

**Department of Energy
Office of Worker Safety and Health Policy
Radiological Control Technical Position
RCTP 2006-01**

**Technical Position Regarding Acceptable Approaches to Developing
Sealed Radioactive Sources and Posting and Labeling Requirements
for Special Tritium Compounds (STCs)**

Issue:

On September 11, 2001, technical position Radiological Control Technical Position (RCTP) 2001-02, addressing an acceptable approach for developing air concentration values for controlling exposures to STCs was issued. In response to a concern that there is a lack of guidance on an appropriate value for sealed radioactive STC accountability, posting and labeling, the Office of Worker Safety and Health Policy has developed a value which may be used for these purposes.

Discussion:

Applicable Requirements

Title 10, Code of Federal Regulations, part 835

§ 835.2 Definitions.

(a) As used in this part:

Accountable sealed radioactive source means a sealed radioactive source having a half-life equal to or greater than 30 days and an isotopic activity equal to or greater than the corresponding value provided in appendix E of this part.

Radioactive material area means any area within a controlled area, accessible to individuals, in which items or containers of radioactive material exist and the total activity of radioactive material exceeds the applicable values provided in appendix E of this part.

§ 835.606 Exceptions to labeling requirements.

- (a) Items and containers may be excepted from the radioactive material labeling requirements of § 835.605 when:
- (2) The quantity of radioactive material is less than one tenth of the values specified in appendix E of this part.

Appendix E

VALUES FOR ESTABLISHING SEALED RADIOACTIVE SOURCE ACCOUNTABILITY AND RADIOACTIVE MATERIAL POSTING AND LABELING REQUIREMENTS

The data presented in appendix E are to be used for identifying accountable sealed radioactive sources and radioactive material areas as those terms are defined at § 835.2(a), establishing the need for radioactive material area posting in accordance with § 835.603(g), and establishing the need for radioactive material labeling in accordance with § 835.605.

Appendix E does not have a value for tritium in the form of special tritium compounds.

Technical Position:

DOE- HDBK-1184-2004, RADIOLOGICAL CONTROL PROGRAMS FOR SPECIAL TRITIUM COMPOUNDS, provides guidance for implementing radiological control programs for STCs. The handbook includes derivations and tables of committed effective dose equivalent dose conversion factors (DCFs) for a variety of STC compounds found in the DOE complex. These DCFs may be used in assessing doses received by individuals breathing and ingesting STCs. They may also be used in deriving sealed radioactive source accountability and posting and labeling criteria.

The Appendix E values were derived using exposure scenarios as were discussed in the 1998 amendment to 10 CFR part 835. In summary, the values were based on the more limiting of the quantity of radioactive material which results in either an external or internal whole body dose, from either inhalation or ingestion, of 100 millirem (0.001 Sv). The external exposure scenario assumes a photon exposure for 12 hours a day for 365 days with the source distance being at 1 meter. The internal exposure scenario assumes an instantaneous intake fraction (IF) of 0.001% (10^{-5}) of the material by an individual.

For the internal exposure scenario involving STCs, one may use a DCF from DOE- HDBK-1184-2004 and calculate a quantity in a similar manner as the other values in Appendix E.

An example of an acceptable approach is:

From Table 5-14 of the handbook, using a conservative value of Type S, HfH₂ material, with a 1 μ AMAD, results in a DCF of 4.29×10^{-10} Sv/Bq.

$$\text{Activity (Bq)} \times \text{IF } (1.0 \times 10^{-5}) \times \text{DCF } (4.29 \times 10^{-10} \text{ Sv/Bq}) = 0.001 \text{ Sv}$$

$$\text{Activity (Bq)} = \frac{1 \times 10^{-3}}{(1 \times 10^{-5}) \times (4.29 \times 10^{-10})} = 2.33 \times 10^{11} \text{ Bq}$$

$$\text{Activity (Ci)} = \frac{2.33 \times 10^{11} \text{ Bq}}{3.7 \times 10^{10} \text{ Bq/Ci}} = 6.3 \text{ Ci}$$

Summary

For implementation and operational purposes, an acceptable value to be used for sealed radioactive STC accountability and radioactive material area posting purposes is 6.3 Ci. An acceptable value to be used for labeling containers of STC is 0.63 Ci. For situations where the particle size and type of special tritium compounds are known and documented, the process described in the technical position above may be used to calculate an alternate value for sealed radioactive STC accountability, labeling and radioactive material area posting purposes.