation include diagnostic nuclear medicine studies, emergency exit lighting, nondestructive testing of critical components in passenger aircraft, pipeline radiography, sterilization of surgical bandages, treatment of cancer, and highway construction materials testing. However, each time that a source of radiation is used, there is an opportunity for misuse, either accidental or intentional, that could result in unnecessary or excess exposure.

**X-RAY AND  
NONIONIZING  
RADIATION**

Radiation exposure from diagnostic medical and dental x-ray comprises the largest single source of ionizing radiation to members of the public. The biological effects of ionizing radiation are recognized as being significant, even at low levels. The National Academy of Science Committee on the Biological Effects of Ionizing Radiation has estimated that each person-rem of exposure costs society \$200 in ill-health effects. During Fiscal Year 1999, the citizens of Texas were exposed to about 108,000 person-rem of unnecessary radiation while receiving diagnostic examinations. This represents a potential cost to our citizens of approximately \$21,600,000. Of this total, over 16,000 person-rem of exposure, and \$3,200,000 in ill-health effects, was avoided as the result of problems identified during the inspection process. With additional inspection resources, an additional savings of 92,000 person-rem could have been avoided and \$18,400,000 in ill-health costs saved. The elimination of unnecessary radiation exposure has the impact of reducing deleterious health effects and their costs.

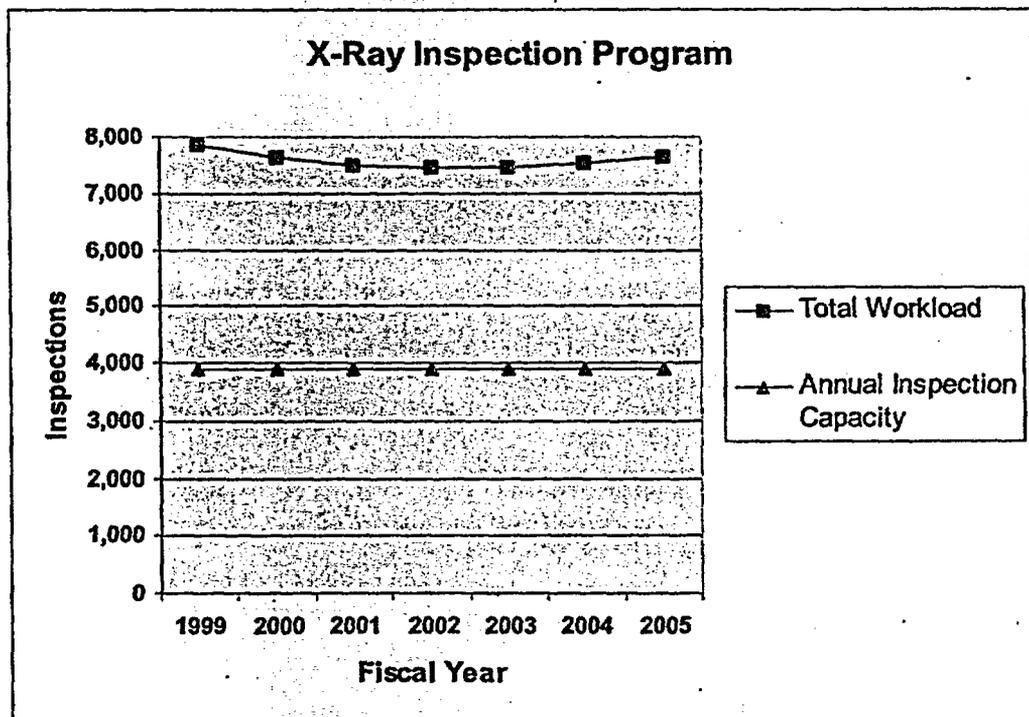




During regularly scheduled x-ray compliance inspections measurements of the amount of x-ray radiation entering the human body is determined for diagnostic procedures. The amount of radiation that a patient would receive during an examination is compared to the diagnostic x-ray examination limit in 25 Texas Administrative Code Chapter 289. If it is excessive, then a violation of the regulations has occurred and the registrant is required to correct the problem. Once it is resolved, patients will not receive excess radiation from that unit. Future excess patient exposure is prevented each time this scenario is repeated during inspections throughout Texas. During fiscal year 1999, approximately 4.3 percent of the x-ray units inspected delivered excessive radiation exposure to patients.

There are over 44,000 x-ray tubes (each unit may have more than one x-ray tube) in Texas that are used for diagnostic procedures on people. There is currently a backlog of approximately 3,192 overdue x-ray inspections. This is down from about 7,000 in Fiscal Year 1996, and results from decreasing the scope of all x-ray inspections and commensurately increasing the number of inspections required to be performed by each inspector by approximately 30 percent. Each x-ray inspector now performs about 250-300 inspections per year. Even with this increase in inspection capacity, there are not enough inspectors to perform all due and overdue inspections, since the number of registered x-ray facilities is increasing at the rate of 1.8 percent per year. In addition, this increase in the number of inspections performed has also increased the travel costs associated with x-ray inspections by about 20-25 percent.

**X-RAY  
INSPECTION  
PROGRAM  
WORKLOAD  
CHART**



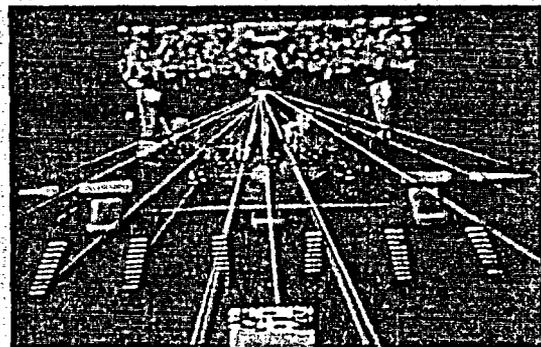


**X-RAY AND  
NONIONIZING  
RADIATION  
Cont'd**

Based on inspection data collected by the BRC, a large number of noncompliant x-ray machines are in use at medical facilities throughout the state. In many instances patients receive excessive radiation from diagnostic x-ray medical procedures resulting in an increased public health threat. In order to eliminate the backlog and reduce the threat, additional qualified inspectors are needed.

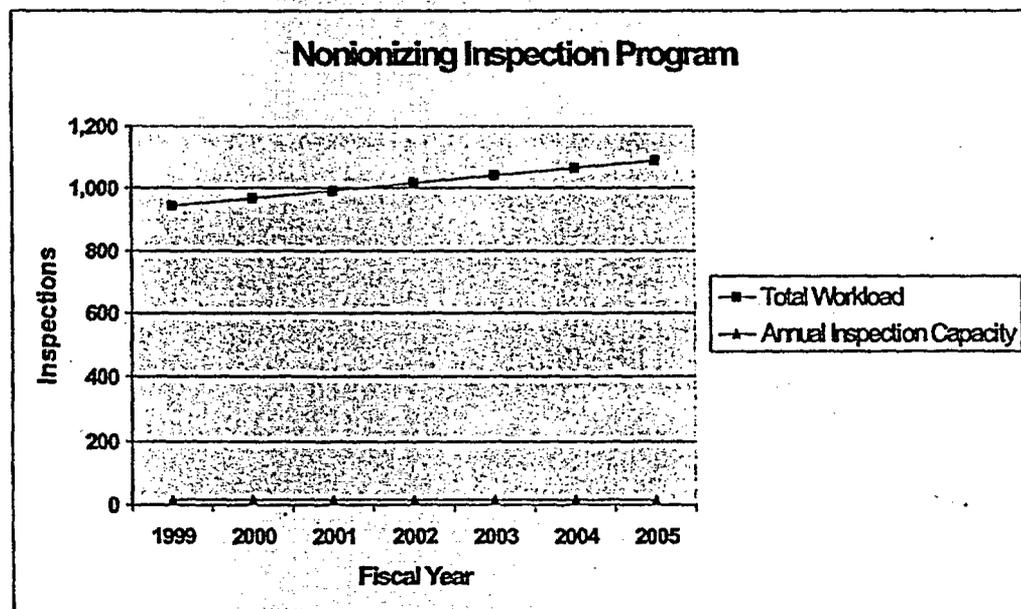
The number of x-ray and nonionizing registration requests has risen from 7,175 in 1992 to approximately 11,268 in 2001. During the past few years, the growth rate of registration requests for new, renewal and amendments has leveled off. Efforts to streamline the registration process have increased the rate of work output by a significant extent without the addition of staff. However, the number of current incoming actions has overcome the ability to process registration requests in a reasonable time. Steps have been taken to eliminate this problem by deleting the expiration date from low risk users of x-ray devices. This will allow more time to process other requests with out compromising public health and safety.

The use of high energy lasers (nonionizing radiation) in medical, dental, educational, industrial and entertainment settings is rapidly increasing. Many of the approximately 1700 high energy laser facilities in Texas are not registered or inspected for compliance with state requirements. Lack of personnel and authorized FTEs has prevented the registration and routine inspection of



lasers except in the entertainment industry, despite their proliferation into the work place and health care facilities. This lack of personnel brings into question TDH's ability to protect public health and safety in this area.

**NONIONIZING  
INSPECTION  
PROGRAM  
WORKLOAD  
CHART**





## RADIOACTIVE MATERIALS

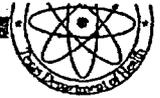
The number of radioactive material license actions completed during FY00 (2,864) increased over 12 percent from FY99 (2,546). This success is the result of outstanding and conscientious effort sustained throughout the year, as evidenced by the following performance statistics: During FY00, even though a record number of new licensing actions were received, the Radioactive Material Licensing Staff was able to reduce the number of open actions by 26 percent (from 587 to 431).

Although the number of actions are projected to remain relatively constant, it is anticipated that the number of complex licensing actions will continue to increase, such as a radioactive waste processing/storage, proliferating medical uses of radioactive material, complex issues involving financial qualifications and security and decommissioning issues. The additional time per action will strain the capacity of the licensing reviewers as they attempt to keep pace with the number of licensing actions submitted. Another factor that causes the backlog to increase beyond resources available is the cycle for renewals of licenses. Licenses expire at seven year intervals, at which time a complete evaluation is made of the radiation safety program and procedures. Depending on the number of renewals that come due in any given year, the backlog of licensing actions can fluctuate dramatically and cause serious delays in processing requests. Currently a backlog of 136 renewal applications is pending; this represents a reduction in backlogged renewals of approximately 27 percent from FY99 (186).

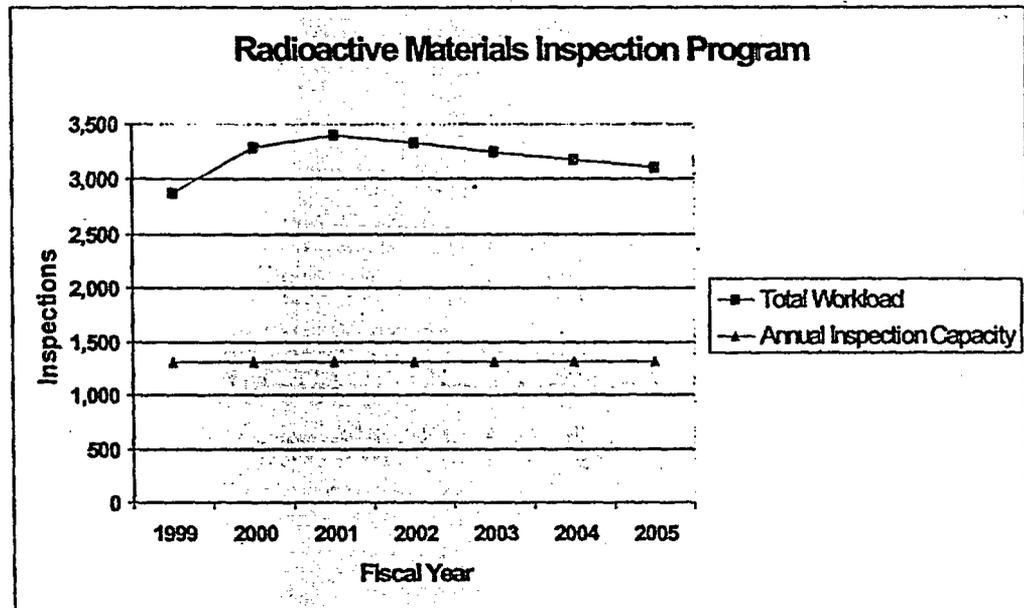


In order to assure that members of the public and occupationally exposed workers do not receive excess radiation and to evaluate releases of radioactive material to the environment, periodic inspections of users of radioactive materials are necessary. When violations are found, corrective actions by the licensee are required. This results in increased compliance by licensees and lower exposure to workers and members of the public.

The radioactive material program has 14 inspectors assigned to eleven public health regional offices in Texas. They perform inspections at radioactive material, industrial x-ray, and industrial laser facilities. Each can perform about 140-160 inspections per year. There is currently a backlog of 753 inspections. Without additional inspectors the number of overdue inspections will increase. This will increase the risk of exposure to workers and members of the public. In order to eliminate the backlog, and reduce the risk, additional qualified inspectors are needed.



## RADIOACTIVE MATERIALS INSPECTION PROGRAM WORKLOAD CHART



## REGULATORY TRENDS

In Texas, radiation control responsibilities are divided among three state agencies:

- Texas Department of Health (TDH) regulates all uses of radiation producing machines and all uses of radioactive material except the disposal of low-level radioactive waste and NORM (Naturally Occurring Radioactive Material) waste.
- Texas Natural Resource Conservation Commission (TNRCC) has regulatory jurisdiction over the disposal of low-level radioactive waste and NORM waste other than that which is produced during oil and gas production.
- Railroad Commission of Texas (RRC) regulates disposal of oil and gas NORM.

Agencies coordinate through an Interagency Radiation Workgroup, which meets at least once a quarter. Also, TDH has a Memorandum of Understanding with TNRCC to define the duties of each agency and areas of mutual cooperation. Of special note, TDH still has the authority to exempt certain sources of radiation from regulation. Small quantities of radioactive material are exempted from disposal as a radioactive waste. Therefore, exempt radioactive materials are being disposed of at facilities regulated by TNRCC and RRC under laws and rules other than radiation control regulation.



FUNDING

FY 2001 BUDGET

General Revenue	\$6,195,456
WIPP (Waste Isolation Pilot Project)	\$ 296,301
Pantex	\$ 228,500
RADEF (Radiological Defense Program)	\$ 90,000
MQSA (Mammography Quality Standards Act)	\$ 493,928
State Mammography	\$ 433,569
<b>TOTAL</b>	<b>\$7,737,754</b>

Impact of level funding results in reduction of regulatory services as shown in "Program and Industry Trends."

BUREAU OF RADIATION CONTROL FUNDS BY FISCAL YEAR

FISCAL YEAR	OPERATING BUDGET
FY1990	\$ 4,653,177
FY1991	\$ 6,075,788
FY1992	\$ 6,030,509
FY1993	\$ 5,779,309
FY1994	\$ 6,064,141
FY1995	\$ 6,623,036
FY1996	\$ 6,210,128
FY1997	\$ 5,918,217
FY1998	\$ 7,311,523
FY1999	\$ 7,232,905
FY2000	\$ 7,542,525
FY2001	\$ 7,737,754



**FY 2001 OPERATING BUDGET AS OF APRIL 30, 2001**

FUNDING SOURCES	BUDGETED	EXPENDED	ENCUMBERED	BALANCE
<b>General Revenue</b>	\$6,195,455	\$3,761,774	\$200,828	\$2,232,853
<b>State Mammography Dedicated Fee Fund (\$433, 569 cap)</b>	\$433,569	\$124,586	\$15,553	\$293,430
<b>CONTRACTS:</b>				
<b>Waste Isolation Pilot Project (WIPP)</b>	\$220,143	\$114,354	\$42,495	\$63,294
<i>Current Contract Period Apr 1, 2000 thru June 30, 2001, Contract Amount \$298,301 Interagency Agreement with the Texas Comptroller of Public Accounts, State Energy Conservation Office. Provides funds for the TDH/BRC to prepare for the safe shipment of defense transuranic waste through the State of Texas to the U.S. Department of Energy Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico and to respond to incidents which might occur as a result of such shipments.</i>				
<b>PANTEX</b>	\$145,420	\$71,561	\$2,006	\$71,853
<i>Current Contract Period Oct 1, 2000 thru Sept 30, 2001, Contract Amount \$228,500 Interagency Agreement with the Texas Comptroller of Public Accounts, State Energy Conservation Office. Provides funds for the TDH/Bureau of Radiation Control (BRC) to assure that past and present activities at the Pantex Plant pose minimal health safety and environmental impacts to citizens of Texas through environmental surveillance, emergency preparedness planning, and other independent oversight activities.</i>				
<b>Mammography Quality Standards Act (MQSA)</b>	\$320,617	\$174,681	\$4,287	\$141,649
<i>Current Contract Period July 17, 2000 thru July 16, 2001, Contract Amount \$493,928 Contract with Dept. of Health &amp; Human Services, Food &amp; Drug Administration. Provides funds for TDH/Radiation Control to inspect mammography systems in use in the state of Texas.</i>				
<b>Radiological Maintenance &amp; Calibration (RADEF)</b>	\$78,271	\$51,066	\$6,686	\$20,519
<i>50/50 State Match, Current Contract \$90,000 each Current Contract Period October 1, 2000 thru September 30, 2001 Interagency Cooperation Contract with the Texas Department of Public Safety. Provides funds for the TDH/BRC to maintain and calibrate radiation detection instruments for local emergency response organizations and provide training to local emergency responders.</i>				
<b>TOTALS</b>	<b>\$7,393,475</b>	<b>\$4,298,023</b>	<b>\$271,854</b>	<b>\$2,823,598</b>





**PERFORMANCE MEASURES**

#		ACTUAL FY 1999	ACTUAL FY 2000
<b>OUTPUT MEASURES</b>			
01	Number of Surveillance Activities Conducted	11,667	11,584
02	Number of Consultations Provided	51,907	N/A
03	Number of Enforcement Actions Taken (KEY MEASURE)	4,425	3,935 N/A
04	Number of Citizen/Community Activities Implemented (KEY MEASURE)	6,389	N/A N/A
05	Number of Licences/Registrations Issued	12,168	14,647
06	Number of Radiation Survey Meters Repaired or Calibrated	10,217	7,792
<b>EFFICIENCY MEASURES</b>			
01	AVERAGE NUMBER OF DAYS LICENSE ISSUANCE	15	11.75
01	AVERAGE COST PER SURVEILLANCE ACTIVITIES (KEY MEASURE)	227.31	241.32

**FY2001 PERFORMANCE MEASURE PROJECTIONS**

#		PROJECTED FY 2001
<b>OUTPUT MEASURES</b>		
01	Number of Surveillance Activities Conducted	11,600
02	Number of Enforcement Actions Taken	4,675
03	Number of Licenses/Registrations Issued	11,770
04	Number of Radiation Survey Meters Repaired or Calibrated	7,650
<b>EFFICIENCY MEASURES</b>		
01	AVERAGE NUMBER OF DAYS LICENSE ISSUANCE	20
01	AVERAGE COST PER SURVEILLANCE ACTIVITIES (KEY MEASURE)	\$ 228.00



**BENCHMARK STUDIES**

**B**RC senior management participated in a Benchmarking Course (1998 Governor's Center for Management Development). Using benchmarking -- the methodical processes involving careful research and an understanding of methods, products and services -- to improve BRC service became the subject of further study as BRC looked for appropriate comparisons. BRC benchmarked its program against (1) recommendations of the Conference of Radiation Control Program Directors, and (2) other states that have similar responsibilities in radiation control

Two categories of comparison were chosen:

1. Staffing, and
2. Cost of protecting public health and number of radiation permits

The following sections summarize findings.

**STAFFING**

**B**RC benchmarked staffing based on recommendations of the Conference of Radiation Control Program Directors found in *Criteria for an Adequate Radiation Control Program* (April 1999). CRCPD is composed of states that have statutory responsibilities of protecting public health and the environment from unnecessary radiation. The recommendations are based on a body of works developed by several agencies over the course of years of study and analyses conducted by U.S. Food & Drug Administration, U.S. Nuclear Regulatory Commission and U.S. Environmental Protection Agency.

Benchmarking revealed that BRC staffing falls short of the Conference of Radiation Control Program Directors recommendations by 35.72 to 67.35 FTEs.

CRCPD Recommended FTEs	BRC Actual FTEs	BRC FTE Shortage
117.92 to 149.55	82.2	35.72 to 67.35

Consequences of this shortage include:

- lack of a comprehensive nonionizing regulatory program
- chronic inability to maintain appropriate frequencies of x-ray inspections
- periodic delays in reviewing radiation safety in order to issue licenses for radioactive materials

Note that CRCPD also expresses the need for support staff with expertise in a number of areas but does not give a recommended number of FTEs. The BRC has 66.8 FTEs for those categories of support and other technical positions. See Appendix A for further detail.



**COSTS OF PROTECTING THE POPULATION AND NUMBER OF RADIATION PERMITS**

**B**RC reviewed the cost of protecting the population and number of radiation permits based on a survey of state radiation programs conducted by the Tennessee Division of Radiological Health. The study was published by Tennessee entitled "Comparison of Agreement States Radiation Control Program Data," September 1998. The study collected data from the United States on factors such as operations, permits issued, inspections conducted, fees, budgets, and staffing for the FY 1997. Of the 50 states surveyed, approximately 26 answered the questionnaire completely.

The information analyzed provided opportunities for comparison of:

1. Number of radiation permits
2. Costs of protecting the population from uncontrolled radiation

Area Evaluated	# Responding	Texas Ranking
Total permits	24	2nd highest
Number of licenses	29	2nd highest
Number of registrations	27	2nd highest

**COSTS OF PROTECTING THE POPULATION**

**W**hen compared with the other states, Texas ranks 17th in costs per person protected of the 23 states reporting. Texas spent \$0.33 per person, considerably under the average cost of \$0.47 per person reported by the other states.

**States and Costs per Person per Year for Radiation Protection**

States	Rankings	Cost/Person
Washington	1st	\$0.94
Texas	17th	\$0.33
Rhode Island	23rd	\$0.24
<b>Average of states</b>		<b>\$0.47</b>



**CONCLUSION  
OF  
BENCHMARK  
STUDIES**

BRC performs regulatory duties with 82.2 FTEs, although the recommended staffing is 117.92 - 149.55 FTEs for an optimum program.

BRC protects the public from uncontrolled exposure to radiation for \$0.33 per person, which is considerably less than the average cost per person of \$0.47 in 23 other states.

**Summary Ranking From Benchmark Studies**

Area Evaluated	# States Reporting	Texas Ranking
Total Permits	24	2nd highest
Population Density	50	23rd most dense
Budget	26	3rd highest
Cost/Person Protected	25	17th highest
Population	50	2nd highest
Population/Staff	29	14th highest
Permits/Staff	29	2nd highest
Number of Licenses	29	2nd highest
Number of Registrations	27	2nd highest

**PROGRAM  
ISSUES**

**B**RC identified five categories of program issues that will require special attention, legislation or dedication of extensive resources. These are:

- **Quality of Regulatory Service**  
Staff training, retention and turnover
- **Legislative Issues**  
Radioactive Waste Management and Disposal  
Laser Regulatory Program  
Funds for training local responders for radiation emergencies (RADEF)
- **Complex Radiation Protection Challenges that require special expertise, extensive resources, development of rules and policies and considerable public involvement**  
Food irradiation  
Long-term storage of Radioactive Waste  
Radioisotope production  
Dose-based Decommissioning  
New Medical Advances  
Financial Qualifications and Security  
Uranium Facility Closeouts
- **Virtual Office Issues**  
Home basing  
Web based delivery of service such as:  
Applications received on-line  
Payments on line  
Electronic Format
- **Regulatory Issues**  
Radon in Water  
NORM (Naturally Occurring Radioactive Material)  
WIPP (Waste Isolation Pilot Project)

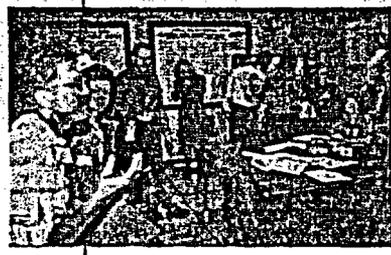


## QUALITY OF REGULATORY SERVICE

The quality of regulatory service directly relates to staff capacity, expertise and training of staff, and resources. Protecting the public health from unnecessary exposure to radiation requires that staff be experts in a specialized scientific discipline -- health physics. Health physics is a professional field that cuts across the basic physical, life, and earth sciences, as well as such applied areas such as toxicology, industrial hygiene, medicine, public health, and engineering.

## STAFF TRAINING

Without adequate staff training, negative consequences to public health could result and federal relations could be jeopardized and impact the Agreement between Texas and the Nuclear Regulatory Commission. The



NRC regularly audits the BRC to review the credentials of the staff and expects adequately trained personnel; without such employees the Agreement is jeopardized. If the Agreement was withdrawn, Texas businesses would face higher license fees if functions performed by the BRC were provided by the NRC. For example, the annual NRC license fee for well logging is \$9,900. In Texas, the annual well logging license fee is \$1,540.

In addition, mammography inspectors require FDA-certified training, which takes place out of state. Without these inspectors, the federal government would have to inspect Texas facilities and the Texas certification and accreditation would not be able to operate, although Texas law directs TDH to perform the mammography accreditation and certification. Also to be an accreditation body, staff credentials must be approved by FDA.



BRC faces three issues regarding maintaining staff performance and expertise that current funding and travel policies do not address adequately:

- hiring qualified new employees and retaining experienced employees
- replacing retirement eligible technical staff
- noncompetitive salaries

NRC and the state program require employees to have specialized education and experience. Historically, the NRC funded travel, per diem, and tuition for the core courses required for radioactive material licensing and inspection staff. These courses are the intensive five-week basic radiological health course at Oak Ridge National Laboratory, the radioactive material licensing course, the radioactive material inspection procedures course, the nuclear medicine course, the industrial radiography course, and the well logging course. The NRC discontinued this funding in 1996, due to pressure from nonagreement states and reactor licensees who were required to pay fees to cover the entire budget of NRC. All these courses are routinely held out of state except the well logging



course, which is held in Houston, Texas. The Texas Department of Health provided limited funding to send staff to a few of these courses until September 1, 1997, when a rider in the appropriations bill, Article IX, Sec. 64, cut travel funds to 90 percent of the amount spent in Fiscal Year (FY) 1997. Reductions were made permanent by provisions of the appropriations bill for 2000 and 2001. As a result, the BRC does not have funds to send newly hired individuals and current employees to required courses and other specialized training. The BRC has requested training funds during each of the past two legislative sessions; in both instances, funds were not appropriated.



The ability to train employees is critical to replacing retirement eligible technical staff. An estimated 38 senior health physicists in the central office and regions will be eligible for retirement within five years. This represents 45 percent of the technical staff and 650 years of radiation control experience. This is a serious concern for the BRC and TDH. Whether or not the current staff will retire is unknown, but the potential exists for a large number of

key positions to become vacant, without reasonable assurance that qualified replacements can be hired. Succession planning and technical and management training are key requirements to assure quality staff in the future.

## STAFF RETENTION

Noncompetitive salaries further complicate the issues of retaining current employees and attracting replacements as BRC personnel retire. In the past it was possible to hire a person with strong health physics credentials and experience at the prevailing state wage schedule. It is no longer possible to do so as academic, federal, and private industry employers pay substantially more; sometimes double.

### Average Salary for Health Physicists in Industry and Federal Government

Experience Levels	Low	Medium	High
With B.S. Degree	\$38,000	\$60,400	\$75,600
With M.S. Degree	\$43,500	\$66,400	\$85,700

**BRC Average Technical Salary = \$ 41,600**

An alternative is to hire a person with a good physical or natural science background and provide them with necessary training. For instance, BRC recently collaborated with Texas A&M to provide a five-week health physics course for technical staff at a substantial savings over sending staff to an out-of-state course.





The main challenges to success are maintaining staff and unity of organization. One challenge is to continue to maintain staff competence level in light of current restrictions in training, travel, and professional advancement in state government. Texas state salaries have not kept pace with the federal government or industry in the health physics profession. Also, the senior staff are senior in years of service as well and approaching ages when they will become eligible for state retirement. Whether or not they will choose to retire is unknown, but an estimated 38 health physicists and seven senior staff will be eligible for retirement in the next five years. Training replacements with limits on travel and education monies will be difficult. Recruiting trained staff will be difficult due to the state salaries and the level of education required.

## LEGISLATIVE ISSUES

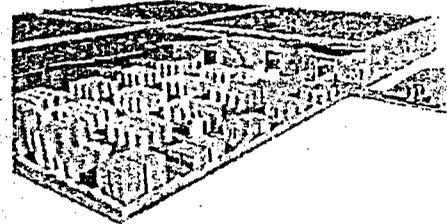
Radiation issues that may be addressed in the next session are:

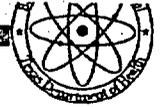
- Management and disposal of low level radioactive waste
- Implementing a program for regulating lasers
- Continuing training for local responders for radiation emergencies

## LOW-LEVEL RADIOACTIVE WASTE

*Assured Isolation* and disposal of low-level radioactive waste will be a significant issue again in the next legislative session, since no legislation concerning low-level radioactive waste was passed during the 77th legislative session. Several companies want the law changed to allow privatization of waste management or disposal. During the 76th state legislative session, legislation was introduced that would have provided for the assured isolation of low-level radioactive waste. Radioactive waste from Texas, and, under the Texas Compact, the waste from Maine and Vermont as well would have been subject to this legislation. The Texas Low-Level Radioactive Waste Disposal Authority would have overseen the development of such a facility; TDH would have had the regulatory authority over the facility. The legislation was not completed during the 76th session, since the author did not request a conference committee to resolve House and Senate versions of the bill. Subsequently, legislation passed that abolished the Low-Level Radioactive Waste Disposal Authority and transferred its functions to Texas Natural Resource Conservation Commission (TNRCC). Interim studies were conducted by both the House of Representatives and the Senate on low-level radioactive waste issues. Techniques for management of low level radioactive waste were also being studied by TNRCC using a private contractor. Therefore, assured isolation and disposal of low-level radioactive waste remain topics of concern.

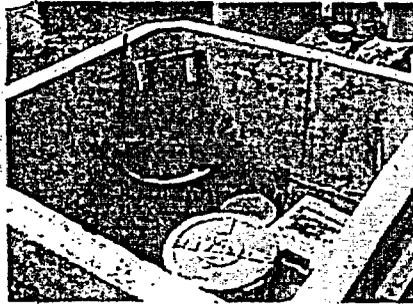
TEXAS ASSURED ISOLATION FACILITY  
CONCEPTUAL DESIGN





**ABANDONED SOURCES**

In order to protect public health and safety, the Bureau of Radiation Control must occasionally accept radioactive sources from members of the public and properly dispose of them. While awaiting disposal, the sources are stored in underground bunkers at TDH's central campus in Austin. The central campus is located adjacent to an urban residential area, and is near the workplace for about 2,000 TDH employees.



As funds permit, the radioactive sources are shipped to a licensed facility for disposal. During FY 1999, the BRC spent over \$100,000 to dispose of radioactive sources collected in this manner. It is not unusual for several years to pass before resources become available to dispose of radioactive sources because there are no funds included in the BRC's operating budget for this purpose. Radioactive waste accumulates at the central campus in Austin awaiting disposal.

Recent legislation to allow using administrative penalties collected by BRC to pay for the disposal of abandoned radioactive sources will provide a source of funding.

**PROGRAM FOR REGULATING LASERS**

The use of high energy lasers (nonionizing radiation) in medical, dental, educational, industrial and entertainment settings is rapidly increasing. Many of the approximately 1700 high energy laser facilities in Texas are not registered or inspected for compliance with state requirements. Lack of personnel and authorized FTEs has prevented the registration and routine inspection of lasers except in the entertainment industry, despite their proliferation into the work place and health care facilities. The lack of funding for FTEs, travel, and equipment needed to register and inspect laser facilities limits TDH's ability to protect public health and safety in this area.

In addition to the lack of registration and inspection resources, laser technology has changed. In classical physics, Texas law, and TDH rules, lasers emit light spontaneously. By definition, if it is not emitted spontaneously it is not a laser. During the past several years manufacturers have started to produce medical, dental, educational, industrial and entertainment "lasers" that emit laser light after being "stimulated." Due to the narrow legal definition of what constitutes a laser, these devices were not regulated by TDH. During the 77th legislative session the definition was changed to allow the BRC to regulate all high intensity light sources.

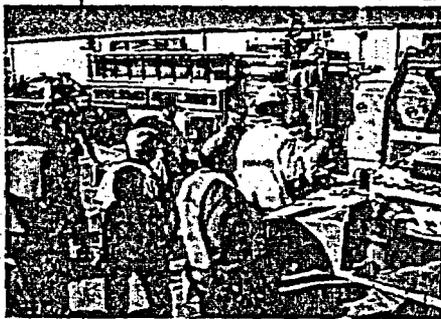




**RADEF**

Since being established during the cold war, the Radiological Defense Program (RADEF) has changed its mission from nuclear attack recovery to local government radiological emergency planning, radiation detection instrument training, and instrument maintenance and calibration. Currently, RADEF is responsible for maintenance of approximately 50,000 radiation detection instrument sets stored in city and county facilities throughout the state. They service each of them over a four year cycle in order to assure that local emergency response organizations have usable radiation detection equipment.

The program provides radiological training and emergency plan development assistance to local government emergency response organizations including law enforcement, fire department, and ambulance personnel. In addition to the routine



scheduled training, the program receives 40-50 requests per year from local organizations needing training for their staff. Information provided in this training teaches these "first responders" how to evaluate accidents at the scene to determine whether a radioactive device or radiological material is involved, thus preventing serious injury or death to the public and to themselves from potentially dangerous radiation exposure. Personnel also receive training in radiological detection, potential health effects, mitigation, and on-scene incident command operations.

Funding is needed to continue this vital function. This program was originally 100 percent funded by FEMA. In FY 2000, FEMA reduced their support to 50 percent and has indicated that future reductions may occur. Unless state funds are appropriated, this vital program will be lost to cities and counties of Texas.

**COMPLEX RADIATION PROTECTION CHALLENGES**

New and evolving technologies using radiation create challenges for BRC because they require unique knowledge for evaluation of safety or financial aspects, development of new rules or policies, and considerable public involvement. BRC anticipates these will consume extensive resources. These challenges include:

- Food irradiation
- Long-term storage of Radioactive Waste
- Radioisotope production
- Dose-based Decommissioning
- New Medical Advances
- Financial Qualifications and Security

**FOOD IRRADIATION**

Several beef processors in Texas plan to use Electron beams (E-beam) for food pasteurization. Using a linear accelerator, this cold pasteurization destroys bacteria, primarily E.coli in beef. E-beam installations requires special radiation safety evaluations by staff.





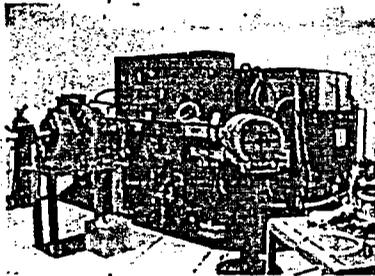
**LONG TERM STORAGE OF RADIOACTIVE WASTE**

The 77<sup>th</sup> Legislature considered several bills to address the long-term storage and disposal of low-level radioactive waste (LLRW); however, none of the bills passed. There are over 60 locations in Texas where LLRW is stored awaiting an economical disposal option. TDH regulates all of these licensees/generators of LLRW with the exception of the two nuclear utilities. Currently the Texas Natural Resource Conservation Commission has jurisdiction over the regulation of a disposal site for LLRW. They can only license themselves and will not do so. Out of state disposal capacity is very limited and may not exist by the time the 78<sup>th</sup> legislature convenes in 2003. In the interim TDH will monitor the storage sites to assure compliance with the rules.



**RADIOISOTOPE PRODUCTION**

Manufacturing radioisotopes by using accelerators has increased dramatically over the past few years. Medical radioisotopes are produced at four separate locations within Texas. BRC evaluates control measures, credentials of authorized users, and reviews plans, as well as conducts thorough on-site investigations of all these major facilities. These radioisotope production operations involve significant industrial processes including irradiating targets, transferring radioactive materials through pneumatic lines, remote handling of radioactive materials in hot cells, and monitoring for potential releases to the environment.

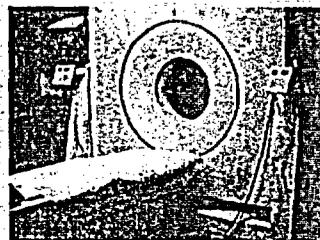


**DOSE-BASED DECOMMISSIONING**

Recent rulemaking activities include changes from decommissioning criteria based on radioactivity levels to an overall dose-based criterion for the decommissioning of facilities for radioactive material license termination. The implementation of the rule, which is a matter of compatibility with the U.S. Nuclear Regulatory Commission (NRC), will require the use of analytical tools, including computer modeling, and knowledge and analysis of doses from multiple exposure pathways, surveys and review of decontamination activities, to determine the adequacy of decommissioning plans and final preparation of facilities for license termination. Staff must have expertise in these areas.



**NEW MEDICAL ADVANCES**

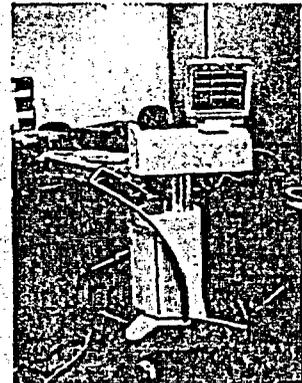


Positron emission tomography (PET), a new medical technology, is growing in importance throughout the state. Applications for two mobile (PET) services submitted foretell of widespread use within a few years. Radiation characteristics of PET radiopharmaceuticals are

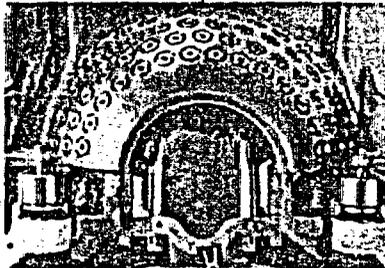


vastly different from routine diagnostic nuclear medicine drugs. Unique factors of higher energy radiation, new equipment and different credentials of physicians will require decisions on policy and rules.

Another change in medical technology is in the area of intervascular brachytherapy ( performing therapy using sealed radioactive sources within the vascular system). One commercial brachytherapy source for this type of device, and the device itself, is already being manufactured in Texas. BRC has developed rules and new licensing procedures for IBV to include authorizing physicians as a team (i.e., cardiologists, radiologists, medical and health physicists), determine if locations where procedures will be performed are adequately shielded, and review the device application to determine if it is safe for use.



A device called a "gamma knife" allows surgeons to do brain surgery with microscopic accuracy by using radiation instead of a knife, and doing in minutes what would take hours to do. A gamma knife facility requires review of architectural and shielding plans for loading a device, which will contain 201 sealed sources of radioactive material, and for operation of the device.



**FINANCIAL  
QUALIFICATIONS  
AND SECURITY  
FOR  
DECOMMISSIONING**

The BRC requires that certain radioactive material licensees maintain financial security in the form of letters of credit, surety bonds, parent company guarantees, or other acceptable methods in order to provide the state with funds to decommission the facility and dispose of any waste should the company default prior to legal termination of the license. The Bureau is faced with increasingly complex financial issues. In addition, recent legislation requires the Texas Board of Health to adopt rules regarding determination of the financial qualifications of radioactive material licensees. Specialists trained in the area of finance may be needed in the future. Neither BRC nor TDH have a financial analyst trained to make these financial security determinations.

**VIRTUAL  
OFFICE ISSUES**

Office space is at a premium and computer technology is advancing rapidly. The Virtual Office is upon us. Employees are being encouraged to work from home or "home-base." The internet and intranet play an important part in the overall scope of home-basing and in delivery of services to the BRC customer. The impact and rapid advancement of the internet has led to legislation that puts more emphasis on developing and maintaining a web presence. Doing business over the internet and providing information to staff, licensees, registrants and the general public can free time for employees to concentrate on the health and safety aspects of a particular job. The future of services offered by BRC via the internet range from accepting applications and payments on-line to offering a database of information that all staff, including the regional inspectors, can access.



Developing and maintaining the internet takes time and expertise. Currently, web development and maintenance are responsibilities that have been added to the job descriptions of a few staff members on top of their other duties. In order to continue to be leaders in this area and provide open information to staff and others, full-time employees dedicated to developing and maintaining the internet and intranet sites are essential.

## REGULATORY INTERFACE ISSUES

**R**egulatory interfaces that have implications for Texas involve the U.S. Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA), Food & Drug Administration (FDA), Federal Emergency Management Administration (FEMA) and three Texas agencies -- the Texas Department of Health, the Texas Natural Resource Conservation Commission and the Railroad Commission of Texas. These interfaces share responsibilities for radiation control, as divided by statutes, and require dedicating time to research and coordinate between agencies. Issues of concern are:

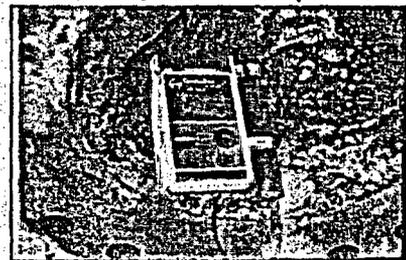
- New EPA radon standards
- NORM (Naturally Occurring Radiative Material) standards
- Regulatory structure for radioactive materials
- Pantex emergency response and environmental monitoring with DOE

## RADON IN WATER

**T**he Environmental Protection Agency (EPA) proposed regulations for radon in drinking water last year with guidelines for the maximum contaminant level (MCL) and alternative MCL available August 2000. The timeline for implementation of the radon regulations, which began with the August publication of the MCL guidance, has been largely ignored since last fall. The main issue for radon drinking water regulations has undoubtedly been cost. With a whole host of issues before it (such as arsenic in drinking water), EPA has unofficially put on hold any further implementation of the radon regulations.

## NORM

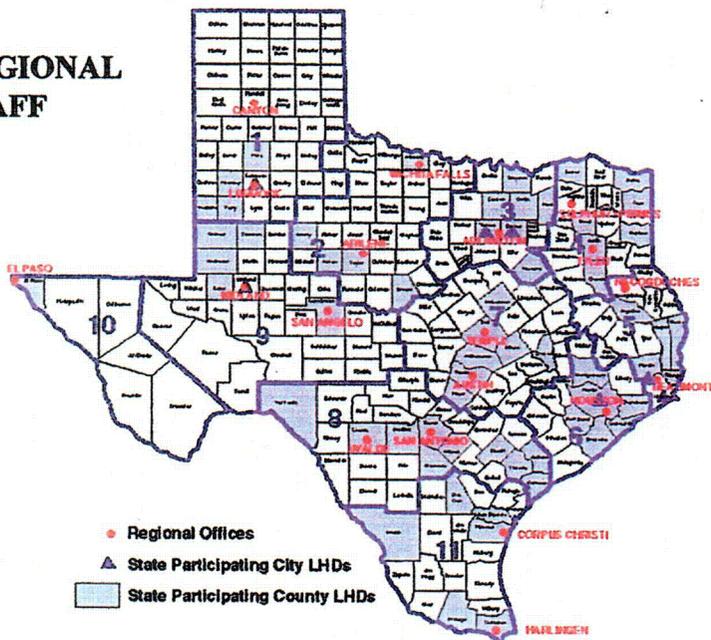
**E**PA has been asked to develop standards for NORM (naturally occurring radioactive material) but has not done so (NRC does not regulate NORM). Some states have developed NORM standards but the standards are not consistent from state to state. In Texas, TDH has adopted NORM rules and is coordinating with the Railroad Commission of Texas (RRC). The RRC is reviewing and updating its NORM regulations based on the RRC's completed Oil and Gas NORM Waste Study. The regulations will be specifically designed to protect workers and the general public from airborne exposure to NORM. The RRC is to determine whether measurement and reporting of NORM waste by oil and gas operators is warranted to protect the public health, public safety and the environment.







**BRC REGIONAL STAFF**



**Region 1, Canyon**

*X-Ray Inspector*  
Tim Gibson

*Radioactive Material (RAM) Inspector*  
Robert Adcock

**Region 1, Lubbock**

*Mammography*  
Vacant

**Region 2, Abilene**

*RAM Inspector*  
Chuck LaSalle

**Region 3, Arlington**

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*Mammography*  
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Deborah Wilson

*RAM Inspector*  
Steven Fernandez

**Region 5, Beaumont**

*X-Ray Inspector*  
Christine Sanchez

*RAM Inspector*  
James Thompson

**Region 6, Houston**

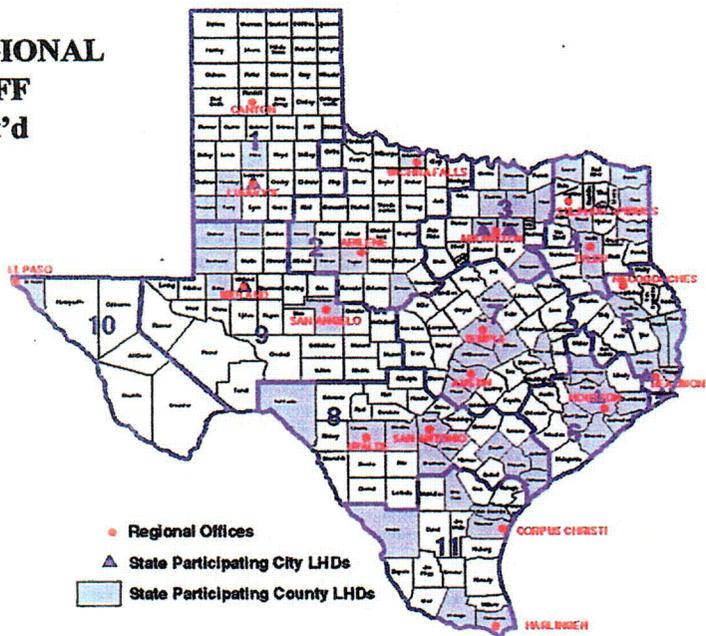
*X-Ray Inspectors*  
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Ann Hanna  
Billy Moton  
Debra Takacs

*RAM Inspectors*  
Lisa Clark  
David Smith  
Vacant  
Vacant

*Mammography*  
Dorothy Douglas



**BRC REGIONAL  
STAFF  
Cont'd**



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*RAM Inspector*  
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*Mammography*  
Sabra Pope

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Sharon Munson

*RAM Inspectors*  
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*Mammography*  
Rick Moreland

**Region 9, Midland**

*RAM Inspector*  
Irene Casares

**Region 10, El Paso**  
*X-Ray Inspector*  
Samuel Mendoza

**Region 11, Harlingen**  
*X-Ray Inspectors*  
Antonio Elizondo

**Region 11, Corpus Christi**

*RAM Inspector*  
David Charles