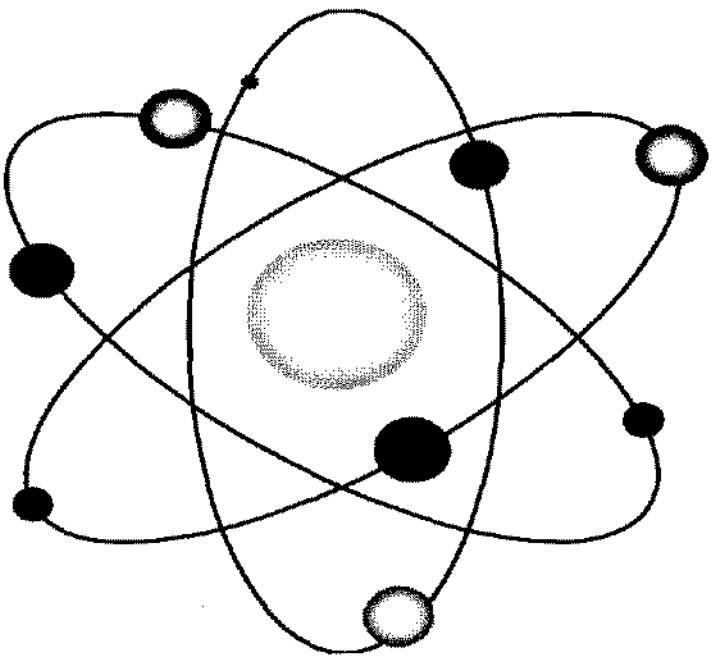
STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT & CONSERVATION
Division of Radiological Health
L&C Annex, Third Floor
401 Church Street
Nashville, Tennessee 37243-1532



GUIDE FOR COMPLETING APPLICATION FOR RADIOACTIVE MATERIAL LICENSE (RHS 8-5) FOR FIXED GAUGES

(OCTOBER 2001)

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Item 1.(a) List the applicant's name and mailing address.

Item 1.(b) Identify the use and/or storage address if different from 1.(a). (A separate license is needed for each permanent use and/or storage address. A multiple site license is available, but at a higher fee.)

Specify if use is also, or only, at temporary job sites.

Item 2. Not required.

Item 3. Only applicable if renewing a license.

Item 4. Confirm that before using licensed materials, gauge users will have successfully completed a fixed gauge manufacturer's training course, or an equivalent course that meets the criteria in Appendix A. As an alternative, you may submit a statement of an individual's training and experience. Applicants wishing to be approved to conduct their own training shall state their commitment to the criteria in Appendix A. For individuals wishing to perform non-routine maintenance, confirm that they will complete the manufacturer's or distributor's course for non-routine maintenance.

Item 5. Name the Radiation Safety Officer and confirm that before obtaining licensed materials, this individual will have successfully completed one of the training courses described in Item 4, or a gauge manufacturer's course for RSOs. As an alternative, you may provide a statement of training and experience. Typical RSO duties can be found in Appendix B.

Item 6.(a). Indicate each radionuclide that will be used in each source in the gauging device(s).

Item 6.(b). Provide the manufacturer and model number for each source that is approved by the regulatory agency having jurisdiction. This can be found in the Registry of Sealed Sources and Devices (SSD) maintained by the U. S. Nuclear Regulatory Commission (NRC). Specify the activity of each source. State the number of sources to be licensed. To request an unlimited number of sources state "No single source to exceed ____(the maximum source activity)."

Item 7. Provide the manufacturer and model number for each gauge approved for licensing. State the general purpose for use of the gauge, i.e. to measure density of material, etc. If the gauge will be used for purposes other than those listed on the SSD Registration, specify these uses and submit safety analyses (and procedures, if needed) to support safe use. State the number of gauges to be licensed or if you wish to be authorized for an unlimited number.

Items 8 & 9. These need not be completed unless submitting a statement of training and experience as part of Items 4 and 5.

Item 10. Not required unless the applicant plans to conduct non-routine operations or enter vessels with gauges for (See Appendix E).

Item 11. If the applicant will use radiation survey instrumentation, confirm that such instrumentation will be capable of measuring 200 mR per hour, will be checked for functionality with a source of radiation before use, and will be calibrated annually by persons specifically licensed to perform such services by the appropriate regulatory agency maintaining jurisdiction.

Item 12. Confirm that you will provide gauge users with personnel monitoring devices processed and evaluated by a National Voluntary Laboratory Accreditation Program (NVLAP) approved processor, or that you will maintain for inspection documentation that unmonitored individuals are not likely to receive in one year, a radiation dose in excess of 10 percent of the allowable limits in 1200-2-5 of "State Regulations for Protection Against Radiation." See Appendix F.

Item 13. Confirm that the gauge is secured to prevent unauthorized removal or access; and submit specific instructions demonstrating that the proposed conditions will not impact safety or integrity of the source or device. Gauges shall be controlled such that doses to the public including non-occupationally exposed employees will not receive a total effective dose equivalent of 0.1 rem in a year, and that the dose in any unrestricted area does not exceed 0.002 rem in any one hour. See Appendix F.

Item 14. Confirm that you will implement the Operating and Emergency Procedures contained in Appendix C, or submit alternative equivalent procedures. When the distance or air gap between the source and detector permits entry of all or a portion of a person's body into the primary radiation beam, licensees must develop lock-out procedures. Lock-out procedures encompass locking the on-off or shutter mechanism into the off position or otherwise controlling the radiation beam or using any other means of preventing an individual or a portion of an individual's body from entering the radiation beam during maintenance, repair, or work in, or around the process line (e.g., bin, tank, hopper, pipe, or conveyor belt) where the device is mounted. The on-off or shutter control mechanism should be tagged to indicate that the gauge is locked out. A warning sign should be posted at each entryway to an area where it is possible to be exposed to the primary beam. In addition to providing a warning, the sign should give safety instructions, e.g., "contact the RSO before entering this vessel." Lock-out procedures should specify who is responsible for performing them. Lock-out procedures shall be submitted to the Department for review.

Verify that leak tests of sealed sources will be performed by the device manufacturer, or other persons authorized by the U.S. Nuclear Regulatory Commission or an Agreement State to provide leak testing services, or that the applicant will collect leak test samples for analysis by one of the above using a leak test kit supplied by persons authorized to provide leak test kits and according to the kit supplier's instructions.

If you will use fixed gauges at temporary job sites, confirm that you will implement operating and emergency procedures in accordance with the elements in Appendix D.

Confirm that routine maintenance (e.g., cleaning, lubrication, calibration, and electrical repairs) will be conducted in accordance with the manufacturer's instructions. Routine maintenance does not include the following non-routine operations:

1. Non-routine maintenance or repair of gauges that involves or potentially affects components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source drive mechanism, shutter, shutter control, or shielding);
2. Installation, relocation, or alignment of the gauge;
3. Initial radiation surveys;
4. Replacement and disposal of sources;
5. Removal of a gauge from service.

Applicants wishing to perform non-routine operations must submit the information contained in Appendix E. However, replacement and disposal of sealed sources may only be performed by the gauge manufacturer, the gauge distributor, or other persons authorized in a specific license to perform these functions.

Item 15. Not applicable. (However, note that gauges shall only be transferred to the manufacturer or another person who is properly licensed for its possession or disposal.)

Item 16. The application shall be signed and dated by a management official for the organization. List this person's title.

APPENDIX A

Criteria for Acceptable Training for Authorized Users and Radiation Safety Officers

COURSE CONTENT

Classroom training may be in the form of lecture, videotape, or self-study emphasizing practical subjects important to safe use of the gauge:

Radiation Safety:

- Radiation vs. contamination
- Internal vs. external exposure
- Biological effects of radiation
- Types and relative hazards of radioactive material processed
- **ALARA** concept
- Use of time, distance, and shielding to minimize exposure
- Location of sealed source within the portable gauge

Regulatory Requirements:

- Applicable regulations
- License conditions, amendments, renewals
- Location of use and storage of radioactive materials
- Material control and accountability
- Annual audit of radiation safety program
- Transfer and disposal
- Recordkeeping
- Prior events involving fixed gauges
- Handling incidents
- Recognizing and ensuring that radiation warning signs are visible and legible
- Licensing and inspection by regulatory agency
- Need for complete and accurate information
- Employee protection
- Deliberate misconduct

Practical Explanation of the Theory and Operation for Each Gauge Possessed by the Licensee:

- Operating and emergency procedures
- Routine vs. Non-routine maintenance
- Lock-out procedures

On-the-job training must be done under the supervision of an AU or RSO:

- Supervised Hands-on Experience Performing:
  - Operating procedures
  - Test runs of emergency procedures
  - Routine maintenance
  - Lock-out procedures

TRAINING ASSESSMENT

Management will ensure that proposed AUs are qualified to work independently with each type of gauge with which they may work. Management will ensure that proposed RSO's are qualified to work independently with and are knowledgeable of the radiation safety aspects of all types of gauges to be possessed by the applicant. This may be demonstrated by written or oral examination or by observation.

COURSE INSTRUCTOR QUALIFICATIONS

Instructor should have:

- Bachelor's degree in a physical or life science or engineering
- Successful completion of a fixed gauge manufacturer's or distributor's course for users (or equivalent)
- Successful completion of an 8 hour radiation safety course; **AND**
- 8 hours hands-on experience with fixed gauges.

OR

- Successful completion of fixed gauge manufacturer's or distributor's course for users (or equivalent)
- Successful completion of 40 hour radiation safety course; **AND**
- 30 hours of hands-on experience with fixed gauges.

OR

- The applicant may submit a description of alternative training and experience for the course instructor.

Note: Additional training is required for those applicants intending to perform non-routine operations such as installation, initial radiation survey, repair, and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement, and disposal of sealed sources, alignment, or removal of a gauge from service. See Appendix E- Non-Routine Operations.

Typical Duties and Responsibilities of the Radiation Safety Officer

The RSO's duties and responsibilities include ensuring radiological safety and compliance with both Department regulations and the conditions of the license. Typically, the RSO's duties and responsibilities include ensuring the following:

- Activities involving licensed material that the RSO considers unsafe are stopped
- Radiation exposures are ALARA
- Development, maintenance, distribution, and implementation of up-to-date operating and emergency procedures
- Individuals that use fixed gauges are properly trained
- Possession, installation, relocation, use, storage, routine maintenance and non-routine operations of fixed gauges are consistent with the limitations in the license, the SSD Registration certificate(s), and manufacturer's or distributor's recommendations and instructions
- Safety consequences of non-routine operations are analyzed before conducting any such activities that have not been previously analyzed
- Non-routine operations are performed by the manufacturer, distributor, or person specifically authorized by the NRC or an Agreement State
- Prospective evaluations are performed demonstrating that unmonitored individuals are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits or personnel monitoring devices are provided
- Personnel monitoring devices, if required, are used and exchanged at the proper intervals; records of the results of such monitoring are maintained
- Documentation is maintained to demonstrate, by measurement or calculation, that the TEDE to the individual member of the public likely to receive the highest dose from the licensed operation does not exceed the annual limit in "State Regulations for Protection Against Radiation (SRPAR) 1200-2-5."
- Fixed gauges are properly secured
- Notification of proper authorities of incidents such as damage to or malfunction of fixed gauges, fire, loss, or theft
- Investigation of unusual occurrences involving the fixed gauge (e.g., malfunction or damage), identification of cause(s), implementation of appropriate and timely corrective actions
- Radiation safety audits are performed at intervals not to exceed 12 months and development, implement, and documentation of timely corrective actions taken
- When the licensee identifies violations of regulations or license conditions or program weakness, corrective actions are developed, implemented, and documented
- Licensed material is transported in accordance with all applicable DOT requirements
- Licensed material is disposed of properly
- Appropriate records are maintained
- An up-to-date license is maintained and amendment and renewal requests are submitted in a timely manner
- Posting of documents required by SRPAR 1200-2-5.

APPENDIX C

Operating and Emergency Procedures

OPERATING PROCEDURES

- If personnel dosimetry is provided:
  - Always wear your assigned personnel monitoring device (TLD) or film badge when using the gauge.
  - Never wear another person's TLD or film badge.
  - Never store your TLD or film badge near the gauge.
- Use the gauge according to the manufacturer's or distributor's instructions and recommendations. Perform routine cleaning and maintenance according to the manufacturer's or distributor's instructions and recommendations.
- Test each gauge for the proper operation of the on-off mechanism (shutter) and indicator, if any, at intervals not to exceed 6 months or as specified on the SSD certificate.
- Do not touch the unshielded source with your fingers, hands, or any part of your body.
- Do not place hands, fingers, feet, or other body parts in the radiation field from an unshielded source.
- Post a radiation warning sign at each entryway to an area where it is possible to be exposed to the beam.
- Prevent employees from entering the radiation beam during maintenance, repairs, or work in, on, or around the bin, tank, or hopper on which the device is mounted by developing lock-out procedures. These procedures should specify who will be responsible for ensuring that the lock-out procedures are followed.
- Prevent unauthorized access, removal, or use of the gauge.
- After making changes affecting the gauge (e.g., changing the location of gauges, removing shielding, adding gauges, changing the occupancy of adjacent areas), reevaluate compliance with public dose limits and ensure proper security of gauges.
- Conduct a physical inventory every 6 months to account for all sealed sources and devices.

EMERGENCY PROCEDURES

- If the gauge becomes damaged or if an emergency or unusual situationarises:
  - Stop use of the gauge.
  - Immediately secure the area and keep people away from the gauge until the situation is assessed and radiation levels are known. However, perform first aid for any injured individuals and remove them from the area only when medically safe to do so.
  - If any equipment is involved, isolate the equipment until it is determined there is no contamination present.

- Gauge users and other potentially contaminated individuals should not leave the scene until emergency assistance arrives.
- Notify the persons in the order listed below of the situation:

NAME*	WORK PHONE NUMBER*	HOMEPHONE NUMBER*
_____	_____	_____
_____	_____	_____
_____	_____	_____

- **Follow the directions provided by the person contacted above.**

**Note: Fill in with (and update, as needed) the names and telephone numbers of appropriate personnel (e.g., the Radiation Safety Officer (RSO), or other knowledgeable licensee staff, licensee's consultant, gauge manufacturer) to be contacted in case of emergency.*

RSO AND LICENSEE MANAGEMENT

- Arrange for a radiation survey to be conducted as soon as possible by a knowledgeable person using appropriate radiation detection instrumentation. This person could be a licensee employee using a survey meter located at the job site or a consultant. To accurately assess the radiation danger, it is essential that the person performing the survey be competent in the use of a radiation survey meter.
- Copies of operating and emergency procedures must be posted at each location of use or if posting procedures is not practicable, a notice which briefly describes the procedures and states where they may be examined may be posted instead.
- Copies of operating and emergency procedures should be provided to all gauge users.

Fixed Gauges Used at Temporary Job Site

CRITERIA

Each applicant requesting authorization to perform work with fixed gauges at temporary job sites should do the following:

Develop, implement, maintain, and distribute operating and emergency procedures containing the following elements:

- Instructions for transporting radioactive material to ensure compliance with DOT regulations
- Instructions for using gauges at temporary job sites and performing routine maintenance according to the manufacturer's or distributor's recommendations and instructions
- Instructions for maintaining security during storage and transportation
- Instructions to keep gauges under control and immediate surveillance or secured to prevent unauthorized use or access
- Steps to take to keep radiation exposures ALARA
- Steps to maintain accountability during use
- Steps to control access to a potentially damaged gauge
- Steps to take, and who to contact, when a gauge has been lost or damaged (e.g., local officials, RSO, etc…)
- If gauges are to be installed at temporary job sites, the operating and emergency procedures should contain instructions on using personal dosimetry and survey instruments and conducting surveys
- Provides copies of operating and emergency procedures to all gauge users and at each job site.

APPENDIX E

Information Needed to Support Applicant's Request to Perform Non-Routine Operations

Applicants should review the section in this document on "Maintenance," which discusses, in general, licensee responsibilities before any maintenance or repair is performed.

Non-routine operations include installation of the gauge, initial radiation survey, repair or maintenance involving or potentially affecting components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source driver mechanism, shutter, shutter control, or shielding), gauge relocation, replacement, and disposal of sealed sources, alignment, removal of a gauge from service, and any other activities during which personnel could receive radiation doses exceeding applicable limits.

Any non-manufacturer/non-distributor supplied replacement components or parts, or the use of materials (e.g., lubricants) other than those specified or recommended by the manufacturer or distributor need to be evaluated to ensure that they do not degrade the engineering safety analysis performed and accepted as part of the device registration. Licensees also need to ensure that, after maintenance or repair is completed, the gauge is tested and functions as designed, before the unit is returned to routine use.

If non-routine operations are not performed properly with attention to good radiation safety principles, the gauge may not operate as designed and personnel performing these tasks could receive radiation doses exceeding applicable limits. Radionuclides and activities in fixed gauges vary widely. For illustrative purposes in less than one minute, an unshielded cesium-137 source with an activity of 100 millicuries can deliver 0.05 Sv (5 rems) to a worker's hands or fingers (i.e., extremities), assuming the extremities are 1 centimeter from the source. However, gauges can contain sources of even higher activities with correspondingly higher dose rates. The threshold for extremity monitoring is 0.05 Sv (5 rems) per year.

Thus, applicants wishing to perform non-routine operations must use personnel with special training and follow appropriate procedures consistent with the manufacturer's or distributor's instructions and recommendations that address radiation safety concerns (e.g., use of radiation survey meter, shielded container for the source, and personnel dosimetry (if required)). Accordingly, provide the following information:

Describe the types of work, maintenance, cleaning, and repair that involve:

- Installation, relocation, or alignment of the gauge
- Components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source drive mechanism, shutter, shutter control, or shielding)

- Replacement and disposal of sources
- Removal of a gauge from service
- A potential for any portion of the body to come into contact with the primary radiation beam; or
- Any other activity during which personnel could receive radiation doses exceeding applicable limits.

The principal reason for obtaining this information is to assist in the evaluation of the qualifications of individuals who will conduct the work and the radiation safety procedures they will follow.

A licensee may initially mount a gauge, without specific NRC or Agreement State authorization, if the gauge's SSD Certificate explicitly permits mounting of gauges by users and under the following conditions:

- **The gauge must be mounted according to written instructions provided by the manufacturer or distributor;**
- **The gauge must be mounted in a location compatible with the "Conditions of Normal Use" and "Limitations and/or Other Considerations of Use" in the certificate of registration issued by NRC or an Agreement State;**
- **The on-off mechanism (shutter) must be locked in the off position, if applicable, or the source must be otherwise fully shielded;**
- **The gauge must be received in good condition (package was not damaged); and**
- **The gauge must not require any modification to fit in the proposed location.**

Mounting does not include electrical connection, activation, or operation of the gauge. The source must remain fully shielded and the gauge may not be used until it is installed and made operational by the Commission or an Agreement State to perform such operations.

- Identify who will perform non-routine operations and their training and experience. Acceptable training would include manufacturer's or distributor's courses for non-routine operations or equivalent.
- Submit procedures for non-routine operations. These procedures should ensure the following:
  - Doses to personnel and members of the public are within regulatory limits and ALARA (e.g., use of shielded containers or shielding);
  - The source is secured against unauthorized removal or access or under constant surveillance;
  - Appropriate labels and signs are used;
  - Manufacturer's or distributor's instructions and recommendations are followed;

- Any non-manufacturer/non-distributor supplied replacement components or parts, or the use of materials (e.g., lubricants) other than those specified or recommended by the manufacturer or distributor are evaluated to ensure that they do not degrade the engineering safety analysis performed and accepted as part of the device registration; and
- Before being returned to routine use, the gauge is tested to verify that it functions as designed and source integrity is not compromised.

- Confirm that individuals performing non-routine operations on gauges will wear both whole and extremity monitoring devices or perform a prospective evaluation demonstrating that unmonitored individuals performing non-routine operations are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits.

- Verify possession of at least one survey instrument that meets the criteria in "Radiation Safety Program - Instruments in NUREG-1556, Vol. 4, 'Consolidated Guidance about Materials Licensees: Program-Specific Guidance about Fixed Gauges License,' dated October 1998."

- Describe steps to be taken to ensure that radiation levels in areas where non-routine operations will take place do not exceed applicable limits. For example, applicants can do the following:
  - Commit to performing surveys with a survey instrument (as described above);
  - Specify where and when surveys will be conducted during non-routine operations; and
  - Commit to maintaining, for 3 years from the date of the survey, records of the survey (e.g., who performed the survey, date of the survey, instrument used, measured radiation levels correlated to location of those measurements).

APPENDIX F

STATE REGULATIONS FOR PROTECTION AGAINST RADIATION (SRPAR) DOSE LIMITS

1200–2–5–.50 Occupational Dose Limits for Adults

(1) Except for planned special exposures under 1200–2–5–.54, the licensee or registrant shall limit the occupational dose to individual adults to the following annual dose limits:

(a) The lesser of a total dose equivalent of 5 rems (0.05 Sv) or the sum of the deep–dose equivalent and the committed dose equivalent to any individual organ or tissue, other then the lens of the eye, equal to 50 rems (0.5 Sv).

(b) An eye–dose equivalent to 15 rems (0.15 Sv).

(c) A shallow–dose equivalent of 50 rems (0.50 Sv) to the skin or to any extremity.

(2) The amount by which occupational dose from all sources exceeds an individual's annual limits shall be subtracted from the individual's limits for planned special exposures for the current year and for lifetime exposure. See 1200–2–5–.54(6)(a) and (b).

(3) The assigned deep–dose equivalent and shallow–dose equivalent shall be for the part of the body receiving the highest exposure. Deep–dose, eye–dose and shallow–dose equivalents may be assessed from surveys or other radiation measurements to demonstrate compliance with occupational dose limits. However, this may be done only if the individual monitoring device was not subject to the highest potential exposure, or the individual monitoring results are unavailable.

(4) Derived air concentration (DAC) and annual limit on intake (ALI) values are presented in Schedule RHS 8–30 and may be used to determine the individual's dose and demonstrate compliance with the occupational dose limits.

(5) In addition to the annual dose limits, the licensee shall limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity (see footnote 3 of Schedule RHS 8–30).

(6) The licensee shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person.

1200–2–5–.55 Occupational Dose Limits for Minors

The annual occupational dose limits for minors are 10 percent of the annual dose limits specified for adult workers in 1200–2–5–.50

1200–2–5–.56 Dose to an Embryo/Fetus

(1) The licensee or registrant shall ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv). (For recordkeeping requirements see 1200–2–5–.135).

(2) Using ALARA the licensee or registrant shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman.

(3) The dose to an embryo/fetus shall be taken as the sum of:

(a) The deep–dose equivalent to the declared pregnant woman; and

(b) The dose to the embryo/fetus from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman.

(4) If when a woman declares her pregnancy to the licensee or registrant the dose to the embryo/fetus is found to be 0.45 rem (4.5 mSv) or greater, the embryo/fetus is permitted an additional dose not exceeding 0.05 rem (0.5 mSv) during the remainder of the pregnancy.

1200–2–5–.60 Dose Limits for Individual Members of the Public

(1) Each licensee and registrant shall conduct operations so that:

(a) The total effective dose equivalent received by any individual member of the public from the licensed or registered operation does not exceed 0.1 rem (1 mSv) in a year. This limit is exclusive of the dose contribution from the licensee's disposal of radioactive material into sanitary sewerage in accordance with 1200–2–5–.122; and

(b) The dose in any unrestricted area from external sources does not exceed 0.002 rem (0.02 mSv) in any one hour.

(2) A licensee, registrant, or applicant may apply for prior authorization to operate up to an annual dose limit of 0.5 rem (5 mSv) for an individual member of the public. This application by the licensee, registrant or applicant shall include the following:

(a) Demonstration of the need for and the expected duration of operations in excess of the limit in (1) of this Rule;

(b) The licensee's or registrant's program to assess and control dose within the 0.5 rem (5 mSv) annual limit; and

(c) The procedures to be followed to maintain the dose as low as is reasonably achievable (ALARA).

(3) In addition to the requirements of this Chapter, a licensee subject to the provisions of EPA's generally applicable environmental radiation standards in 40 CFR Part 190 shall comply with those standards.

(4) The Division may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that a licensee may release in effluents in order to restrict the collective dose.