package, the system must be capable of
withstanding, without generating
stress in any material of the package
in excess of its yield strength, a static
force applied to the center of gravity of
the package having a vertical com-
ponent of 2 times the weight of the pack-
age with its contents, a horizontal
component along the direction in
which the vehicle travels of 10 times
the weight of the package with its con-
tenst, and a horizontal component in
the transverse direction of 5 times the
weight of the package with its con-
tenst.

(2) Any other structural part of the
package that could be used to tie down
the package must be capable of being
rendered inoperable for tying down the
device during transport, or must be
designed with strength equivalent to
that required for tie-down devices.

(3) Each tie-down device that is a
structural part of a package must be
designed so that failure of the device
under excessive load would not impair
the ability of the package to meet
other requirements of this part.

§ 71.47 External radiation standards
for all packages.

(a) Except as provided in paragraph
(b) of this section, each package of ra-
dioactive materials offered for trans-
portation must be designed and pre-
pared for shipment so that under condi-
tions normally incident to transpor-
tation the radiation level does not ex-
ceed 2 mSv/h (200 mrem/h) at any point
on the external surface of the package,
and the transport index does not ex-
ceed 10.

(b) A package that exceeds the radia-
tion level limits specified in para-
graph (a) of this section must be trans-
ported by exclusive use shipment only,
and the radiation levels for such ship-
ment must not exceed the following
during transportation:

(1) 2 mSv/h (200 mrem/h) on the exter-
nal surface of the package, unless the
following conditions are met, in which
case the limit is 10 mSv/h (1000 mrem/
h):

(i) The shipment is made in a closed
transport vehicle;

(ii) The package is secured within the
vehicle so that its position remains
fixed during transportation; and

(iii) There are no loading or unload-
ing operations between the beginning
and end of the transportation;

(2) 2 mSv/h (200 mrem/h) at any point
on the outer surface of the vehicle, in-
cluding the top and underside of the vehi-
icle; or in the case of a flat-bed style
vehicle, at any point on the vertical
planes projected from the outer edges
of the vehicle, on the upper surface of
the load or enclosure, if used, and on
the lower external surface of the vehi-
cle; and

(3) 0.1 mSv/h (10 mrem/h) at any point
2 meters (80 in) from the outer lateral
surfaces of the vehicle (excluding the
top and underside of the vehicle); or in
the case of a flat-bed style vehicle, at
any point 2 meters (6.6 feet) from the
vertical planes projected by the outer
device, excluding the top
and underside of the vehicle); and

(4) 0.02 mSv/h (2 mrem/h) in any nor-
mally occupied space, except that this
provision does not apply to private car-
rriers, if exposed personnel under their
control wear radiation dosimetry de-
vices in conformance with 10 CFR
20.1502.

(c) For shipments made under the
provisions of paragraph (b) of this sec-
tion, the shipper shall provide specific
written instructions to the carrier for
maintenance of the exclusive use ship-
ment controls. The instructions must
be included with the shipping paper in-
formation.

(d) The written instructions required
for exclusive use shipments must be
sufficient so that, when followed, they
will cause the carrier to avoid actions
that will unnecessarily delay delivery
or unnecessarily result in increased ra-
diation levels or radiation exposures to
transport workers or members of the
general public.

§ 71.51 Additional requirements for
Type B packages.

(a) A Type B package, in addition to
satisfying the requirements of §§ 71.41
through 71.47, must be designed, con-
structed, and prepared for shipment so
that under the tests specified in:

(1) Section 71.71 ("Normal conditions
of transport"), there would be no loss
or dispersal of radioactive contents—as
demonstrated to a sensitivity of 10^{-6}
A_2 per hour, no significant increase in
external surface radiation levels, and no substantial reduction in the effectiveness of the packaging; and

(2) Section 71.73 (‘‘Hypothetical accident conditions’’), there would be no escape of krypton-85 exceeding 10 $A_2$ in 1 week, no escape of other radioactive material exceeding a total amount $A_2$ in 1 week, and no external radiation dose rate exceeding 10 mSv/h (1 rem/h) at 1 m (40 in) from the external surface of the package.

(b) Where mixtures of different radio-isotopes are present, the provisions of appendix A, paragraph IV of this part shall apply, except that for Krypton-85, an effective $A_2$ value equal to 10 $A_2$ may be used.

(c) Compliance with the permitted activity release limits of paragraph (a) of this section may not depend on filters or on a mechanical cooling system.

(d) For packages which contain radioactive contents with activity greater than $10^5 A_2$, the requirements of §71.61 must be met.

§ 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) or (g) 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 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(a)(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: