from the fissile material standards of § 71.55 and § 71.59, but are subject to all other requirements of this part:

(a) A package containing not more than 15 g of fissile material. If material is transported in bulk, the quantity limitation applies to the conveyance;

(b) A package containing homogeneous hydrogenous solutions or mixtures where:

- (1) The minimum ratio of the number of hydrogen atoms to the number of atoms of fissile radionuclides (H/X) is 5200.
- (2) The maximum concentration of fissile radionuclides is 5 g/liter; and
- (3) The maximum mass of fissile radionuclides in the package is 800 g, with an exception for a mixture where the total mass of plutonium and uranium-233 exceeds 1 percent of the mass of uranium-235, the limit is 500 g. If the material is transported in bulk, other than by aircraft, the quantity limitations apply to the conveyance;
- (c) A package containing uranium enriched in uranium-235 to a maximum of 1 percent by weight, and with a total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, if the fissile radionuclides are distributed homogeneously throughout the package contents and do not form a lattice arrangement within the package;
- (d) A package containing any fissile material if it does not contain more than 5 g of fissile radionuclides in any 10 liter volume, and if the material is packaged so as to maintain this limit of fissile radionuclide concentration during normal transport;
- (e) A package containing not more than 1 kg of plutonium of which not more than 20 percent by mass may consist of plutonium-239, plutonium-241, or any combination of those radionuclides; or
- (f) A package containing liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 percent by weight, with total plutonium and uranium-233 not more than 0.1 percent of the mass of uranium-235 and with a minimum nitrogen-to-uranium atomic ratio (N/U) of 2.

§ 71.55 General requirements for fissile material packages.

- (a) A package used for the shipment of fissile material must be designed and constructed in accordance with §§ 71.41 through 71.47. When required by the total amount of radioactive material, a package used for the shipment of fissile material must also be designed and constructed in accordance with § 71.51.
- (b) Except as provided in paragraph (c) of this section, a package used for the shipment of fissile material must be so

- designed and constructed and its contents so limited that it would be subcritical if water were to leak into the containment system, or liquid contents were to leak out of the containment system so that, under the following conditions, maximum reactivity of the fissile material would be attained:
- (1) The most reactive credible configuration consistent with the chemical and physical form of the material:
- (2) Moderation by water to the most reactive credible extent; and
- (3) Close full reflection of the containment system by water on all sides, or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging.
- (c) The Commission may approve exceptions to the requirements of paragraph (b) of this section if the package incorporates special design features that ensure that no single packaging error would permit leakage, and if appropriate measures are taken before each shipment to ensure that the containment system does not leak.
- (d) A package used for the shipment of fissile material must be so designed and constructed and its contents so limited that under the tests specified in § 71.71 ("Normal conditions of transport")—
- (1) The contents would be subcritical;(2) The geometric form of the package
- (2) The geometric form of the packag contents would not be substantially altered;
- (3) There would be no leakage of water into the containment system unless, in the evaluation of undamaged packages under § 71.59(b)(1), it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material; and
- (4) There will be no substantial reduction in the effectiveness of the packaging, including:
- (i) No more than 5 percent reduction in the total effective volume of the packaging on which nuclear safety is assessed;
- (ii) No more than 5 percent reduction in the effective spacing between the fissile contents and the outer surface of the packaging; and
- (iii) No occurrence of an aperture in the outer surface of the packaging large enough to permit the entry of a 10 cm (4 in) cube.
- (e) A package used for the shipment of fissile material must be so designed and constructed and its contents so limited that under the tests specified in § 71.73 ("Hypothetical accident conditions"), the package would be

- subcritical. For this determination, it must be assumed that:
- (1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package and the chemical and physical form of the contents;
- (2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents; and
- (3) There is full reflection by water on all sides, as close as is consistent with the damaged condition of the package.

§71.57 [Reserved]

§ 71.59 Standards for arrays of fissile material packages.

- (a) A fissile material package must be controlled by either the shipper or the carrier during transport to assure that an array of such packages remains subcritical. To enable this control, the designer of a fissile material package shall derive a number "N" based on all the following conditions being satisfied, assuming packages are stacked together in any arrangement and with close full reflection on all sides of the stack by water:
- (1) Five times "N" undamaged packages with nothing between the packages would be subcritical;
- (2) Two times "N" damaged packages, if each package were subjected to the tests specified in § 71.73 ("Hypothetical accident conditions") would be subcritical with optimum interspersed hydrogenous moderation; and
- (3) The value of "N" cannot be less than 0.5.
- (b) The transport index based on nuclear criticality control must be obtained by dividing the number 50 by the value of "N" derived using the procedures specified in paragraph (a) of this section. The value of the transport index for nuclear criticality control may be zero provided that an unlimited number of packages is subcritical such that the value of "N" is effectively equal to infinity under the procedures specified in paragraph (a) of this section. Any transport index greater than zero must be rounded up to the first decimal place.
- (c) Where a fissile material package is assigned a nuclear criticality control transport index—
- (1) Not in excess of 10, that package may be shipped by any carrier, and that carrier provides adequate criticality control by limiting the sum of the transport indexes to 50 in a non-exclusive use vehicle, and to 100 in an exclusive use vehicle.
- (2) In excess of 10, that package may only be shipped by exclusive use