sealed in the cladding. In all cases the fuel is hermetically sealed inside a suitable cladding which is designed to be the primary envelope encasing the fuel so as to provide suitable performance and safety during reactor operation. Also, in all cases precise control of processes, procedures and equipment to extremely high standards is necessary in order to ensure predictable and safe fuel performance.

(a) Items that are considered especially designed or prepared for the fabrication of fuel elements include equipment that:

(1) Normally comes in direct contact with, or directly processes or controls, the production flow of nuclear material;

(2) Seals the nuclear material within the cladding;

(3) Checks the integrity of the cladding or the seal; and

(4) Checks the finished treatment of the sealed fuel.

(b) This equipment or systems of equipment may include, for example:

(1) Fully automatic pellet inspection stations especially designed or prepared for checking final dimensions and surface defects of fuel pellets;

(2) Automatic welding machines especially designed or prepared for welding end caps onto the fuel pins (or rods);

(3) Automatic test and inspection stations especially designed or prepared for checking the integrity of completed fuel pins (or rods). This item typically includes equipment for:

(i) X-ray examination of pin (or rod) end cap welds;

(ii) Helium leak detection from pressurized pins (or rods); and

(iii) Gamma-ray scanning of the pins (or rods) to check for correct loading of the fuel pellets inside.

[65 FR 70292, Nov. 22, 2000]

APPENDIX P TO PART 110—CATEGORY 1 AND 2 RADIOACTIVE MATERIAL

TABLE 1—IMPORT AND EXPORT THRESHOLD LIMITS

Radioactive material	Category 1		Category 2	
	Terabequerels (TBq)	Curies (Ci) [1]	Terabequerels (TBq)	Curies (Ci) [1]
Americium-241	60	1,600	0.6	16
Americium-241/Be	60	1,600	0.6	16
Californium-252	20	540	0.2	5.4
Curium-244	50	1,400	0.5	14
Cobalt-60	30	810	0.3	8.1
Cesium-137	100	2,700	1.0	27
Gadolinium-153	1,000	27,000	10.0	270
Iridium-192	80	2,200	0.8	22
Plutonium-238[2]	60	1,600	0.6	16
Plutonium-239/Be[2]	60	1,600	0.6	16
Promethium-147	40,000	1,100,000	400	11,000
Radium-226[a]	40	1,100	0.4	11
Selenium-75	200	5,400	2.0	54
Strontium-90 (Y–90)	1,000	27,000	10.0	270
Thulium-170	20,000	540,000	200	5,400
Ytterbium-169	300	8,100	3.0	81

[1] The values to be used to determine whether a license is required are given in TBq. Curie (Ci) values are provided for practical usefulness only and are rounded after conversion.

[2] The limits for Pu-238 and Pu-239/Be in this table apply for imports to the U.S. The limits for exports of Pu-238 and Pu-239/Be can be found in §110.21.

[a] Discrete sources of radium-226.

Calculation of Shipments Containing Multiple Sources or Radionuclides

The ''sum of fractions'' methodology for evaluating combinations of radionuclides being transported, is to be used when import or export shipments contain multiple sources or multiple radionuclides. The threshold limit values used in a sum of the fractions calculation must be the metric values (*i.e.*, TBq).

I. If multiple sources and/or multiple radionuclides are present in an import or export shipment, the sum of the fractions of the activity of each radionuclides must be determined to verify the shipment is less than the Category 1 or 2 limits of Table 1, as appropriate. If the calculated sum of the fractions ratio, using the following equation, is greater than or equal to 1.0, then the import or export shipment exceeds the threshold limits of Table 1 and the applicable security provisions of this part apply.

II. Use the equation below to calculate the sum of the fractions ratio by inserting the actual activity of the applicable radionuclides or of the individual sources (of the same radionuclides) in the numerator of the equation and the corresponding threshold activity limit from the Table 1 in the denominator of the equation. Ensure the numerator

and denominator values are in the same units and all calculations must be performed using the TBq (*i.e.*, metric) values of Table 1.

R_1 = activity for radionuclides or source number 1

R_2 = activity for radionuclides or source number 2

R_N = activity for radionuclides or source number n

AR_1 = activity limit for radionuclides or source number 1

AR_2 = activity limit for radionuclides or source number 2

AR_N = activity limit for radionuclides or source number n

$$\sum_{1}^{n}\left[\frac{R_1}{AR_1}+\frac{R_2}{AR_2}+\frac{R_n}{AR_n}\right]\geq 1$$

[70 FR 37993, July 1, 2005, as amended at 71 FR 20339, Apr. 20, 2006]

PART 140—FINANCIAL PROTECTION REQUIREMENTS AND INDEMNITY AGREEMENTS

Subpart A—General Provisions

Subpart B—Provisions Applicable Only to Applicants and Licensees Other Than Federal Agencies and Nonprofit Educational Institutions

Subpart C—Provisions Applicable Only to Federal Agencies

Subpart D—Provisions Applicable Only to Nonprofit Educational Institutions

Subpart E—Extraordinary Nuclear Occurrences

Subpart F—Violations

APPENDIXES TO PART 140