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Program for Maintaining Occupational Radiation Exposures and  
Radioactive Gaseous and Liquid Effluents ALARA

**Last Reviewed Date:** 04/27/2016

**Effective Date:** 07/29/2003

**Applies To:** Employees, Students, Others

**For More Information contact:** EHS, Radiation Safety Manager at 860-486-3613

**UNIVERSITY OF CONNECTICUT**

**PROGRAM FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES AND  
RADIOACTIVE GASEOUS AND LIQUID EFFLUENTS ALARA**

**A. MANAGEMENT COMMITMENT**

1. We, the management of the University of Connecticut, are committed to the program described in this document for keeping exposures (individual and collective) and radioactive effluents as low as is reasonable achievable (ALARA). In accord with this commitment, we hereby describe an administrative organization for radiation safety policy, procedures, and instructions to foster the ALARA concept within our institution. The organization will include a radiation safety committee (RSC) and a radiation safety officer (RSO).
2. We, through the Radiation Safety Committee, will perform a formal annual review of the radiation safety program including ALARA considerations. This will include reviews of operating procedures and past exposure records, reviews of air and sewer releases of radioactive materials, and consultations with Radiation Safety Officer or outside consultants.
3. Modifications to operating maintenance procedures and to equipment and facilities will be made if they will significantly reduce exposures or effluent releases unless the cost, in our judgement, is considered to be unjustified.
4. In addition to maintaining doses to occupationally exposed individual as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level.

**B. RADIATION SAFETY COMMITTEE (RSC)**

1. Review of Proposed Licensed Investigators
  - a. The RSC will thoroughly review the qualifications of each licensed investigator, with respect to the training and experience for the use which that person has applied and will inform that applicant, through the licensing process, that all exposures to radiation and that all radioactive gaseous and liquid effluents must be maintained ALARA.
  - b. During the annual review, the RSC will review the ALARA program.

- c. The RSC will ensure that all use of byproduct material is justified and proper, and that doses (individual and collective) and radioactive effluent concentrations will be kept ALARA.

2. Delegation of Authority

The judicious delegation of RSC authority is essential to the enforcement of an ALARA program.

- a. The RSC will delegate authority to the RSO for enforcement of the ALARA concept.
- b. The RSC will support the RSO in those instances in which it is necessary for the RSO to assert authority. When the RSO has been overruled, the RSC will record the basis for its action in the minutes of its quarterly meeting.

3. Review of ALARA Program

- a. The RSC will encourage all investigators, through the license review process, to develop procedures, as appropriate, to implement the ALARA concept.
- b. The RSC will receive and evaluate a quarterly review of occupational radiation exposures provided by the RSO with particular attention to instances in which Investigational Levels in Table A-I are exceeded. The RSC will receive and evaluate a semiannual review of releases to air and the sanitary sewer system provided by the RSO paying particular attention to instances in which the investigation levels provided in Table A-II are exceeded. The principal purpose of this review is to assess trends in occupational exposure and effluent releases as an indicator of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded.

## **C. RADIATION SAFETY OFFICER (RSO)**

1. Annual and Quarterly Review

- a. The RSO will perform an annual review of the radiation safety program for adherence to ALARA concepts and make a report to the RSC. Reviews of specific procedures may be conducted on a more frequent basis.
- b. The RSO will review at least quarterly the radiation exposures of licensed investigators and workers to determine if their exposures are ALARA in accordance with the provisions of paragraph F and with appropriate regulatory and license conditions and provide a report to the RSC.

2. Education Responsibilities for an ALARA Program

- a. Educational training sessions to workers will include ALARA program concepts.
3. Cooperative Efforts for Development of ALARA Procedures

Licensed Investigators and workers will be encouraged to participate in the formulation of procedures that they will be required to follow. The RSO will be receptive to receiving and evaluating the suggestions of individual investigators and workers for improving health physics practices and will consider the use of those practices.

4. Reviewing Instances of Deviation from Good ALARA Practices

The RSO will investigate all known instances of deviation from good ALARA practices and, if possible, determine the causes. When the cause is known, the RSO will require reasonable changes in the program to maintain exposures ALARA.

#### **D. LICENSED INVESTIGATORS**

1. Previously Unauthorized Procedures Involving Potential Radiation Exposures or Radioactive Gaseous and/or Liquid Effluents
  - a. The Licensed Investigator will consult with and receive the approval of the RSO and/the RSC during the planning stage before using byproduct material for previously unauthorized uses.
  - b. The licensed investigator will ensure that exposures and effluent releases will be kept ALARA. This may be accomplished through the application of trial runs.
2. Responsibility of the licensed Investigator to those supervised
  - a. The Licensed Investigator (and/or the RSO) will ensure that workers under his or her supervision have been trained and educated in good health physics practices, and maintaining exposures and effluent releases ALARA.

#### **E. WORKERS**

1. Training will include instructions in the ALARA concept.
2. Workers will know what recourses are available if they believe that ALARA is not being promoted on the job.

**F. ESTABLISHMENT OF INVESTIGATIONAL LEVELS TO MONITOR INDIVIDUAL OCCUPATIONAL RADIATION EXPOSURES (AS PER 10 CFR 20.1201) AND CONCENTRATIONS OF BYPRODUCT MATERIAL IN GASEOUS AND LIQUID EFFLUENTS (AS PER CFR 20.1302)**

1. Individual Occupational Radiation Exposure Investigation Levels.

The University of Connecticut hereby establishes Investigational Levels for occupational radiation exposure that, when exceeded, will initiate review or investigation by the RSC, the RSO, or both. The Investigational Levels apply to the exposure of all individuals.

TABLE A-I

	<u>Type Dose</u>	<u>Level I (10%) (mrem)</u>	<u>Level II (30%) (mrem)</u>
Whole body, head and trunk, active blood-forming organs, or gonads.	Total effective dose equivalent (TEDE)	500	1500
Lens of eyes	Dose equivalent	1500	4500
Hands and forearms, feet and ankles	Shallow dose equivalent	5000	15000
Skin of whole body	Shallow dose equivalent	5000	15000
Any organ/tissue (excluding eyes)	Total organ dose equivalent (TODE)	5000	15000
Declared pregnancy	Deep dose equivalent or Fetal TODE	50	150

2. Concentration of Byproduct Material in Gaseous and Liquid Effluents

The University of Connecticut hereby establishes Investigational Levels for byproduct material releases of gaseous and liquid effluents that, when exceeded, will initiate review or investigation by the RSC, the RSO or both. The University of Connecticut encourages radioactive decay and filtration of gaseous and particulate effluents prior to release to the environment. The Investigational Levels for gaseous and liquid effluents are:

TABLE A-II

	Investigational Levels	
	<u>Level I (20%)</u>	<u>Level II (50%)</u>
Yearly gaseous/particulate releases to air at each release point	$\geq 20\%$ of summed annual radionuclide fractions permitted, 10 CFR 20, APP.B, Table 2, Col. 1	$\geq 50\%$ of summed annual radionuclide fractions permitted, 10 CFR 20, APP.B, Table 2, Col. 1
Monthly releases to sewer	$\geq 20\%$ of summed monthly radionuclide fractions permitted, 10 CFR 20, APP.B, Table 3	$\geq 50\%$ of summed monthly radionuclide fractions permitted, 10 CFR 20, APP.B, Table 3
Accumulated total activity of radioactive material released into the sanitary sewer in a year	$^3\text{H} \geq 1000 \text{ mCi}$ $^{14}\text{C} \geq 200 \text{ mCi}$ Total all others $\geq 200 \text{ mCi}$	$^3\text{H} \geq 2500 \text{ mCi}$ $^{14}\text{C} \geq 500 \text{ mCi}$ Total all others $\geq 500 \text{ mCi}$

3. Investigational Level Actions

The RSO will review and record on Form NRC-5, "Current Occupational External Radiation Exposures," or an equivalent form (e.g., dosimeter processor's report) the results of personnel monitoring at least once in each calendar quarter. The RSO will review the results of radioactive aqueous and liquid effluents at least quarterly. The exposures and radioactive effluent releases will be compared with the Investigational Levels in Table's A-I and A-II respectfully, and the following actions will be taken:

- a. Personnel exposures or effluent concentrations/releases less than Investigational Level I.

Except when deemed appropriate by the RSO, no further action will be taken in those cases in which an individual's exposure or an effluent concentration/release is less than values for Investigational Level I.

- b. Personnel exposures or effluent concentrations/releases equal to or greater than Investigational Level I, but less than Investigational Level II.

The RSO will review the exposure of each individual whose accumulated exposure equals or exceeds Investigational Levels I and will report the results of such reviews at the first RSC meeting following the quarter when the exposure was recorded. The RSO will review the radioactive materials released in gaseous and liquid effluents quarterly and will report any results which exceed Investigational Level I at the next scheduled RSC meeting. IF the exposure or effluent release does not equal or exceed Investigational Level II, no further action related specifically to the exposure or release is required unless deemed appropriate by the RSC. The RSC will, however, consider each such exposure and effluent release in comparison with those of others performing similar tasks as an indication of ALARA program quality and will record the review in the minutes of the RSC meeting.

- c. Personnel exposures or effluent concentrations/releases equal to or greater than Investigational Level II.

The RSO will investigate in a timely manner the causes of all personnel exposures or effluent releases equaling or exceeding Investigational Level II and, if warranted, take action. For personal exposures, a report of the investigation, actions taken, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the RSC at the first RSC meeting following completion of the investigation. For gaseous or liquid effluents a summary will be provided with details concerning the release. The details of these reports will be recorded in the minutes of the RSC meeting.


- d. Establishment of an individual worker exposure or radioactive material gaseous/liquid effluent release above Investigational Level II listed in Table's A-I or A-II.

If a worker or a group of worker's occupational exposures or effluent releases needs to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consistent with good ALARA practices for that individual, group or situation in relation to the intended task. Justification for a new Investigational Level II will be documented in RSC minutes.

The RSC will review the justification for, and will approve all revisions of Investigational Level II. In such cases, when the exposure or effluent concentration/release equals or exceeds the newly established Investigational Level II, those actions listed in paragraph C above will be followed.

**G. ALARA PROGRAM APPROVAL**

The following have reviewed and approved the content and goals of the ALARA program set forth herein.

	<u>6/2/2016</u>
Chair, Radiation Safety Committee	Date
	<u>6/1/2016</u>
Executive Management Representative	Date
	<u>6/7/2016</u>
Radiation Safety Officer	Date