

# NRC Regulation of Exposure

## Permissible Doses, Levels, and Concentrations

Section 20.101 of 10 C.F.R. establishes occupational radiation dose standards. These standards include only exposure received in the course of employment; a worker's exposure resulting from medical treatment or other non-job-related circumstances is not considered. Generally, a worker is not to receive a total occupational dose in excess of those in the following table:

### Rems Per Calendar Quarter

|   |       |
|---|-------|
| Whole body; head and trunk; active blood-forming organs; lens of eye, or gonads . . . . . | 1.25  |
| Hands and forearms; feet and ankles . . . . .   | 18.75 |
| Skin of whole body . . . . .  | 7.50  |

Cumulative lifetime dosage is limited by the formula  $5(N-18)$ , where N is the worker's age at his or her last birthday. The purpose of this formula is to set an upper limit on cumulative lifetime dose, and it has a variable individual impact depending on the status of the employee. For a *permanent employee with a history of exposure*, application of the formula can result in an exposure limit of 1.25 rems per quarter; but for a *new regular employee or temporary employee, with no dose history*, the formula does not provide for a limiting level. In this latter case, a 3 rem quarterly standard would serve as the dose limit.<sup>1</sup>

Prior dose must be determined whenever an employee is likely to receive an occupational dose in excess of 25 percent of the standards specified in the above table.<sup>2</sup> This determination depends largely on the employee. The worker must sign a statement that he or she had no prior occupational dose during the current calendar quarter, or must describe the amount of any dose received during that quarter. Calculation of previously accumulated occupational doses is also required.

NRC limits exposure of workers who are under 18 years of age to a quarterly dose of 10 percent of the limits specified in the above table. Therefore, the maximum dose to the minor's whole body or gonads cannot exceed 0.125 rems per quarter.<sup>3</sup>

Worker exposure to concentrations of airborne radioactive materials and to radioactive materials capable of skin absorption is restricted. Internalization by either route in any calendar quarter cannot exceed

material specific limits set forth in 10 C.F.R., Appendix B of Part 20. Appendix B contains additional restrictive limits for minors. The licensee is directed to ". . . use process or other engineering controls, to the extent practicable, to limit concentrations of radioactive materials in air. . . ."<sup>4</sup> When it is impracticable to use such controls, other precautionary procedures, including limitation of working time or provision of respiratory protective equipment, is mandated.<sup>5</sup> Inhalation protection is important, since many radioactive materials used in the nuclear industry cannot damage reproductive systems unless internalized.

## Precautionary Procedures

There are three main precautionary procedures required of all NRC licensees that influence reproductive health. First, licensees must make periodic surveys to evaluate the extent of radiation hazards. Surveys are an evaluation of the hazards incident to the presence of radioactive materials, and include measurements of radiation levels.<sup>6</sup>

Second, the licensee must supply employees with monitoring equipment and must require its use. Workers who must wear monitors are differentiated by age. Any adult likely to receive 25 percent, and any minor likely to receive 5 percent, of the values specified in the above table must wear monitors.

Third, the licensee is required to clearly mark restricted areas, which must be controlled for the purpose of protecting workers from exposure. The design of warning devices is prescribed, and radioactive containers and access points to radiation areas must be clearly marked.<sup>7</sup>

## Records, Reports, and Notification

All licensees are required to maintain records of radiation surveys and personnel exposure. Yearly reports to the NRC are required only for licensees in the industries thought to encompass the greatest exposure. These industries include nuclear reactors, radiography, fuel processing, high-level waste repositories, spent fuel storage, and facilities using specified quantities of byproduct material.<sup>8</sup> Reports must detail the number of workers monitored and provide a statisti-

<sup>1</sup>10 C.F.R. pt. 20, §20.101(b)(1)(1984)

<sup>2</sup>10 C.F.R. pt. 20, §20.102

<sup>3</sup>10 C.F.R. pt. 20, §20.104

<sup>4</sup>10 C.F.R. pt. 20, §20.103(d)(1)

<sup>5</sup>10 C.F.R. pt. 20, §20.103(b)(2)

<sup>6</sup>10 C.F.R. pt. 20, §20.20.1

<sup>7</sup>10 C.F.R. pt. 20, §20.2041

<sup>8</sup>10 C.F.R. pt. 20, §20.408

cal summary of their exposures. This group of licensees must also report to the Commission on the exposure of each worker, at termination of employment.<sup>9</sup> All licensees must also report to NRC any condition that results in over-exposure of any workers.<sup>10</sup>

NRC regulations also provide for reports to workers and for NRC inspections of facilities. Required reports to workers include both general instructions and individual exposure data.

The licensee is required to make general information available to workers, including copies of the license, license conditions, licensed operating proce-

dures, and notices of violations involving radiological working conditions.<sup>11</sup> Furthermore, the licensee must instruct employees in the health protection problems associated with exposure to radioactive materials.<sup>12</sup>

Licensees must furnish a written report to workers describing their personal radiation exposure data, including any analysis of radioactive material retained by the body. These reports are to be made annually or on termination of the worker, but only at the worker's request. A former employee can request an exposure report from the employer's records.<sup>13</sup>

---

<sup>9</sup>10 C.F.R. pt. 20, § 20.408(b).

<sup>10</sup>10 C.F.R. pt. 20, § 20.403.

<sup>11</sup>10 C.F.R. pt. 19, § 19.11.

---

<sup>12</sup>10 C.F.R. pt. 19, § 19.12.

<sup>13</sup>10 C.F.R. pt. 19, § 19.13.