Department of Energy
Washington, DC 20585

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MEMORANDUM FOR DISTRIBUTION

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SUBJECT: Technical Position Regarding Acceptable Methods for Assessing and Recording Radiation Doses to Individuals

The Office of Worker Safety and Health Policy, within the Office of Health, Safety and Security, issues Radiological Control Technical Positions in response to questions or issues associated with Department of Energy (DOE) occupational radiation protection programs.

This technical position addresses acceptable approaches for assessing and recording radiation doses to individuals. In June 2007, DOE updated its occupational radiation protection rule, title 10, Code of Federal Regulations, part 835 (10 C.F.R. 835). DOE is in the process of updating Manual 231.1-1A, *Environment, Safety and Health Reporting Manual*, to incorporate the 2007 amendment to 10 C.F.R. 835. A review of the draft revision to Manual 231.1-1A prompted several questions regarding acceptable methods for recording and assessing doses, especially those involving skin doses.

The attached technical position does not represent new policy or direction to the field. Rather, it provides clarification regarding assessing and recording radiation doses.

Please ensure further distribution of the attached document to the applicable radiation protection organizations at your facilities. The DOE Radiological Control Coordinating Committee has reviewed this technical position.

Attachment

Department of Energy
Office of Worker Safety and Health Policy
Radiological Control Technical Position
RCTP 2009-01

Technical Position Clarifying Dose Assessment and Recording

Issue:

Title 10 Code of Federal Regulation Part 835, *Occupational Radiation Protection* (10 CFR 835), requires assessment and recording of radiation doses to individuals who are exposed to sources of radiation or contamination. This includes assessing exposure to a variety of radiation types, such as alpha, neutron, gamma, and beta, as well as exposures to non-uniform skin dose. The requirements include assessing doses to the whole body, skin, lens of the eyes, extremities and various organs and tissues. In June 2007, 10 CFR 835 was amended to adopt more current dosimetric models (i.e., International Commission on Radiological Protection Publication 60 (ICRP 60)).

Adoption of ICRP 60 dosimetric models included the updating of tissue weighting factors used primarily for assessing radiation doses resulting from intakes of radioactive material. A change in ICRP 60 includes the addition of skin as a specified organ assigned a tissue weighting factor. Prior to the 2007 amendment to 10 CFR 835, skin was not listed as an organ specifically assigned a tissue weighting factor. DOE is in the process of updating DOE Manual 231.1-1A, *Environment, Safety and Health Reporting Manual*, which includes updating the instructions for reporting occupational doses to the Department (Radiation Exposure Monitoring System). The revision to DOE Manual 231.1-1A will incorporate the 2007 amendment to 10 CFR 835. A review of the draft revision to DOE Manual 231.1-1A prompted several questions regarding acceptable methods for recording and assessing doses, especially those involving skin doses.

Discussion:

Applicable Requirements

10 CFR 835

835.202 Occupational dose limits for general employees.

(a) Except for planned special exposures conducted consistent with 835.204 and emergency exposures authorized in accordance with 835.1302, the occupational dose received by general employees shall be controlled such that the following limits are not exceeded in a year:

(1) A total effective dose of 5 rems (0.05 Sv);

(2) The sum of the equivalent dose to the whole body for external exposures and the committed equivalent dose to any organ or tissue other than the skin or the lens of the eye of 50 rems (0.5 Sv);
(3) An equivalent dose to the lens of the eye of 15 rems (0.15 Sv); and
(4) The sum of the equivalent dose to the skin or to any extremity for external exposures and the committed equivalent dose to the skin or to any extremity of 50 rems (0.5 Sv).

§ 835.702 Individual monitoring records.

(b) Recording of the non-uniform equivalent dose to the skin is not required if the dose is less than 2 percent of the limit specified for the skin at § 835.202(a)(4).

(c) The records required by this section shall:
(1) Be sufficient to evaluate compliance with subpart C of this part;
(2) Be sufficient to provide dose information necessary to complete reports required by subpart I of this part;
(3) Include the results of monitoring used to assess the following quantities for external dose received during the year:
  (i) The effective dose from external sources of radiation (equivalent dose to the whole body may be used as effective dose for external exposure);
  (ii) The equivalent dose to the lens of the eye;
  (iii)The equivalent dose to the skin; and
  (iv)The equivalent dose to the extremities.
(4) Include the following information for internal dose resulting from intakes received during the year:
  (i) Committed effective dose;
  (ii) Committed equivalent dose to any organ or tissue of concern; and
  (iii)Identity of radionuclides.
(5) Include the following quantities for the summation of the external and internal dose:
  (i) Total effective dose in a year;
  (ii) For any organ or tissue assigned an internal dose during the year, the sum of the equivalent dose to the whole body from external exposures and the committed equivalent dose to that organ or tissue; and
  (iii)Cumulative total effective dose.
(6) Include the equivalent dose to the embryo/fetus of a declared pregnant worker.

Technical Position:

10 CFR 835.702 (c) specifies the radiological dose quantities which must be included in dose records. The table below specifies the components of the quantities and lists acceptable methods for assessing these quantities. The table also provides clarification for reporting occupational doses as required by DOE Manual 231.1-1A.

Radiation Quantities to Record

Quantity to Record	Components of Quantity
Effective dose from external sources	Sum of: • Photon plus neutron whole body dose at 10 mm depth as measured using a whole body dosimeter. • The effective dose from external beta dose assessed at 0.07 mm depth from either uniform or non-uniform exposure of the skin may be added. However this is not required under 10 CFR 835.
Equivalent dose to lens of eye from external sources	Sum of: • Photon/beta lens of eye dose assessed at 3 mm depth. • Neutron dose at 10 mm depth. • For periods when lens of eye dose was not specifically being monitored, photon/beta dose from whole body dosimeter assessed at 3 mm (or 0.07 mm, if 3 mm is unavailable) depth.
Equivalent dose to skin from external sources	Sum of: • Photon/beta dose at 0.07 mm depth. • Neutron dose at 10 mm depth from whole body dosimeter. • Non-uniform skin dose to an area ≥ 10 cm^2 that is 1 rem or greater.
Equivalent dose to any extremity from external sources	Sum of: • Photon/beta dose at 0.07 mm depth from direct monitoring of extremities. • Neutron dose at 10 mm depth. • Non-uniform skin dose of extremities of 1 rem or greater. • For periods when extremities were not specifically monitored, photon/beta dose at 0.07 mm depth from whole body dosimeter.
Committed effective dose	Committed effective dose from the intakes of radionuclides.
Committed equivalent dose to any organ or tissue	Committed equivalent dose to any organ/tissue from the intake of radionuclides. This quantity includes dose to the skin from intakes of radionuclides.
Total effective dose	Sum of: • Effective dose from external sources, see above. • Committed effective dose from intakes of radionuclides.
Organ/Tissue dose (except skin): sum of external and internal	Sum of: • Effective dose from external sources, see above. • Committed equivalent dose to organ/tissue from intakes of radionuclides.

Radiation Quantities to Record (continued)

Quantity to Record	Components of Quantity
Skin dose: sum of external and internal	Sum of: • Equivalent dose to skin from external sources, see above. • Committed equivalent dose to the skin from intakes of radionuclides. Note: 10 CFR 835.702 does not explicitly list this quantity in the individual monitoring records. However, 10 CFR 835.202(a)(4) does list this quantity as a limit. 10 CFR 835.702(c)(1) states that records must be sufficient to evaluate compliance with 10 CFR 835.202, therefore, it is appropriate to record this quantity and to include it in reports to individuals.
Extremity dose: sum of external and internal	Sum of: • Equivalent dose to any extremity from external sources, see above. • Committed equivalent dose to the extremity from intakes of radionuclides. Note: 10 CFR 835.702 does not explicitly list this quantity in the individual monitoring records. However, 10 CFR 835.202(a)(4) does list this quantity as a limit. 10 CFR 835.702(c)(1) states that records must be sufficient to evaluate compliance with 10 CFR 835.202, therefore, it is appropriate to record this quantity and to include it in reports to individuals.
Cumulative total effective dose	Sum of: • Total effective dose, see above. • Total effective dose equivalent (for exposures prior to implementing the 10 CFR 835 (2007) quantities) since January 1989.
Equivalent dose to the embryo/fetus	Sum of: • Photon plus neutron whole body doses from mother's whole body dosimeter (abdomen/torso area). • Committed equivalent dose to embryo/fetus from intakes of radionuclides.

Summary:

The above table lists acceptable methods for assessing the various dose quantities specified in 10 CFR 835.702(c) and for reporting these to the Department as required by DOE Manual 231.1-1A.