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BOB TAFT
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J. NICK BAIRD, M.D.
Director of Health

January 30, 2001

Fred Combs
United States Nuclear Regulatory Commission
Assistant Director
Office of State and Tribal Programs
Washington, D.C. 20555

Dear Mr. Combs,

Please find enclosed Ohio rule 3701:1-50, Transportation of Radioactive Material. This is Ohio's version of 10 CFR 71. The rule is being sent to you for USNRC review.

Please feel free to contact Marcia Howard or myself at 614-644-2727 if there are any questions.

Sincerely,

Michael J. Snee
Ohio Department of Health
Bureau of Radiation Protection

cc: James L. Lynch, State Agreements Officer

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3701:1-50-01 DEFINITIONS.

(A) TO ENSURE COMPATIBILITY WITH INTERNATIONAL TRANSPORTATION STANDARDS, ALL LIMITS IN THIS CHAPTER ARE GIVEN IN TERMS OF DUAL UNITS: THE "INTERNATIONAL SYSTEM OF UNITS" (SI) FOLLOWED OR PRECEDED BY "U.S. STANDARD" OR U. S. CUSTOMARY UNITS". THE "U.S. CUSTOMARY UNITS" ARE NOT EXACT EQUIVALENTS, BUT ARE ROUNDED TO A CONVENIENT VALUE, PROVIDING A FUNCTIONALLY EQUIVALENT UNIT. FOR THE PURPOSE OF THIS CHAPTER, EITHER UNIT MAY BE USED. TERMS USED WITHIN THIS CHAPTER ARE DEFINED IN 3701:1-38-01 IF THEY ARE TERMS THAT WOULD BE USED IN MORE THAN ONE CHAPTER OF RULES. TERMS DEFINED IN THIS RULE ARE USED WITHIN THIS CHAPTER.

(B) AS USED IN THIS CHAPTER:

(1) "CARRIER" MEANS A PERSON ENGAGED IN THE TRANSPORTATION OF PASSENGERS OR PROPERTY BY LAND OR WATER AS A COMMON, CONTRACT, OR PRIVATE CARRIER, OR BY CIVIL AIRCRAFT.

(2) "CERTIFICATE HOLDER" MEANS A PERSON WHO HAS BEEN ISSUED A CERTIFICATE OF COMPLIANCE OR OTHER PACKAGE APPROVAL BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION.

(3) "CLOSED TRANSPORT VEHICLE" MEANS A TRANSPORT VEHICLE EQUIPPED WITH A SECURELY ATTACHED EXTERIOR ENCLOSURE THAT DURING NORMAL TRANSPORTATION RESTRICTS THE ACCESS OF UNAUTHORIZED PERSONS TO THE CARGO SPACE CONTAINING THE RADIOACTIVE MATERIAL. THE ENCLOSURE MAY BE TEMPORARY OR PERMANENT BUT SHALL LIMIT ACCESS FROM TOP, SIDES, AND ENDS. IN THE CASE OF PACKAGED MATERIALS, IT MAY BE OF THE "SEE-THROUGH" TYPE.

(4) "CLOSE REFLECTION BY WATER" MEANS IMMEDIATE CONTACT BY WATER OF SUFFICIENT THICKNESS FOR MAXIMUM REFLECTION OF NEUTRONS.

(5) "CONTAINMENT SYSTEM" MEANS THE ASSEMBLY OF COMPONENTS OF THE PACKAGING INTENDED TO RETAIN THE RADIOACTIVE MATERIAL DURING TRANSPORT.

(6) "CONVEYANCE" MEANS:

(a) FOR TRANSPORT BY PUBLIC HIGHWAY OR RAIL, ANY TRANSPORT VEHICLE OR LARGE FREIGHT CONTAINER;

(b) FOR TRANSPORT BY WATER, ANY VESSEL, OR ANY HOLD, COMPARTMENT, OR DEFINED DECK AREA OF A VESSEL INCLUDING ANY TRANSPORT VEHICLE ON BOARD THE VESSEL; AND

(c) FOR TRANSPORT BY AIRCRAFT, ANY AIRCRAFT.

(7) "DEPLETED URANIUM" MEANS URANIUM CONTAINING LESS URANIUM-235 THAN THE NATURALLY OCCURRING DISTRIBUTION OF URANIUM ISOTOPES.

(8) "DOT" MEANS UNITED STATES DEPARTMENT OF TRANSPORTATION.

(9) "ENRICHED URANIUM" MEANS URANIUM CONTAINING MORE URANIUM-235 THAN THE NATURALLY OCCURRING DISTRIBUTION OF URANIUM ISOTOPES.

(10) "EXCLUSIVE USE" MEANS THE SOLE USE BY A SINGLE CONSIGNOR OF A CONVEYANCE FOR WHICH ALL INITIAL, INTERMEDIATE, AND FINAL LOADING AND UNLOADING ARE CARRIED OUT IN ACCORDANCE WITH THE DIRECTION OF THE CONSIGNOR OR CONSIGNEE. THE CONSIGNOR AND THE CARRIER MUST ENSURE THAT ANY LOADING OR UNLOADING IS PERFORMED BY PERSONNEL HAVING RADIOLOGICAL TRAINING AND RESOURCES APPROPRIATE FOR SAFE HANDLING OF THE CONSIGNMENT. THE CONSIGNOR MUST ISSUE SPECIFIC INSTRUCTIONS, IN WRITING, FOR MAINTENANCE OF EXCLUSIVE USE SHIPMENT CONTROLS, AND INCLUDE THEM WITH THE SHIPPING PAPER INFORMATION PROVIDED TO THE CARRIER BY THE CONSIGNOR.

(11) "LOW TOXICITY ALPHA EMITTERS" MEANS NATURAL URANIUM, DEPLETED URANIUM, NATURAL THORIUM; URANIUM-235, URANIUM-238, THORIUM-232, THORIUM-228 OR THORIUM-230 WHEN CONTAINED IN ORES OR PHYSICAL OR CHEMICAL CONCENTRATES OR TAILINGS; OR ALPHA EMITTERS WITH A HALF-LIFE OF LESS THAN TEN DAYS.

(12) "MAXIMUM NORMAL OPERATING PRESSURE" MEANS THE MAXIMUM GAUGE PRESSURE THAT WOULD DEVELOP IN THE CONTAINMENT SYSTEM IN A PERIOD OF ONE YEAR UNDER THE HEAT CONDITION SPECIFIED IN 10 C.F.R. 71.71(C)(1), IN THE ABSENCE OF VENTING, EXTERNAL COOLING BY AN ANCILLARY SYSTEM, OR OPERATIONAL CONTROLS DURING TRANSPORT.

(13) "NATURAL THORIUM" MEANS THORIUM WITH THE NATURALLY OCCURRING DISTRIBUTION OF THORIUM ISOTOPES OR ONE HUNDRED WEIGHT PERCENT THORIUM-232.

(14) "NATURAL URANIUM" MEANS URANIUM WITH THE NATURALLY OCCURRING DISTRIBUTION OF URANIUM ISOTOPES (APPROXIMATELY 0.711 WEIGHT PERCENT URANIUM-235, AND THE REMAINDER BY WEIGHT ESSENTIALLY URANIUM-238).

(15) "NORMAL FORM RADIOACTIVE MATERIAL" MEANS RADIOACTIVE MATERIAL THAT HAS NOT BEEN DEMONSTRATED TO QUALIFY AS "SPECIAL FORM RADIOACTIVE MATERIAL."

(16) "OPTIMUM INTERSPERSED HYDROGENOUS MODERATION" MEANS THE PRESENCE OF HYDROGENOUS MATERIAL BETWEEN PACKAGES TO SUCH AN EXTENT THAT THE MAXIMUM NUCLEAR REACTIVITY RESULTS.

(17) "REGULATIONS OF THE U. S. DEPARTMENT OF TRANSPORTATION" MEANS THE REGULATIONS IN 49 CFR PARTS 100-189.

(18) "SPECIAL FORM RADIOACTIVE MATERIAL" MEANS RADIOACTIVE MATERIAL THAT

SATISFIES THE FOLLOWING CONDITIONS:

(a) IT IS EITHER A SINGLE SOLID PIECE OR IS CONTAINED IN A SEALED CAPSULE THAT CAN BE OPENED ONLY BY DESTROYING THE CAPSULE;

(b) THE PIECE OR CAPSULE HAS AT LEAST ONE DIMENSION NOT LESS THAN FIVE MILLIMETERS (0.2 INCHES); AND

(c) IT SATISFIES THE REQUIREMENTS OF 10 C.F.R. 71.75. A SPECIAL FORM ENCAPSULATION DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF 10 C.F.R. 71.4 IN EFFECT ON JUNE 30,1983, AND CONSTRUCTED BEFORE JULY 1, 1985, AND A SPECIAL FORM ENCAPSULATION DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF 10 C.F.R. IN EFFECT ON MARCH 31, 1996, AND CONSTRUCTED BEFORE APRIL 1, 1998, MAY CONTINUE TO BE USED. ANY OTHER SPECIAL FORM ENCAPSULATION MUST MEET THE SPECIFICATIONS OF THIS DEFINITION.

(19) "SPECIFIC ACTIVITY OF A RADIONUCLIDE" MEANS THE RADIOACTIVITY OF THE RADIONUCLIDE PER UNIT MASS OF THAT NUCLIDE. THE SPECIFIC ACTIVITY OF A MATERIAL IN WHICH THE RADIONUCLIDE IS ESSENTIALLY UNIFORMLY DISTRIBUTED IS THE RADIOACTIVITY PER UNIT MASS OF THE MATERIAL.

(20) "STATE" MEANS A STATE OF THE UNITED STATES, THE DISTRICT OF COLUMBIA, THE COMMONWEALTH OF PUERTO RICO, THE VIRGIN ISLANDS, GUAM, AMERICAN SAMOA, AND THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS.

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Certified by:

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Jodi Govern, Secretary
Public Health Council

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Date

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Rule amplifies: section 3748.04
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3701:1-50-02 PURPOSE AND SCOPE.

(A) THIS CHAPTER ESTABLISHES REQUIREMENTS FOR PACKAGING, PREPARATION FOR SHIPMENT, AND TRANSPORTATION OF RADIOACTIVE MATERIAL; AND

(B) THE PACKAGING AND TRANSPORT OF RADIOACTIVE MATERIAL ARE ALSO SUBJECT TO OTHER CHAPTERS OF THE OHIO ADMINISTRATIVE CODE AND TO THE REGULATIONS OF OTHER AGENCIES (SUCH AS THE UNITED STATES DEPARTMENT OF TRANSPORTATION (DOT), THE UNITED STATES POSTAL SERVICE AND THE UNITED STATES NUCLEAR REGULATORY COMMISSION) HAVING JURISDICTION OVER MEANS OF TRANSPORT. THE REQUIREMENTS OF THIS CHAPTER ARE IN ADDITION TO, AND NOT IN SUBSTITUTION FOR, OTHER REQUIREMENTS.

(C) THIS CHAPTER APPLIES TO ANY LICENSEE AUTHORIZED BY SPECIFIC OR GENERAL LICENSE ISSUED BY THE DIRECTOR TO RECEIVE, POSSESS, USE, OR TRANSFER LICENSED MATERIAL, IF THE LICENSEE DELIVERS THAT MATERIAL TO A CARRIER FOR TRANSPORT, TRANSPORTS THE MATERIAL OUTSIDE THE SITE OF USAGE AS SPECIFIED IN THE OHIO LICENSE, OR TRANSPORTS THAT MATERIAL ON PUBLIC HIGHWAYS. NO PROVISION OF THIS CHAPTER AUTHORIZES POSSESSION OF LICENSED MATERIAL.

(D) EXEMPTIONS FROM THE REQUIREMENT FOR LICENSE IN RULE 3701:1-50-04 OF THE ADMINISTRATIVE CODE ARE SPECIFIED IN RULE 3701:1-50-06 OF THE ADMINISTRATIVE CODE. GENERAL LICENSES FOR WHICH NO PACKAGE APPROVAL IS REQUIRED ARE ISSUED IN RULES 3701:1-50-09 TO 3701:1-50-13 OF THE ADMINISTRATIVE CODE. THE GENERAL LICENSE IN RULE 3701:1-50-07 OF THE ADMINISTRATIVE CODE REQUIRES THAT AN NRC CERTIFICATE OF COMPLIANCE OR OTHER PACKAGE APPROVAL BE ISSUED FOR THE PACKAGE TO BE USED UNDER THE GENERAL LICENSE. THE TRANSPORT OF LICENSED MATERIAL OR DELIVERY OF LICENSED MATERIAL TO A CARRIER FOR TRANSPORT IS SUBJECT TO THE OPERATING CONTROLS AND PROCEDURES REQUIREMENTS OF RULES 3701:1-50-14 TO 3701:1-50-23 OF THE ADMINISTRATIVE CODE, TO THE QUALITY ASSURANCE REQUIREMENTS OF RULE 3701:1-50-24 OF THE ADMINISTRATIVE CODE OR NRC, AND TO THE GENERAL PROVISIONS OF RULES 3701:1-50-01 TO 3701:1-50-05 OF THE ADMINISTRATIVE CODE, INCLUDING DOT REGULATIONS REFERENCED IN RULE 3701:1-50-05 OF THE ADMINISTRATIVE CODE.

(E) THESE RULES APPLY TO ANY PERSON REQUIRED TO OBTAIN A CERTIFICATE OF COMPLIANCE OR AN APPROVED COMPLIANCE PLAN FROM THE UNITED STATES NUCLEAR REGULATORY COMMISSION PURSUANT TO 10 C.F.R. 76 IF THE PERSON DELIVERS RADIOACTIVE MATERIAL TO A COMMON OR CONTRACT CARRIER FOR TRANSPORT OR TRANSPORTS THE MATERIAL OUTSIDE THE CONFINES OF THE PERSON'S PLANT OR OTHER AUTHORIZED PLACE OF USE.

(F) CHAPTER 3701:1-50 OF THE ADMINISTRATIVE CODE SUPERSEDES PROVISIONS OF RULE 3701-39-021 OF THE ADMINISTRATIVE CODE RELATING TO STANDARDS AND REQUIREMENTS CONTAINED IN 10 C.F.R. 71 GOVERNING THE TRANSPORTATION OF RADIOACTIVE MATERIALS.

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Jodi Govern, Secretary
Public Health Council

Date

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3701:1-50-03 COMMUNICATIONS AND RECORDS.

(A) ALL COMMUNICATIONS REQUIRED BY THIS CHAPTER SHALL BE ADDRESSED TO THE BUREAU OF RADIATION PROTECTION AT:

OHIO DEPARTMENT OF HEALTH
246 NORTH HIGH STREET
BUREAU OF RADIATION PROTECTION/7TH FLOOR, 35 BLDG.
POST OFFICE BOX 118
COLUMBUS, OHIO 43216-0118

IF COMMUNICATIONS ARE REQUIRED TO BE SUBMITTED TO THE UNITED STATES NUCLEAR REGULATORY COMMISSION USE THE FOLLOWING ADDRESS, THE DIRECTOR, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, OR MAY BE DELIVERED IN PERSON, AT THE COMMISSION OFFICES, AT 11545 ROCKVILLE PIKE, ROCKVILLE, MARYLAND.

(B) EACH RECORD REQUIRED BY THIS CHAPTER MUST BE LEGIBLE THROUGHOUT THE RETENTION PERIOD SPECIFIED BY EACH RULE. THE RECORD MAY BE THE ORIGINAL OR A REPRODUCED COPY OR A MICROFORM PROVIDED THAT THE COPY OR MICROFORM IS AUTHENTICATED BY AUTHORIZED PERSONNEL AND THAT THE MICROFORM IS CAPABLE OF PRODUCING A CLEAR COPY THROUGHOUT THE REQUIRED RETENTION PERIOD. THE RECORD MAY ALSO BE STORED IN ELECTRONIC MEDIA WITH THE CAPABILITY FOR PRODUCING LEGIBLE, ACCURATE, AND COMPLETE RECORDS DURING THE REQUIRED RETENTION PERIOD. RECORDS SUCH AS LETTERS, DRAWINGS, SPECIFICATIONS, MUST INCLUDE ALL PERTINENT INFORMATION SUCH AS STAMPS, INITIALS, AND SIGNATURES. THE LICENSEE SHALL MAINTAIN ADEQUATE SAFEGUARDS AGAINST TAMPERING WITH AND LOSS OF RECORDS.

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3701:1-50-04 REQUIREMENT FOR LICENSE.

EXCEPT AS AUTHORIZED IN A GENERAL LICENSE OR A SPECIFIC LICENSE ISSUED BY THE DIRECTOR, OR AS EXEMPTED IN THIS CHAPTER, NO LICENSEE MAY:

(A) DELIVER LICENSED MATERIAL TO A CARRIER FOR TRANSPORT; OR

(B) TRANSPORT LICENSED MATERIAL.

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3701:1-50-05 TRANSPORTATION OF LICENSED MATERIAL.

(A) EACH LICENSEE WHO TRANSPORTS LICENSED MATERIAL OUTSIDE THE SITE OF USAGE, AS SPECIFIED IN THE U. S. NUCLEAR REGULATORY COMMISSION OR OHIO LICENSE, OR WHERE TRANSPORT IS ON PUBLIC HIGHWAYS, OR WHO DELIVERS LICENSED MATERIAL TO A CARRIER FOR TRANSPORT, SHALL COMPLY WITH THE APPLICABLE REQUIREMENTS OF THE DOT REGULATIONS IN 49 C.F.R. PARTS 170 TO 189 APPROPRIATE TO THE MODE OF TRANSPORT. THESE REGULATIONS INCLUDE:

(1) PACKAGING-49 C.F.R. PART 173: SUBPARTS A AND B AND I.

(2) MARKING AND LABELING-49 C.F.R. PART 172: SUBPART D, " 172.400 TO 172.407, " 172.436 TO 172.440, AND SUBPART E.

(3) PLACARDING-49 C.F.R. PART 172: SUBPART F, ESPECIALLY " 172.500 TO 172.519, 172.556, AND APPENDICES B AND C.

(4) ACCIDENT REPORTING-49 C.F.R. PART 171: " 171.15 AND 171.16.

(5) SHIPPING PAPERS AND EMERGENCY INFORMATION-49 C.F.R. PART 172: SUBPARTS C AND G.

(6) HAZARDOUS MATERIAL EMPLOYEE TRAINING-49 C.F.R. PART 172: SUBPART H.

(7) HAZARDOUS MATERIAL SHIPPER/CARRIER REGISTRATION-49 C.F.R. PART 107: SUBPART G.

(8) DOT REGULATIONS PERTAINING TO THE FOLLOWING MODES OF TRANSPORTATION:

(a) RAIL-49 C.F.R. PART 174: SUBPARTS A TO D AND K.

(b) AIR-49 C.F.R. PART 175.

(c) VESSEL-49 C.F.R. PART 176: SUBPARTS A TO F AND M.

(d) PUBLIC HIGHWAY-49 C.F.R. PART 177 AND PARTS 390 TO 397.

(B) IF DOT REGULATIONS ARE NOT APPLICABLE TO A SHIPMENT OF LICENSED MATERIAL, THE LICENSEE SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE DOT SPECIFIED IN PARAGRAPH (A) OF THIS RULE TO THE SAME EXTENT AS IF THE SHIPMENT OR TRANSPORTATION WERE SUBJECT TO DOT REGULATIONS. REQUIRED NOTIFICATIONS SHALL INCLUDE THE DEPARTMENT AS SPECIFIED IN 3701:1-50-03 OF THE ADMINISTRATIVE CODE.

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3701:1-50-06 EXEMPTION FOR LOW-LEVEL MATERIALS.

(A) A LICENSEE IS EXEMPT FROM ALL REQUIREMENTS OF THIS CHAPTER WITH RESPECT TO SHIPMENT OR CARRIAGE OF A PACKAGE CONTAINING RADIOACTIVE MATERIAL HAVING A SPECIFIC ACTIVITY NOT GREATER THAN SEVENTY BQ/G (0.002 μCI/G).

(B) A LICENSEE IS EXEMPT FROM ALL REQUIREMENTS OF THIS CHAPTER, OTHER THAN RULES 3701:1-50-05 AND 3701:1-50-18 OF THE ADMINISTRATIVE CODE, WITH RESPECT TO SHIPMENT OR CARRIAGE OF THE FOLLOWING PACKAGES, PROVIDED THE PACKAGES CONTAIN NO FISSILE MATERIAL, OR THE FISSILE MATERIAL EXEMPTION STANDARDS IN PARAGRAPH (C) OF THIS RULE ARE SATISFIED:

(1) A PACKAGE CONTAINING NO MORE THAN A TYPE A QUANTITY OF RADIOACTIVE MATERIAL;

(2) A PACKAGE IN WHICH THE ONLY RADIOACTIVE MATERIAL IS LOW SPECIFIC ACTIVITY (LSA) MATERIAL OR SURFACE CONTAMINATED OBJECTS (SCO), PROVIDED THE EXTERNAL RADIATION LEVEL AT THREE METERS FROM THE UNSHIELDED MATERIAL OR OBJECTS DOES NOT EXCEED TEN MSV/H (ONE REM/H); OR

(3) A PACKAGE TRANSPORTED WITHIN LOCATIONS WITHIN THE UNITED STATES WHICH CONTAINS ONLY AMERICIUM OR PLUTONIUM IN SPECIAL FORM WITH AN AGGREGATE RADIOACTIVITY NOT TO EXCEED TWENTY CURIES.

(C) FISSILE MATERIALS MEETING THE REQUIREMENTS OF ONE OF THE PARAGRAPHS IN (1) TO (4) OF THIS PARAGRAPH ARE EXEMPT FROM FISSILE MATERIAL CLASSIFICATION AND FROM THE FISSILE MATERIAL PACKAGE STANDARDS OF 10 C.F.R. 71.55 AND 10 C.F.R. 71.59, BUT ARE SUBJECT TO ALL OTHER REQUIREMENTS OF THIS CHAPTER. THESE EXEMPTIONS APPLY ONLY WHEN BERYLLIUM, GRAPHITE, OR HYDROGENOUS MATERIAL ENRICHED IN DEUTERIUM IS NOT PRESENT IN QUANTITIES EXCEEDING 0.1 PERCENT OF THE FISSILE MATERIAL MASS.

(1) FISSILE MATERIAL SUCH THAT

$$\frac{\text{GRAMS OF URANIUM - 235}}{X} + \frac{\text{GRAMS OF OTHER FISSILE MATERIAL}}{Y} \leq 1$$

FOR AN INDIVIDUAL CONSIGNMENT, WHERE X AND Y ARE THE MASS LIMITS DEFINED IN THE TABLE FOLLOWING PARAGRAPH (1)(c), PROVIDED THAT:

(a) EACH PACKAGE CONTAINS NO MORE THAN FIFTEEN GRAMS OF FISSILE MATERIAL. FOR UNPACKAGED MATERIAL THE MASS LIMIT OF FIFTEEN GRAMS APPLIES TO THE CONVEYANCE; OR

(b) THE FISSILE MATERIAL CONSISTS OF A HOMOGENEOUS HYDROGENOUS SOLUTION OR MIXTURE WHERE THE MINIMUM RATIO OF HYDROGEN ATOMS TO FISSILE RADIONUCLIDE ATOMS (H/X) IS FIVE THOUSAND TWO HUNDRED AND THE MAXIMUM CONCENTRATION OF FISSILE RADIONUCLIDES WITHIN A PACKAGE IS FIVE GRAMS PER LITER; OR

(c) THERE IS NO MORE THAN FIVE GRAMS OF FISSILE MATERIAL IN ANY TEN LITER VOLUME OF MATERIAL AND THE MATERIAL IS PACKAGED SO AS TO MAINTAIN THIS LIMIT OF FISSILE RADIONUCLIDE CONCENTRATION DURING NORMAL TRANSPORT.

THE REQUIREMENTS FOR PACKAGES CONTAINING FISSILE MATERIAL AS SPECIFIED IN PARAGRAPH (C)(1) OF THIS RULE ARE REPRESENTED AS FOLLOWS:

FISSILE MATERIAL	FISSILE MATERIAL MASS (G) MIXED WITH SUBSTANCES HAVING AN AVERAGE HYDROGEN DENSITY LESS THAN OR EQUAL TO WATER	FISSILE MATERIAL MASS (G) MIXED WITH SUBSTANCES HAVING AN AVERAGE HYDROGEN DENSITY GREATER THAN WATER
URANIUM-235 (X)	400	290
OTHER FISSILE MATERIAL	250	180

(2) URANIUM ENRICHED IN URANIUM-235 TO A MAXIMUM OF ONE PERCENT BY WEIGHT, AND WITH TOTAL PLUTONIUM AND URANIUM-233 CONTENT OF UP TO ONE PERCENT OF THE MASS OF URANIUM-235, PROVIDED THAT THE FISSILE MATERIAL IS DISTRIBUTED HOMOGENEOUSLY THROUGHOUT THE PACKAGE CONTENTS AND DOES NOT FORM A LATTICE ARRANGEMENT WITHIN THE PACKAGE.

(3) LIQUID SOLUTIONS OF URANYL NITRATE ENRICHED IN URANIUM-235 TO A MAXIMUM OF TWO PERCENT BY WEIGHT, WITH A TOTAL PLUTONIUM AND URANIUM-233 CONTENT NOT EXCEEDING 0.1 PERCENT OF THE MASS OF URANIUM-235, AND WITH A MINIMUM NITROGEN TO URANIUM ATOMIC RATIO (N/U) OF TWO.

(4) PLUTONIUM, LESS THAN ONE KILOGRAM, OF WHICH NOT MORE THAN TWENTY PERCENT BY MASS MAY CONSIST OF PLUTONIUM-239, PLUTONIUM-241, OR ANY COMBINATION OF THESE RADIONUCLIDES.

(D) A LICENSEE IS EXEMPT FROM ALL REQUIREMENTS OF THIS PART, OTHER THAN RULES 3701:1-50-05 AND 3701:1-50-18 OF THE ADMINISTRATIVE CODE, WITH RESPECT TO SHIPMENT OR CARRIAGE OF LOW-SPECIFIC-ACTIVITY (LSA) MATERIAL IN GROUP LSA-I, OR SURFACE CONTAMINATED OBJECTS (SCOS) IN GROUP SCO-I.

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RULE 3701:1-50-07 GENERAL LICENSE: NRC-APPROVED PACKAGE.

(A) A GENERAL LICENSE IS HEREBY ISSUED TO ANY OHIO RADIOACTIVE MATERIALS LICENSEE TO TRANSPORT, OR TO DELIVER TO A CARRIER FOR TRANSPORT, LICENSED MATERIAL, PROVIDED IT IS CONTAINED IN A PACKAGE FOR WHICH A LICENSE, CERTIFICATE OF COMPLIANCE, OR OTHER APPROVAL HAS BEEN ISSUED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION.

(B) THIS GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO HAS A QUALITY ASSURANCE PROGRAM APPROVED BY THE DIRECTOR WHICH MEETS THE PROVISIONS OF RULE 3701:1-50-24 OF THE ADMINISTRATIVE CODE.

(C) THIS GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO:

(1) HAS A COPY OF THE CERTIFICATE OF COMPLIANCE, OR OTHER APPROVAL OF THE PACKAGE, AND HAS THE DRAWINGS AND OTHER DOCUMENTS REFERENCED IN THE APPROVAL RELATING TO THE USE AND MAINTENANCE OF THE PACKAGING AND TO THE ACTIONS TO BE TAKEN BEFORE SHIPMENT;

(2) COMPLIES WITH THE TERMS AND CONDITIONS OF THE LICENSE, CERTIFICATE, OR OTHER APPROVAL, AS APPLICABLE, AND THE APPLICABLE REQUIREMENTS OF THIS CHAPTER; AND

(3) SUBMITS IN WRITING TO THE DIRECTOR, OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, BEFORE THE LICENSEE'S FIRST USE OF THE PACKAGE, THE LICENSEE'S NAME AND LICENSE NUMBER AND THE PACKAGE IDENTIFICATION NUMBER SPECIFIED IN THE PACKAGE APPROVAL.

(D) THIS GENERAL LICENSE APPLIES ONLY WHEN THE PACKAGE APPROVAL AUTHORIZES USE OF THE PACKAGE UNDER THIS GENERAL LICENSE.

(E) FOR A TYPE B OR FISSILE MATERIAL PACKAGE, THE DESIGN OF WHICH WAS APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION BEFORE APRIL 1, 1996, THE GENERAL LICENSE IS SUBJECT TO THE ADDITIONAL RESTRICTIONS OF RULE 3701:1-50-08 OF THE ADMINISTRATIVE CODE.

Effective date:
R.C. 119.032 review date:

Certified by:

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Jodi Govern, Secretary
Public Health Council

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Date

Rule promulgated under: Chapter 119
Rule authorized by: section 3748.02

3701:1-50-08 PREVIOUSLY APPROVED PACKAGE.

(A) A TYPE B PACKAGE PREVIOUSLY APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION BUT NOT DESIGNATED AS B(U) OR B(M) IN THE IDENTIFICATION NUMBER OF THE UNITED STATES NUCLEAR REGULATORY COMMISSION CERTIFICATE OF COMPLIANCE, MAY BE USED UNDER THE GENERAL LICENSE OF RULE 3701:1-50-07 OF THE ADMINISTRATIVE CODE WITH THE FOLLOWING ADDITIONAL CONDITIONS:

(1) FABRICATION OF THE PACKAGING WAS SATISFACTORILY COMPLETED BY AUGUST 31, 1986, AS DEMONSTRATED BY APPLICATION OF ITS MODEL NUMBER IN ACCORDANCE WITH 10 C.F.R. 71.85(C);

(2) A PACKAGE USED FOR A SHIPMENT TO A LOCATION OUTSIDE THE UNITED STATES IS SUBJECT TO MULTILATERAL APPROVAL, AS DEFINED IN DOT REGULATIONS AT 49 C.F.R. 173.403; AND

(3) A SERIAL NUMBER THAT UNIQUELY IDENTIFIES EACH PACKAGING WHICH CONFORMS TO THE APPROVED DESIGN IS ASSIGNED TO, AND LEGIBLY AND DURABLY MARKED ON, THE OUTSIDE OF EACH PACKAGING.

(B) A TYPE B(U) PACKAGE, A TYPE B(M) PACKAGE, A LOW SPECIFIC ACTIVITY (LSA) MATERIAL PACKAGE OR A FISSILE MATERIAL PACKAGE, PREVIOUSLY APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION BUT WITHOUT THE DESIGNATION "-85" IN THE IDENTIFICATION NUMBER OF THE UNITED STATES NUCLEAR REGULATORY COMMISSION CERTIFICATE OF COMPLIANCE, MAY BE USED UNDER THE GENERAL LICENSE OF RULE 3701:1-50-07 OF THE ADMINISTRATIVE CODE WITH THE FOLLOWING ADDITIONAL CONDITIONS:

(1) FABRICATION OF THE PACKAGE IS SATISFACTORILY COMPLETED BY APRIL 1, 1999 AS DEMONSTRATED BY APPLICATION OF ITS MODEL NUMBER IN ACCORDANCE WITH 10 C.F.R. 71.85(C);

(2) A PACKAGE USED FOR A SHIPMENT TO A LOCATION OUTSIDE THE UNITED STATES IS SUBJECT TO MULTILATERAL APPROVAL AS DEFINED IN DOT REGULATIONS AT 49 C.F.R. 173.403; AND

(3) A SERIAL NUMBER WHICH UNIQUELY IDENTIFIES EACH PACKAGING WHICH CONFORMS TO THE APPROVED DESIGN IS ASSIGNED TO AND LEGIBLY AND DURABLY MARKED ON THE OUTSIDE OF EACH PACKAGING.

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Jodi Govern, Secretary
Public Health Council

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3701:1-50-08
Date

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Rule amplifies: section 3748.04
Prior effective date: none

3701:1-50-09 GENERAL LICENSE: DOT SPECIFICATION CONTAINER.

(A) A GENERAL LICENSE IS ISSUED TO ANY LICENSEE TO TRANSPORT, OR TO DELIVER TO A CARRIER FOR TRANSPORT, LICENSED MATERIAL IN A SPECIFICATION CONTAINER FOR FISSILE MATERIAL OR FOR A TYPE B QUANTITY OF RADIOACTIVE MATERIAL AS SPECIFIED IN DOT REGULATIONS AT 49 CFR PARTS 173 AND 178.

(B) THIS GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO HAS A QUALITY ASSURANCE PROGRAM APPROVED BY THE DIRECTOR AS SATISFYING THE PROVISIONS OF THIS CHAPTER.

(C) THIS GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO:

(1) HAS A COPY OF THE SPECIFICATION; AND

(2) COMPLIES WITH THE TERMS AND CONDITIONS OF THE SPECIFICATION AND THE APPLICABLE REQUIREMENTS OF THIS CHAPTER.

(D) THIS GENERAL LICENSE IS SUBJECT TO THE LIMITATION THAT THE SPECIFICATION CONTAINER MAY NOT BE USED FOR A SHIPMENT TO A LOCATION OUTSIDE THE UNITED STATES, EXCEPT BY MULTILATERAL APPROVAL, AS DEFINED IN DOT REGULATIONS AT 49 CFR 173.403.

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Jodi Govern, Secretary
Public Health Council

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Rule amplifies: section 3748.02
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3701:1-50-10 GENERAL LICENSE: USE OF FOREIGN APPROVED PACKAGE.

(A) A GENERAL LICENSE IS ISSUED TO ANY LICENSEE TO TRANSPORT, OR TO DELIVER TO A CARRIER FOR TRANSPORT, LICENSED MATERIAL IN A PACKAGE THE DESIGN OF WHICH HAS BEEN APPROVED IN A FOREIGN NATIONAL COMPETENT AUTHORITY CERTIFICATE THAT HAS BEEN REVALIDATED BY DOT AS MEETING THE APPLICABLE REQUIREMENTS OF 49 CFR 171.12.

(B) THIS GENERAL LICENSE APPLIES ONLY TO SHIPMENTS MADE TO OR FROM LOCATIONS OUTSIDE THE UNITED STATES.

(C) THIS GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO:

(1) HAS A COPY OF THE APPLICABLE CERTIFICATE, THE REVALIDATION, AND THE DRAWINGS AND OTHER DOCUMENTS REFERENCED IN THE CERTIFICATE, RELATING TO THE USE AND MAINTENANCE OF THE PACKAGING AND TO THE ACTIONS TO BE TAKEN BEFORE SHIPMENT;

(2) COMPLIES WITH THE TERMS AND CONDITIONS OF THE CERTIFICATE AND REVALIDATION, AND WITH THE APPLICABLE REQUIREMENTS OF THIS CHAPTER; AND

(3) HAS A QUALITY ASSURANCE PROGRAM APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION.

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Certified by:

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Jodi Govern, Secretary
Public Health Council

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Date

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Rule amplifies: section 3748.04
Prior effective date: none

3701:1-50-11 GENERAL LICENSE: FISSILE MATERIAL, LIMITED QUANTITY PER PACKAGE.

(A) A GENERAL LICENSE IS ISSUED TO ANY LICENSEE TO TRANSPORT FISSILE MATERIAL, OR TO DELIVER FISSILE MATERIAL TO A CARRIER FOR TRANSPORT, WITHOUT COMPLYING WITH THE PACKAGE STANDARDS OF SUBPARTS E AND F OF 10 C.F.R. 71, PROVIDED THAT THE MATERIAL IS SHIPPED IN ACCORDANCE WITH THIS RULE.

(B) THE GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO HAS A QUALITY ASSURANCE PROGRAM APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION AS SATISFYING THE PROVISIONS OF SUBPART H OF 10 C.F.R. 71

(C) EXCEPT AS PROVIDED IN PARAGRAPH (D) OF THIS RULE, THIS GENERAL LICENSE APPLIES ONLY WHEN A PACKAGE CONTAINS NO MORE THAN A TYPE A QUANTITY OF RADIOACTIVE MATERIAL, INCLUDING ONLY ONE OF THE FOLLOWING:

(1) UP TO FORTY GRAMS OF URANIUM-235;

(2) UP TO THIRTY GRAMS OF URANIUM-233;

(3) UP TO TWENTY FIVE GRAMS OF THE FISSILE RADIONUCLIDES OF PLUTONIUM, EXCEPT THAT FOR ENCAPSULATED PLUTONIUM-BERYLLIUM NEUTRON SOURCES IN SPECIAL FORM, AN A_1 QUANTITY OF PLUTONIUM MAY BE PRESENT; OR

(4) A COMBINATION OF FISSILE RADIONUCLIDES IN WHICH THE SUM OF THE RATIOS OF THE AMOUNT OF EACH RADIONUCLIDE TO THE CORRESPONDING MAXIMUM AMOUNTS IN PARAGRAPHS (C) (1) TO (C)(3) OF THIS RULE DOES NOT EXCEED UNITY.

(D) FOR PACKAGES WHERE FISSILE MATERIAL IS MIXED WITH SUBSTANCES HAVING AN AVERAGE HYDROGEN DENSITY GREATER THAN WATER, THIS GENERAL LICENSE APPLIES ONLY WHEN A PACKAGE CONTAINS NO MORE THAN A TYPE A QUANTITY OF RADIOACTIVE MATERIAL, INCLUDING ONLY ONE OF THE FOLLOWING:

(1) UP TO TWENTY NINE GRAMS OF URANIUM-235;

(2) UP TO EIGHTEEN GRAMS OF URANIUM-233;

(3) UP TO EIGHTEEN GRAMS OF FISSILE RADIONUCLIDES OF PLUTONIUM, OR

(4) A COMBINATION OF FISSILE RADIONUCLIDES IN WHICH THE SUM OF THE RATIOS OF THE AMOUNT OF EACH RADIONUCLIDE TO THE CORRESPONDING MAXIMUM AMOUNTS IN PARAGRAPHS (D)(1) TO (D)(3) OF THIS RULE DOES NOT EXCEED UNITY.

(E) EXCEPT FOR THE BERYLLIUM CONTAINED WITHIN THE SPECIAL FORM PLUTONIUM-BERYLLIUM SOURCES AUTHORIZED IN PARAGRAPH (C) OF THIS RULE, THIS GENERAL LICENSE APPLIES ONLY WHEN BERYLLIUM, GRAPHITE, OR HYDROGENOUS MATERIAL ENRICHED IN DEUTERIUM IS NOT PRESENT IN QUANTITIES EXCEEDING 0.1 PERCENT OF THE FISSILE MATERIAL MASS.

(F) (1) EXCEPT AS SPECIFIED IN PARAGRAPH (F)(2) OF THIS RULE FOR ENCAPSULATED PLUTONIUM-BERYLLIUM SOURCES, THIS GENERAL LICENSE APPLIES ONLY WHEN, A PACKAGE IS LABELED WITH A TRANSPORT INDEX NOT LESS THAN THE NUMBER GIVEN

BY THE FOLLOWING EQUATION, WHERE THE PACKAGE CONTAINS X GRAMS OF URANIUM-235, Y GRAMS OF URANIUM-233, AND Z GRAMS OF THE FISSILE RADIONUCLIDES OF PLUTONIUM:

MINIMUM TRANSPORT INDEX = (0.25X + 0.33Y + 0.4Z).

(2) FOR A PACKAGE IN WHICH THE ONLY FISSILE MATERIAL IS IN THE FORM OF ENCAPSULATED PLUTONIUM-BERYLLIUM NEUTRON SOURCES IN SPECIAL FORM, THE TRANSPORT INDEX BASED ON CRITICALITY CONSIDERATIONS MAY BE TAKEN AS 0.025 TIMES THE NUMBER OF GRAMS OF THE FISSILE RADIONUCLIDES OF PLUTONIUM.

(3) PACKAGES WHICH HAVE A TRANSPORT INDEX GREATER THAN TEN ARE NOT AUTHORIZED UNDER THE GENERAL LICENSE PROVISIONS OF THIS CHAPTER.

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3701:1-50-12 GENERAL LICENSE: FISSILE MATERIAL, LIMITED MODERATOR PER PACKAGE.

(A) A GENERAL LICENSE IS ISSUED TO ANY LICENSEE TO TRANSPORT FISSILE MATERIAL, OR TO DELIVER FISSILE MATERIAL TO A CARRIER FOR TRANSPORT, WITHOUT COMPLYING WITH THE PACKAGE STANDARDS OF SUBPARTS E AND F OF 10 C.F.R. 71 IF THE MATERIAL IS SHIPPED IN ACCORDANCE WITH THIS RULE.

(B) THE GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO HAS A QUALITY ASSURANCE PROGRAM APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION AS SATISFYING THE PROVISIONS OF SUBPART H OF 10 C.F.R. 71.

(C) THIS GENERAL LICENSE APPLIES AS FOLLOWS:

(1) THE PACKAGE CONTAINS NO MORE THAN A TYPE A QUANTITY OF RADIOACTIVE MATERIAL;

(2) NEITHER BERYLLIUM NOR HYDROGENOUS MATERIAL ENRICHED IN DEUTERIUM IS PRESENT;

(3) THE TOTAL MASS OF GRAPHITE PRESENT DOES NOT EXCEED 7.7 TIMES THE TOTAL MASS OF URANIUM-235 PLUS PLUTONIUM;

(4) SUBSTANCES HAVING A HIGHER HYDROGEN DENSITY THAN WATER (SUCH AS CERTAIN HYDROCARBON OILS), ARE NOT PRESENT, EXCEPT THAT POLYETHYLENE MAY BE USED FOR PACKING OR WRAPPING;

(5) URANIUM-233 IS NOT PRESENT, AND THE AMOUNT OF PLUTONIUM DOES NOT EXCEED ONE PERCENT OF THE AMOUNT OF URANIUM-235;

(6) THE AMOUNT OF URANIUM-235 IS LIMITED AS FOLLOWS:

(a) IF THE FISSILE RADIONUCLIDES ARE NOT UNIFORMLY DISTRIBUTED, THE MAXIMUM AMOUNT OF URANIUM-235 PER PACKAGE MAY NOT EXCEED THE VALUE GIVEN IN APPENDIX A TO THIS RULE; OR

(b) IF THE FISSILE RADIONUCLIDES ARE DISTRIBUTED UNIFORMLY (I.E., CANNOT FORM A LATTICE ARRANGEMENT WITHIN THE PACKAGING), THE MAXIMUM AMOUNT OF URANIUM-235 PER PACKAGE MAY NOT EXCEED THE VALUE GIVEN IN APPENDIX B TO THIS RULE; AND

(7) THE TRANSPORT INDEX OF EACH PACKAGE, BASED ON CRITICALITY CONSIDERATIONS, IS TAKEN AS TEN TIMES THE NUMBER OF GRAMS OF URANIUM-235 IN THE PACKAGE DIVIDED BY THE MAXIMUM ALLOWABLE NUMBER OF GRAMS PER PACKAGE IN ACCORDANCE WITH APPENDIX A OR APPENDIX B TO THIS RULE, AS APPLICABLE.

APPENDIX A

PERMISSIBLE MASS OF URANIUM-235 PER FISSILE MATERIAL PACKAGE, APPLICABLE TO PARAGRAPH (C)(6)(a) OF THIS RULE
[NONUNIFORM DISTRIBUTION]

URANIUM ENRICHMENT IN WEIGHT PERCENT OF URANIUM-235 NOT EXCEEDING	PERMISSIBLE MAXIMUM GRAMS OF URANIUM-235 PER PACKAGE
24	40
20	42
15	45
11	48
10	51
9.5	52
9	54
8.5	55
8	57
7.5	59
7	60
6.5	62
6	65
5.5	68
5	72
4.5	76
4	80
3.5	88
3	100
2.5	120
2	164
1.5	272
1.35	320
1	*680
0.92	*1,200

*PURSUANT TO THE AGREEMENT WITH THE U. S. NUCLEAR REGULATORY COMMISSION, STATE JURISDICTION EXTENDS ONLY TO 350 GRAMS OF URANIUM-235.

APPENDIX B

PERMISSIBLE MASS OF URANIUM-235 PER FISSILE MATERIAL PACKAGE, APPLICABLE TO PARAGRAPH (C)(6)(B) OF THIS RULE
[UNIFORM DISTRIBUTION]

URANIUM ENRICHMENT IN WEIGHT PERCENT OF URANIUM-235 NOT EXCEEDING	PERMISSIBLE MAXIMUM GRAMS OF URANIUM-235 PER PACKAGE
4	84

3.5	92
3	112
2.5	148
2	240
1.5	560*
1.35	800*

*PURSUANT TO THE AGREEMENT WITH THE U. S. NUCLEAR REGULATORY COMMISSION, STATE JURISDICTION EXTENDS ONLY TO 350 GRAMS OF URANIUM-235.

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3701:1-50-13 GENERAL LICENSE: FISSILE MATERIAL, LIMITED QUANTITY, CONTROLLED SHIPMENT.

(A) A GENERAL LICENSE IS ISSUED TO ANY LICENSEE TO TRANSPORT FISSILE MATERIAL, OR TO DELIVER FISSILE MATERIAL TO A CARRIER FOR TRANSPORT, WITHOUT COMPLYING WITH THE PACKAGE STANDARDS OF SUBPARTS E AND F OF 10 CFR 71, IF LIMITED MATERIAL IS SHIPPED IN ACCORDANCE WITH THIS RULE.

(B) THE GENERAL LICENSE APPLIES ONLY TO A LICENSEE WHO HAS A QUALITY ASSURANCE PROGRAM APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION AS SATISFYING THE PROVISIONS OF SUBPART H OF 10 C.F.R. 71.

(C) THIS GENERAL LICENSE APPLIES ONLY WHEN A PACKAGE CONTAINS NO MORE THAN A TYPE A QUANTITY OF RADIOACTIVE MATERIAL AND NO MORE THAN FOUR HUNDRED GRAMS TOTAL OF THE FISSILE RADIONUCLIDES OF PLUTONIUM ENCAPSULATED AS PLUTONIUM-BERYLLIUM NEUTRON SOURCES IN SPECIAL FORM.

(D) THIS GENERAL LICENSE APPLIES ONLY WHEN:

(1) THE ENCAPSULATED PLUTONIUM-BERYLLIUM NEUTRON SOURCES ARE IN SPECIAL FORM AND THE TOTAL MASS OF FISSILE RADIONUCLIDES IN THE SHIPMENT DOES NOT EXCEED TWO THOUSAND FIVE HUNDRED GRAMS, OR

(2) THE MASS OF FISSILE RADIONUCLIDES IN THE SHIPMENT IS LIMITED SUCH THAT THE

$$\frac{\text{GRAMS OF URANIUM-235}}{X} + \frac{\text{GRAMS OF OTHER FISSILE MATERIAL}}{Y} \leq 1$$

WHERE X AND Y ARE THE MASS DEFINED IN THE FOLLOWING TABLE:

PERMISSIBLE MASS LIMITS FOR SHIPMENTS OF FISSILE MATERIAL

FISSILE MATERIAL	FISSILE MATERIAL MASS (G) MIXED WITH SUBSTANCES HAVING A HYDROGEN DENSITY LESS THAN OR EQUAL TO WATER	FISSILE MATERIAL MASS (G) MIXED WITH SUBSTANCES HAVING A HYDROGEN DENSITY GREATER THAN WATER
URANIUM-235(X)	500	290
OTHER FISSILE MATERIAL (Y)	300	180

(E) EXCEPT FOR THE BERYLLIUM CONTAINED WITHIN THE SPECIAL FORM PLUTONIUM-BERYLLIUM SOURCES AUTHORIZED IN PARAGRAPHS (C) AND (D) OF THIS RULE, THIS GENERAL LICENSE APPLIES ONLY WHEN BERYLLIUM, GRAPHITE OR HYDROGENOUS MATERIAL ENRICHED IN DEUTERIUM IS NOT PRESENT IN QUANTITIES EXCEEDING 0.1 PERCENT OF THE FISSILE MATERIAL MASS.

(F) THIS GENERAL LICENSE APPLIES ONLY WHEN SHIPMENT OF THESE PACKAGES IS MADE UNDER PROCEDURES SPECIFICALLY AUTHORIZED BY DOT, IN ACCORDANCE WITH 49

C.F.R. 173 OF ITS REGULATIONS, TO PREVENT LOADING, TRANSPORT, OR STORAGE OF THESE PACKAGES WITH OTHER FISSILE MATERIAL SHIPMENTS.

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3701:1-50-14 APPLICABILITY OF OPERATING CONTROLS AND PROCEDURES.

A LICENSEE SUBJECT TO THIS CHAPTER, WHO, UNDER A GENERAL OR SPECIFIC LICENSE, TRANSPORTS LICENSED MATERIAL OR DELIVERS LICENSED MATERIAL TO A CARRIER FOR TRANSPORT, SHALL COMPLY WITH THE REQUIREMENTS OF THIS RULE AND RULE 3701:1-50-15 TO 3701:1-50-23 OF THE ADMINISTRATIVE CODE, WITH THE QUALITY ASSURANCE REQUIREMENTS OF RULE 3701:1-50-24 OF THE ADMINISTRATIVE CODE, AND WITH THE GENERAL PROVISIONS OF RULE 3701:1-50-01 TO 3701:1-50-05 OF THE ADMINISTRATIVE CODE.

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3701:1-50-15 ASSUMPTIONS AS TO UNKNOWN PROPERTIES.

WHEN THE ISOTOPIC ABUNDANCE, MASS, CONCENTRATION, DEGREE OF IRRADIATION, DEGREE OF MODERATION, OR OTHER PERTINENT PROPERTY OF FISSILE MATERIAL IN ANY PACKAGE IS NOT KNOWN, THE LICENSEE SHALL PACKAGE THE FISSILE MATERIAL AS IF THE UNKNOWN PROPERTIES HAVE CREDIBLE VALUES THAT WILL CAUSE THE MAXIMUM NEUTRON MULTIPLICATION.

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3701:1-50-16 PRELIMINARY DETERMINATIONS.

BEFORE THE FIRST USE OF ANY PACKAGING FOR THE SHIPMENT OF LICENSED MATERIAL:

(A) THE LICENSEE SHALL ASCERTAIN THAT THERE ARE NO CRACKS, PINHOLES, UNCONTROLLED VOIDS, OR OTHER DEFECTS THAT COULD SIGNIFICANTLY REDUCE THE EFFECTIVENESS OF THE PACKAGING;

(B) WHERE THE MAXIMUM NORMAL OPERATING PRESSURE WILL EXCEED THIRTY FIVE KILOPASCAL (FIVE POUNDS FORCE PER SQUARE INCH) GAUGE, THE LICENSEE SHALL TEST THE CONTAINMENT SYSTEM AT AN INTERNAL PRESSURE AT LEAST FIFTY PERCENT HIGHER THAN THE MAXIMUM NORMAL OPERATING PRESSURE, TO VERIFY THE CAPABILITY OF THAT SYSTEM TO MAINTAIN ITS STRUCTURAL INTEGRITY AT THAT PRESSURE; AND

(C) THE LICENSEE SHALL CONSPICUOUSLY AND DURABLY MARK THE PACKAGING WITH ITS MODEL NUMBER, SERIAL NUMBER, GROSS WEIGHT, AND A PACKAGE IDENTIFICATION NUMBER ASSIGNED BY THE U. S. NUCLEAR REGULATORY COMMISSION. BEFORE APPLYING THE MODEL NUMBER, THE LICENSEE SHALL DETERMINE THAT THE PACKAGING HAS BEEN FABRICATED IN ACCORDANCE WITH THE DESIGN APPROVED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION.

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3701:1-50-17 ROUTINE DETERMINATIONS.

BEFORE EACH SHIPMENT OF LICENSED MATERIAL, THE LICENSEE SHALL ENSURE THAT THE PACKAGE WITH ITS CONTENTS SATISFIES THE APPLICABLE REQUIREMENTS OF THIS CHAPTER AND OF THE LICENSE. THE LICENSEE SHALL COMPLY WITH THE FOLLOWING:

(A) THE PACKAGE IS PROPER FOR THE CONTENTS TO BE SHIPPED;

(B) THE PACKAGE IS IN UNIMPAIRED PHYSICAL CONDITION EXCEPT FOR SUPERFICIAL DEFECTS SUCH AS MARKS OR DENTS;

(C) EACH CLOSURE DEVICE OF THE PACKAGING, INCLUDING ANY REQUIRED GASKET, IS PROPERLY INSTALLED AND SECURED AND FREE OF DEFECTS;

(D) ANY SYSTEM FOR CONTAINING LIQUID IS ADEQUATELY SEALED AND HAS ADEQUATE SPACE OR OTHER SPECIFIED PROVISION FOR EXPANSION OF THE LIQUID;

(E) ANY PRESSURE RELIEF DEVICE IS OPERABLE AND SET IN ACCORDANCE WITH WRITTEN PROCEDURES;

(F) THE PACKAGE HAS BEEN LOADED AND CLOSED IN ACCORDANCE WITH WRITTEN PROCEDURES;

(G) FOR FISSILE MATERIAL, ANY MODERATOR OR NEUTRON ABSORBER, IF REQUIRED, IS PRESENT AND IN PROPER CONDITION;

(H) ANY STRUCTURAL PART OF THE PACKAGE THAT COULD BE USED TO LIFT OR TIE DOWN THE PACKAGE DURING TRANSPORT IS RENDERED INOPERABLE FOR THAT PURPOSE, UNLESS IT SATISFIES THE DESIGN REQUIREMENTS BELOW:

(1) ANY LIFTING ATTACHMENT THAT IS A STRUCTURAL PART OF A PACKAGE MUST BE DESIGNED WITH A MINIMUM SAFETY FACTOR OF THREE AGAINST YIELDING WHEN USED TO LIFT THE PACKAGE IN THE INTENDED MANNER, AND IT MUST BE DESIGNED SO THAT FAILURE OF ANY LIFTING DEVICE UNDER EXCESSIVE LOAD WOULD NOT IMPAIR THE ABILITY OF THE PACKAGE TO MEET OTHER PACKAGE APPROVAL REQUIREMENTS IN 10 C.F.R. 71, SUBPART E. ANY OTHER STRUCTURAL PART OF THE PACKAGE THAT COULD BE USED TO LIFT THE PACKAGE MUST BE CAPABLE OF BEING RENDERED INOPERABLE FOR LIFTING THE PACKAGE DURING TRANSPORT, OR MUST BE DESIGNED WITH STRENGTH EQUIVALENT TO THAT REQUIRED FOR LIFTING ATTACHMENTS.

(2) TIE-DOWN DEVICES SHALL COMPLY WITH THE FOLLOWING:

(a) IF THERE IS A SYSTEM OF TIE-DOWN DEVICES THAT IS A STRUCTURAL PART OF THE 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 COMPONENT OF TWO TIMES THE WEIGHT OF THE PACKAGE WITH ITS CONTENTS, A HORIZONTAL COMPONENT ALONG THE DIRECTION IN WHICH THE VEHICLE TRAVELS OF TEN TIMES THE WEIGHT OF THE PACKAGE WITH ITS CONTENTS, AND A HORIZONTAL COMPONENT IN THE TRANSVERSE DIRECTION OF FIVE TIMES THE WEIGHT OF THE PACKAGE WITH ITS CONTENTS.

(b) 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 PACKAGE DURING TRANSPORT, OR MUST BE DESIGNED WITH STRENGTH EQUIVALENT TO THAT REQUIRED FOR TIE-DOWN DEVICES.

(c) 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 CHAPTER.

(I) THE LEVEL OF NON-FIXED OR REMOVABLE RADIOACTIVE CONTAMINATION ON THE EXTERNAL SURFACES OF EACH PACKAGE OFFERED FOR SHIPMENT IS AS LOW AS REASONABLY ACHIEVABLE;

(1) THE LEVEL OF NON-FIXED RADIOACTIVE CONTAMINATION MAY NOT EXCEED THE LIMITS SET FORTH IN TABLE 1

CONTAMINANT	MAXIMUM PERMISSIBLE LIMITS		
	BQ/CM^2	μCI/CM^2	DPM/CM^2
BETA AND GAMMA EMITTERS AND LOW TOXICITY ALPHA EMITTERS	0.4	10^{-5}	22
ALL OTHER ALPHA EMITTING RADIONUCLIDES	0.04	10^{-6}	2.2

(2) THE LEVEL OF NON-FIXED RADIOACTIVE CONTAMINATION SHALL BE DETERMINED BY EITHER:

(a) WIPING AN AREA OF THREE HUNDRED SQUARE CENTIMETERS OF THE SURFACE CONCERNED WITH AN ABSORBENT MATERIAL, USING MODERATE PRESSURE, AND MEASURING THE ACTIVITY ON THE WIPING MATERIAL. SUFFICIENT MEASUREMENTS MUST BE TAKEN IN THE MOST APPROPRIATE LOCATIONS TO YIELD A REPRESENTATIVE ASSESSMENT OF THE NON-FIXED CONTAMINATION LEVELS. THE AMOUNT OF RADIOACTIVITY MEASURED ON ANY SINGLE WIPING MATERIAL, WHEN AVERAGED OVER THE SURFACE WIPED, MAY NOT EXCEED THE LIMITS SET FORTH IN TABLE 1 AT ANY TIME DURING TRANSPORT; OR

(b) USING OTHER METHODS OF ASSESSMENT OF EQUAL OR GREATER EFFICIENCY, IN WHICH CASE THE EFFICIENCY OF THE METHOD USED MUST BE TAKEN INTO ACCOUNT AND THE NON-FIXED CONTAMINATION ON THE EXTERNAL SURFACES OF THE PACKAGE MAY NOT EXCEED TEN TIMES THE LIMITS SET FORTH IN PARAGRAPH (I)(1)

(3) EXCEPT AS PROVIDED IN PARAGRAPH (I)(5) OF THIS RULE, IN THE CASE OF PACKAGES TRANSPORTED AS EXCLUSIVE USE SHIPMENTS BY RAIL OR PUBLIC HIGHWAY ONLY, THE REMOVABLE OR NON-FIXED RADIOACTIVE CONTAMINATION ON ANY PACKAGE AT ANY TIME DURING TRANSPORT MAY NOT EXCEED TEN TIMES THE LEVELS PRESCRIBED IN PARAGRAPH (I)(1) OF THIS RULE. THE LEVELS AT THE BEGINNING OF TRANSPORT MAY NOT EXCEED THE LEVELS PRESCRIBED IN PARAGRAPH (I)(1) OF THIS RULE;

(4) EXCEPT AS PROVIDED IN PARAGRAPH(I)(5) OF THIS RULE, EACH TRANSPORT VEHICLE USED FOR TRANSPORTING RADIOACTIVE MATERIALS AS AN EXCLUSIVE USE SHIPMENT THAT UTILIZES THE PROVISIONS OF PARAGRAPH (I)(3) OF THIS RULE MUST BE SURVEYED WITH APPROPRIATE RADIATION DETECTION INSTRUMENTS AFTER EACH USE. A VEHICLE MAY NOT BE RETURNED TO SERVICE UNTIL THE RADIATION DOSE RATE AT EACH ACCESSIBLE SURFACE IS 0.005 MSV PER HOUR (0.5 MREM PER HOUR) OR LESS, AND THERE IS NO SIGNIFICANT REMOVABLE OR NON-FIXED RADIOACTIVE SURFACE CONTAMINATION AS SPECIFIED IN PARAGRAPH (I)(1) OF THIS RULE.

(5) PARAGRAPHS (I)(3) AND (4) OF THIS RULE DO NOT APPLY TO ANY CLOSED TRANSPORT VEHICLE USED SOLELY FOR THE TRANSPORTATION BY HIGHWAY OR RAIL OF RADIOACTIVE MATERIAL PACKAGES WITH CONTAMINATION LEVELS THAT DO NOT EXCEED TEN TIMES THE LEVELS PRESCRIBED IN (I)(1) OF THIS RULE IF:

(a) A SURVEY OF THE INTERIOR SURFACES OF THE EMPTY VEHICLE SHOWS THAT THE RADIATION DOSE RATE AT ANY POINT DOES NOT EXCEED 0.1 MSV PER HOUR (TEN MREM PER HOUR) AT THE SURFACE OR 0.02 MSV PER HOUR (TWO MREM PER HOUR) AT ONE METER (3.3 FEET) FROM THE SURFACE;

(b) EACH VEHICLE IS STENCILED WITH THE WORDS "FOR RADIOACTIVE MATERIALS USE ONLY" IN LETTERS AT LEAST SEVENTY SIX MILLIMETERS (THREE INCHES) HIGH IN A CONSPICUOUS PLACE ON BOTH SIDES OF THE EXTERIOR OF THE VEHICLE; AND

(c) EACH VEHICLE IS KEPT CLOSED EXCEPT FOR LOADING OR UNLOADING.

(J) EXTERNAL RADIATION LEVELS AROUND THE PACKAGE, AND AROUND THE VEHICLE IF APPLICABLE, WILL NOT EXCEED THE LIMITS SPECIFIED BELOW AT ANY TIME DURING TRANSPORTATION:

(1) EACH PACKAGE OF RADIOACTIVE MATERIALS OFFERED FOR TRANSPORTATION MUST BE DESIGNED AND PREPARED FOR SHIPMENT SO THAT UNDER CONDITIONS NORMALLY INCIDENT TO TRANSPORTATION THE RADIATION LEVEL DOES NOT EXCEED TWO MSV/H (TWO HUNDRED MREM/H) AT ANY POINT ON THE EXTERNAL SURFACE OF THE PACKAGE, AND THE TRANSPORT INDEX DOES NOT EXCEED TEN;

(2) A PACKAGE THAT EXCEEDS THE RADIATION LEVEL LIMITS SPECIFIED IN PARAGRAPH (J)(1) OF THIS RULE MUST BE TRANSPORTED BY EXCLUSIVE USE SHIPMENT ONLY, AND THE RADIATION LEVELS FOR SUCH SHIPMENT MUST NOT EXCEED THE FOLLOWING DURING TRANSPORTATION:

(a) TWO MSV/H (TWO HUNDRED MREM/H) ON THE EXTERNAL SURFACE OF THE PACKAGE, UNLESS THE FOLLOWING CONDITIONS ARE MET, IN WHICH CASE THE LIMIT IS TEN MSV/H (ONE THOUSAND 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 UNLOADING OPERATIONS BETWEEN THE BEGINNING AND END OF THE TRANSPORTATION;

(b) TWO MSV/H (TWO HUNDRED MREM/H) AT ANY POINT ON THE OUTER SURFACE OF THE VEHICLE, INCLUDING THE TOP AND UNDERSIDE OF THE VEHICLE; 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 VEHICLE; AND

(c) 0.1 MSV/H (TEN MREM/H) AT ANY POINT TWO METERS (EIGHTY INCHES) 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 TWO METERS (6.6 FEET) FROM THE VERTICAL PLANES PROJECTED BY THE OUTER EDGES OF THE VEHICLE (EXCLUDING THE TOP AND UNDERSIDE OF THE VEHICLE); AND

(d) 0.02 MSV/H (TWO MREM/H) IN ANY NORMALLY OCCUPIED SPACE, EXCEPT THAT THIS PROVISION DOES NOT APPLY TO PRIVATE CARRIERS, IF EXPOSED PERSONNEL UNDER THEIR CONTROL WEAR RADIATION DOSIMETRY DEVICES IN CONFORMANCE WITH RULE 3701:1-38-14 OF THE ADMINISTRATIVE CODE.

(3) FOR SHIPMENTS MADE UNDER THE PROVISIONS OF PARAGRAPH (J)(2) OF THIS RULE, THE SHIPPER SHALL PROVIDE SPECIFIC WRITTEN INSTRUCTIONS TO THE CARRIER FOR MAINTENANCE OF THE EXCLUSIVE USE SHIPMENT CONTROLS. THE INSTRUCTIONS MUST BE INCLUDED WITH THE SHIPPING PAPER INFORMATION.

(4) 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 RADIATION LEVELS OR RADIATION EXPOSURES TO TRANSPORT WORKERS OR MEMBERS OF THE GENERAL PUBLIC; AND

(K) ACCESSIBLE PACKAGE SURFACE TEMPERATURES WILL NOT EXCEED, IN STILL AIR AT THIRTY EIGHT DEGREES CENTIGRADE (ONE HUNDRED DEGREES FAHRENHEIT) AND IN THE SHADE, AT ANY TIME DURING TRANSPORTATION:

(1) FIFTY DEGREES CENTIGRADE (ONE HUNDRED TWENTY TWO DEGREES FAHRENHEIT) IN A NONEXCLUSIVE USE SHIPMENT, OR

(2) EIGHTY FIVE DEGREES CENTIGRADE (ONE HUNDRED EIGHTY FIVE DEGREES FAHRENHEIT) IN AN EXCLUSIVE USE SHIPMENT.

(L) A PACKAGE MAY NOT INCORPORATE A FEATURE INTENDED TO ALLOW CONTINUOUS VENTING DURING TRANSPORT.

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3701:1-50-18 AIR TRANSPORT OF PLUTONIUM.

(A) NOTWITHSTANDING THE PROVISIONS OF ANY GENERAL LICENSES AND NOTWITHSTANDING ANY EXEMPTIONS STATED DIRECTLY IN THIS CHAPTER OR INCLUDED INDIRECTLY BY CITATION OF 49 CFR CHAPTER I, AS MAY BE APPLICABLE, THE LICENSEE SHALL ASSURE THAT PLUTONIUM IN ANY FORM, WHETHER FOR IMPORT, EXPORT, OR DOMESTIC SHIPMENT, IS NOT TRANSPORTED BY AIR OR DELIVERED TO A CARRIER FOR AIR TRANSPORT UNLESS:

(1) THE PLUTONIUM IS CONTAINED IN A MEDICAL DEVICE DESIGNED FOR INDIVIDUAL HUMAN APPLICATION; OR

(2) THE PLUTONIUM IS CONTAINED IN A MATERIAL IN WHICH THE SPECIFIC ACTIVITY IS NOT GREATER THAN SEVENTY BQ/G (0.002 μCI/G) OF MATERIAL AND IN WHICH THE RADIOACTIVITY IS ESSENTIALLY UNIFORMLY DISTRIBUTED; OR

(3) THE PLUTONIUM IS SHIPPED IN A SINGLE PACKAGE CONTAINING NO MORE THAN AN A_2 QUANTITY OF PLUTONIUM IN ANY ISOTOPE OR FORM, AND IS SHIPPED IN ACCORDANCE WITH RULE 3701:1-50-05 OF THE ADMINISTRATIVE CODE; OR

(4) THE PLUTONIUM IS SHIPPED IN A PACKAGE SPECIFICALLY AUTHORIZED FOR THE SHIPMENT OF PLUTONIUM BY AIR IN THE CERTIFICATE OF COMPLIANCE FOR THAT PACKAGE ISSUED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION.

(B) THE REQUIREMENTS OF PARAGRAPH (A) OF THIS RULE ARE IN ADDITION TO THE REQUIREMENTS OF 10 C.F.R. 73.24.

(C) FOR A SHIPMENT OF PLUTONIUM BY AIR WHICH IS SUBJECT TO PARAGRAPH (A)(4) OF THIS RULE, THE LICENSEE SHALL, THROUGH SPECIAL ARRANGEMENT WITH THE CARRIER, REQUIRE COMPLIANCE WITH 49 C.F.R. 175.704, UNITED STATES DEPARTMENT OF TRANSPORTATION REGULATIONS APPLICABLE TO THE AIR TRANSPORT OF PLUTONIUM.

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3701:1-50-19 OPENING INSTRUCTIONS.

BEFORE DELIVERY OF A PACKAGE TO A CARRIER FOR TRANSPORT, THE LICENSEE SHALL ENSURE THAT ANY SPECIAL INSTRUCTIONS NEEDED TO SAFELY OPEN THE PACKAGE HAVE BEEN SENT TO, OR OTHERWISE MADE AVAILABLE TO, THE CONSIGNEE FOR THE CONSIGNEE'S USE IN ACCORDANCE WITH RULE 3701:1-38-18 OF THE ADMINISTRATIVE CODE.

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3701:1-50-20 RECORDS.

(A) EACH LICENSEE SHIPPING MATERIAL SHALL MAINTAIN, FOR A PERIOD OF THREE YEARS AFTER SHIPMENT, A RECORD OF EACH SHIPMENT OF LICENSED MATERIAL NOT EXEMPT UNDER RULE 3701:1-50-06 OF THE ADMINISTRATIVE CODE, SHOWING WHERE APPLICABLE:

(1) IDENTIFICATION OF THE PACKAGING BY MODEL NUMBER AND SERIAL NUMBER;

(2) VERIFICATION THAT THERE ARE NO SIGNIFICANT DEFECTS IN THE PACKAGING, AS SHIPPED;

(3) VOLUME AND IDENTIFICATION OF COOLANT;

(4) TYPE AND QUANTITY OF LICENSED MATERIAL IN EACH PACKAGE, AND THE TOTAL QUANTITY OF EACH SHIPMENT;

(5) FOR EACH ITEM OF IRRADIATED FISSILE MATERIAL:

(a) IDENTIFICATION BY MODEL NUMBER AND SERIAL NUMBER;

(b) IRRADIATION AND DECAY HISTORY TO THE EXTENT APPROPRIATE TO DEMONSTRATE THAT ITS NUCLEAR AND THERMAL CHARACTERISTICS COMPLY WITH LICENSE CONDITIONS; AND

(c) ANY ABNORMAL OR UNUSUAL CONDITION RELEVANT TO RADIATION SAFETY;

(6) DATE OF THE SHIPMENT;

(7) FOR FISSILE PACKAGES AND FOR TYPE B PACKAGES, ANY SPECIAL CONTROLS EXERCISED;

(8) NAME AND ADDRESS OF THE TRANSFEREE;

(9) ADDRESS TO WHICH THE SHIPMENT WAS MADE; AND

(10) RESULTS OF THE DETERMINATIONS REQUIRED BY RULE 3701:1-50-17 OF THE ADMINISTRATIVE CODE AND BY THE CONDITIONS OF THE PACKAGE APPROVAL.

(B) THE LICENSEE SHALL MAKE AVAILABLE TO THE DEPARTMENT FOR INSPECTION, UPON REASONABLE NOTICE, ALL RECORDS REQUIRED BY THIS CHAPTER. RECORDS ARE ONLY VALID IF STAMPED, INITIALED, OR SIGNED AND DATED BY AUTHORIZED PERSONNEL OR OTHERWISE AUTHENTICATED.

(C) THE LICENSEE SHALL MAINTAIN SUFFICIENT WRITTEN RECORDS TO FURNISH EVIDENCE OF THE QUALITY OF PACKAGING. THE RECORDS TO BE MAINTAINED INCLUDE RESULTS OF THE DETERMINATIONS REQUIRED BY RULE 3701:1-50-16 OF THE ADMINISTRATIVE CODE; DESIGN, FABRICATION, AND ASSEMBLY RECORDS, RESULTS OF REVIEWS, INSPECTIONS, TESTS, AND AUDITS; RESULTS OF MONITORING WORK PERFORMANCE AND MATERIALS ANALYSES; AND RESULTS OF MAINTENANCE, MODIFICATION AND REPAIR ACTIVITIES. INSPECTION, TEST, AND AUDIT RECORDS MUST IDENTIFY THE INSPECTOR OR DATA RECORDER, THE TYPE OF OBSERVATION,

THE RESULTS, THE ACCEPTABILITY AND THE ACTION TAKEN IN CONNECTION WITH ANY DEFICIENCIES NOTED. THE RECORDS MUST BE RETAINED FOR THREE YEARS AFTER THE LIFE OF THE PACKAGING TO WHICH THEY APPLY.

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3701:1-50-21 INSPECTION AND TESTS.

(A) THE LICENSEE SHALL PERMIT THE DIRECTOR, AT ALL REASONABLE TIMES, TO INSPECT THE LICENSED MATERIAL, PACKAGING, PREMISES, AND FACILITIES IN WHICH THE LICENSED MATERIAL OR PACKAGING IS USED, PROVIDED, CONSTRUCTED, FABRICATED, TESTED, STORED, OR SHIPPED.

(B) THE LICENSEE SHALL PERFORM, AND PERMIT THE DIRECTOR TO PERFORM, ANY TESTS THE DEPARTMENT DEEMS NECESSARY OR APPROPRIATE FOR THE ADMINISTRATION OF THE RULES IN THIS CHAPTER.

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3701:1-50-22 REPORTS.

THE LICENSEE SHALL REPORT TO THE DIRECTOR, WITHIN THIRTY DAYS:

(A) ANY INSTANCE IN WHICH THERE IS SIGNIFICANT REDUCTION IN THE EFFECTIVENESS OF ANY APPROVED TYPE B, OR FISSILE, PACKAGING DURING USE;

(B) DETAILS OF ANY DEFECTS WITH SAFETY SIGNIFICANCE IN TYPE B, OR FISSILE, PACKAGING AFTER FIRST USE, WITH THE MEANS EMPLOYED TO REPAIR THE DEFECTS AND PREVENT THEIR RECURRENCE; OR

(C) INSTANCES IN WHICH THE CONDITIONS OF APPROVAL IN THE CERTIFICATE OF COMPLIANCE WERE NOT OBSERVED IN MAKING A SHIPMENT.

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3701:1-50-23 ADVANCE NOTIFICATION OF SHIPMENT OF NUCLEAR WASTE.

(A) AS SPECIFIED IN PARAGRAPHS (B), (C) AND (D) OF THIS RULE, EACH LICENSEE SHALL PROVIDE ADVANCE NOTIFICATION OF THE SHIPMENT OF LICENSED MATERIAL, THROUGH, OR ACROSS THE BOUNDARY OF THE STATE, BEFORE THE TRANSPORT, OR DELIVERY TO A CARRIER, FOR TRANSPORT, OF LICENSED MATERIAL OUTSIDE THE CONFINES OF THE LICENSEE'S PLACE OF USE OR STORAGE TO:

(1) OHIO DEPARTMENT OF HEALTH
246 NORTH HIGH STREET
BUREAU OF RADIATION PROTECTION/7TH FLOOR, 35 BLDG.
POST OFFICE BOX 118
COLUMBUS, OH 43216-0118

(2) OHIO EMERGENCY MANAGEMENT AGENCY
2855 W. DUBLIN-GRANVILLE ROAD
COLUMBUS, OH 43234-2206; AND

(3) PUBLIC UTILITIES COMMISSION
180 E. BROAD STREET
COLUMBUS, OH 43266-0573
FOR ROUTING INFORMATION FOR HIGHWAY ROUTE CONTROLLED SHIPMENTS

(B) ADVANCE NOTIFICATION IS REQUIRED UNDER THIS RULE FOR SHIPMENTS OF LICENSED MATERIAL, OTHER THAN IRRADIATED REACTOR FUEL, MEETING THE FOLLOWING THREE CONDITIONS:

(1) THE LICENSED MATERIAL IS REQUIRED BY THIS PART TO BE IN TYPE B PACKAGING FOR TRANSPORTATION;

(2) THE LICENSED MATERIAL IS BEING TRANSPORTED TO OR ACROSS A STATE BOUNDARY IN ROUTE TO A DISPOSAL FACILITY OR TO A COLLECTION POINT FOR TRANSPORT TO A DISPOSAL FACILITY; AND

(3) THE QUANTITY OF LICENSED MATERIAL IN A SINGLE PACKAGE EXCEEDS THE LEAST OF THE FOLLOWING:

(a) THREE THOUSAND TIMES THE A_1 VALUE OF THE RADIONUCLIDES AS SPECIFIED IN RULE 3701:1-50-25 OF THE ADMINISTRATIVE CODE FOR SPECIAL FORM RADIOACTIVE MATERIAL;

(b) THREE THOUSAND TIMES THE A_2 VALUE OF THE RADIONUCLIDES AS SPECIFIED IN RULE 3701:1-50-25 OF THE ADMINISTRATIVE CODE FOR NORMAL FORM RADIOACTIVE MATERIAL; OR

(c) ONE THOUSAND TBQ (TWENTY SEVEN THOUSAND CI).

(C) EACH LICENSEE SHALL SUBMIT AS FOLLOWS:

(1) THE NOTIFICATION MUST BE MADE IN WRITING TO EACH APPROPRIATE OFFICE LISTED IN PARAGRAPH (A) OF THIS RULE AND TO THE ADMINISTRATOR OF THE APPROPRIATE NRC REGIONAL OFFICE LISTED IN APPENDIX A OF 10 C.F.R. 73.

(2) A NOTIFICATION DELIVERED BY MAIL MUST BE POSTMARKED AT LEAST SEVEN DAYS BEFORE THE BEGINNING OF THE SEVEN-DAY PERIOD DURING WHICH DEPARTURE OF THE SHIPMENT IS ESTIMATED TO OCCUR.

(3) A NOTIFICATION DELIVERED BY MESSENGER MUST REACH THE OFFICES LISTED IN PARAGRAPH (A) OF THIS RULE AT LEAST FOUR DAYS BEFORE THE BEGINNING OF THE SEVEN-DAY PERIOD DURING WHICH DEPARTURE OF THE SHIPMENT IS ESTIMATED TO OCCUR.

(4) THE LICENSEE SHALL RETAIN A COPY OF THE NOTIFICATION AS A RECORD FOR THREE YEARS.

(D) EACH ADVANCE NOTIFICATION OF SHIPMENT OF NUCLEAR WASTE MUST CONTAIN THE FOLLOWING INFORMATION:

(1) THE NAME, ADDRESS, AND TELEPHONE NUMBER OF THE SHIPPER, CARRIER, AND RECEIVER OF THE NUCLEAR WASTE SHIPMENT;

(2) A DESCRIPTION OF THE NUCLEAR WASTE CONTAINED IN THE SHIPMENT, AS SPECIFIED IN THE REGULATIONS OF DOT IN 49 C.F.R. 172.202 AND 49 C.F.R. 172.203(D);

(3) THE POINT OF ORIGIN OF THE SHIPMENT AND THE SEVEN-DAY PERIOD DURING WHICH DEPARTURE OF THE SHIPMENT IS ESTIMATED TO OCCUR;

(4) THE SEVEN-DAY PERIOD DURING WHICH ARRIVAL OF THE SHIPMENT AT STATE BOUNDARIES IS ESTIMATED TO OCCUR;

(5) THE DESTINATION OF THE SHIPMENT, AND THE SEVEN-DAY PERIOD DURING WHICH ARRIVAL AT THE DESTINATION OF THE SHIPMENT IS ESTIMATED TO OCCUR; AND

(6) A POINT OF CONTACT, WITH A TELEPHONE NUMBER, FOR CURRENT SHIPMENT INFORMATION.

(E) A LICENSEE WHO FINDS THAT SCHEDULE INFORMATION PREVIOUSLY FURNISHED TO AN OFFICE LISTED IN PARAGRAPH (A) OF THIS RULE WILL NOT BE MET SHALL TELEPHONE THE RESPONSIBLE INDIVIDUAL AND INFORM THAT INDIVIDUAL OF THE EXTENT OF THE DELAY BEYOND THE SCHEDULE ORIGINALLY REPORTED. THE LICENSEE SHALL MAINTAIN A RECORD OF THE NAME OF THE INDIVIDUAL CONTACTED FOR THREE YEARS.

(F) CANCELLATION NOTICE.

(1) EACH LICENSEE WHO CANCELS A NUCLEAR WASTE SHIPMENT FOR WHICH ADVANCE NOTIFICATION HAS BEEN SENT SHALL SEND A CANCELLATION NOTICE TO THE OFFICES LISTED IN PARAGRAPH (A) OF THIS RULE PREVIOUSLY NOTIFIED, AND TO THE ADMINISTRATOR OF THE APPROPRIATE NRC REGIONAL OFFICE LISTED IN APPENDIX A OF 10 C.F.R. 73 PRIOR TO THE DAY SCHEDULED AS THE SHIPMENT DATE.

(2) THE LICENSEE SHALL STATE IN THE NOTICE THAT IT IS A CANCELLATION AND

IDENTIFY THE ADVANCE NOTIFICATION THAT IS BEING CANCELED. THE LICENSEE SHALL RETAIN A COPY OF THE NOTICE AS A RECORD FOR THREE YEARS.

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3701:1-50-24 QUALITY ASSURANCE REQUIREMENTS.

(A) EACH LICENSEE SHALL ESTABLISH, MAINTAIN, AND EXECUTE A QUALITY ASSURANCE PROGRAM TO VERIFY BY PROCEDURES SUCH AS CHECKING, AUDITING, AND INSPECTION THAT DEFICIENCIES, DEVIATIONS, AND DEFECTIVE MATERIAL AND EQUIPMENT RELATING TO THE SHIPMENT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL ARE PROMPTLY IDENTIFIED AND CORRECTED. THIS QUALITY ASSURANCE PROGRAM SHALL CONTAIN THE ELEMENTS OF THE QUALITY ASSURANCE PROGRAM IN 10 C.F.R. 71.101 TO 10 C.F.R. 71.137.

(B) BEFORE THE USE OF ANY PACKAGE FOR THE SHIPMENT OF LICENSED MATERIAL, EACH LICENSEE SHALL OBTAIN DEPARTMENT APPROVAL OF ITS QUALITY ASSURANCE PROGRAM. EACH LICENSEE SHALL FILE A DESCRIPTION OF ITS QUALITY ASSURANCE PROGRAM, INCLUDING A DISCUSSION OF WHICH REQUIREMENTS ARE APPLICABLE AND HOW THEY WILL BE SATISFIED, WITH OHIO DEPARTMENT OF HEALTH BUREAU OF RADIATION PROTECTION.

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RULE 3701:1-50-25 DETERMINATION OF A_1 AND A_2 VALUES FOR RADIONUCLIDES.

(A) VALUES OF A_1 AND A_2 FOR INDIVIDUAL RADIONUCLIDES, WHICH ARE THE BASES FOR MANY ACTIVITY LIMITS ELSEWHERE IN THESE RULES ARE GIVEN IN TABLE A-1. THE CURIE (CI) VALUES SPECIFIED ARE OBTAINED BY CONVERTING FROM THE TERABECQUEREL (TBQ) FIGURE. THE CURIE VALUES ARE EXPRESSED TO THREE SIGNIFICANT FIGURES TO ASSURE THAT THE DIFFERENCE IN THE TBQ AND CI QUANTITIES IS ONE TENTH OF ONE PERCENT OR LESS. WHERE VALUES OF A_1 OR A_2 ARE UNLIMITED, IT IS FOR RADIATION CONTROL PURPOSES ONLY. FOR NUCLEAR CRITICALITY SAFETY, SOME MATERIALS ARE SUBJECT TO CONTROLS PLACED ON FISSILE MATERIAL.

(B) FOR INDIVIDUAL RADIONUCLIDES WHOSE IDENTITIES ARE KNOWN, BUT WHICH ARE NOT LISTED IN TABLE A-1, THE DETERMINATION OF THE VALUES OF A_1 AND A_2 REQUIRES DIRECTOR APPROVAL, EXCEPT THAT THE VALUES OF A_1 AND A_2 IN TABLE A-2 MAY BE USED WITHOUT OBTAINING DIRECTOR APPROVAL.

(C) IN THE CALCULATIONS OF A_1 AND A_2 FOR A RADIONUCLIDE NOT IN TABLE A-1, A SINGLE RADIOACTIVE DECAY CHAIN, IN WHICH RADIONUCLIDES ARE PRESENT IN THEIR NATURALLY OCCURRING PROPORTIONS, AND IN WHICH NO DAUGHTER NUCLIDE HAS A HALF-LIFE EITHER LONGER THAN 10 DAYS, OR LONGER THAN THAT OF THE PARENT NUCLIDE, SHALL BE CONSIDERED AS A SINGLE RADIONUCLIDE, AND THE ACTIVITY TO BE TAKEN INTO ACCOUNT, AND THE A_1 OR A_2 VALUE TO BE APPLIED SHALL BE THOSE CORRESPONDING TO THE PARENT NUCLIDE OF THAT CHAIN. IN THE CASE OF RADIOACTIVE DECAY CHAINS IN WHICH ANY DAUGHTER NUCLIDE HAS A HALF-LIFE EITHER LONGER THAN 10 DAYS, OR GREATER THAN THAT OF THE PARENT NUCLIDE, THE PARENT AND THOSE DAUGHTER NUCLIDES SHALL BE CONSIDERED AS MIXTURES OF DIFFERENT NUCLIDES.

(D) FOR MIXTURES OF RADIONUCLIDES WHOSE IDENTITIES AND RESPECTIVE ACTIVITIES ARE KNOWN, THE FOLLOWING CONDITIONS APPLY:

(1) FOR SPECIAL FORM RADIOACTIVE MATERIAL, THE MAXIMUM QUANTITY TRANSPORTED IN A TYPE A PACKAGE:

$$\sum_{I} \frac{B(i)}{A_1(i)} \text{ less than or equal to } 1$$

(2) FOR NORMAL FORM RADIOACTIVE MATERIAL, THE MAXIMUM QUANTITY TRANSPORTED IN A TYPE A PACKAGE:

$$\sum_{I} \frac{B(i)}{A_2(i)} \text{ less than or equal to } 1$$

WHERE B(i) IS THE ACTIVITY OF RADIONUCLIDE I AND $A_1(i)$ AND $A_2(i)$ ARE THE A_1 AND A_2 VALUES FOR RADIONUCLIDE I, RESPECTIVELY.

ALTERNATIVELY, AN A_1 VALUE FOR MIXTURES OF SPECIAL FORM MATERIAL MAY BE DETERMINED AS FOLLOWS:

$$A_1 \text{ for mixture} = \frac{1}{\sum_{I} \frac{f(i)}{A_1(i)}}$$

WHERE F(i) IS THE FRACTION OF ACTIVITY OF NUCLIDE I IN THE MIXTURE AND $A_1(i)$ IS THE APPROPRIATE A_1 VALUE FOR NUCLIDE I. AN A_2 VALUE FOR MIXTURES OF NORMAL FORM MATERIAL MAY BE DETERMINED AS FOLLOWS:

$$A_2 \text{ for mixture} = \frac{1}{\sum_{I} \frac{f(i)}{A_2(i)}}$$

WHERE F(i) IS THE FRACTION OF ACTIVITY OF NUCLIDE I IN THE MIXTURE AND $A_2(i)$ IS THE APPROPRIATE A_2 VALUE FOR NUCLIDE I.

(E) WHEN THE IDENTITY OF EACH RADIONUCLIDE IS KNOWN, BUT THE INDIVIDUAL ACTIVITIES OF SOME OF THE RADIONUCLIDES ARE NOT KNOWN, THE RADIONUCLIDES MAY BE GROUPED AND THE LOWEST A_1 OR A_2 VALUE, AS APPROPRIATE, FOR THE RADIONUCLIDES IN EACH GROUP MAY BE USED IN APPLYING THE FORMULAS IN PARAGRAPH IV. GROUPS MAY BE BASED ON THE TOTAL ALPHA ACTIVITY AND THE TOTAL BETA/GAMMA ACTIVITY WHEN THESE ARE KNOWN, USING THE LOWEST A_1 OR A_2 VALUES FOR THE ALPHA EMITTERS AND BETA/GAMMA EMITTERS.

TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Ac-225	Actinium (89) ...	0.6	16.2	$1x10^{-2}$	0.27	$2.1x10^{3}$	$5.8x10^{4}$
Ac-227		40	1080	$2x10^{-5}$	$5.41x10^{-4}$	2.7	$7.2x10^{1}$
Ac-228		0.6	16.2	0.4	10.8	$8.4x10^{4}$	$2.2x10^{6}$
Ag-105	Silver (47).....	2	54.1	2	54.1	$1.1x10^{3}$	$3.0x10^{4}$
Ag-108m		0.6	16.2	0.6	16.2	$9.7x10^{-1}$	$2.6x10^{1}$

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Ag-110m		0.4	10.8	0.4	10.8	1.8×10^{2}	4.7×10^{3}
Ag-111		0.6	16.2	0.5	13.5	5.8×10^{3}	1.6×10^{5}
Al-26	Aluminum (13)	0.4	10.8	0.4	10.8	7.0×10^{-4}	1.9×10^{-2}
Am-241	Americium (95)	2	54.1	2×10^{-4}	5.41×10^{-3}	1.3×10^{-1}	3.4
Am-242m		2	54.1	2×10^{-4}	5.41×10^{-3}	3.6×10^{-1}	1.0×10^{1}
Am-243		2	54.1	2×10^{-4}	5.41×10^{-3}	7.4×10^{-3}	2.0×10^{-1}
Ar-37	Argon (18)	40	1080	40	1080	3.7×10^{3}	9.9×10^{4}
Ar-39		20	541	20	541	1.3	3.4×10^{1}
Ar-41		0.6	16.2	0.6	16.2	1.5×10^{6}	4.2×10^{7}
Ar-42		0.2	5.41	0.2	5.41	9.6	2.6×10^{2}
As-72	Arsenic (33)	0.2	5.41	0.2	5.41	6.2×10^{4}	1.7×10^{6}
As-73		40	1080	40	1080	8.2×10^{2}	2.2×10^{4}
As-74		1	27	0.5	13.5	3.7×10^{3}	9.9×10^{4}
As-76		0.2	5.41	0.2	5.41	5.8×10^{4}	1.6×10^{6}
As-77		20	541	0.5	13.5	3.9×10^{4}	1.0×10^{6}
At-211	Astatine (85)	30	811	2	54.1	7.6×10^{4}	2.1×10^{6}
Au-193	Gold (79)	6	162	6	162	3.4×10^{4}	9.2×10^{5}
Au-194		1	27	1	27	1.5×10^{4}	4.1×10^{5}
Au-195		10	270	10	270	1.4×10^{2}	3.7×10^{3}
Au-196		2	54.1	2	54.1	4.0×10^{3}	1.1×10^{5}
Au-198		3	81.1	0.5	13.5	9.0×10^{3}	2.4×10^{5}
Au-199		10	270	0.9	24.3	7.7×10^{3}	2.1×10^{5}
Ba-131	Barium (56)	2	54.1	2	54.1	3.1×10^{3}	8.4×10^{4}
Ba-133m		10	270	0.9	24.3	2.2×10^{4}	6.1×10^{5}
Ba-133		3	81.1	3	81.1	9.4	2.6×10^{2}
Ba-140		0.4	10.8	0.4	10.8	2.7×10^{3}	7.3×10^{4}
Be-7	Beryllium (4)	20	541	20	541	1.3×10^{4}	3.5×10^{5}
Be-10		20	541	0.5	13.5	8.3×10^{-4}	2.2×10^{-2}
Bi-205	Bismuth (83)	0.6	16.2	0.6	16.2	1.5×10^{-3}	4.2×10^{4}
Bi-206		0.3	8.11	0.3	8.11	3.8×10^{3}	1.0×10^{5}
Bi-207		0.7	18.9	0.7	18.9	1.9	5.2×10^{1}
Bi-210m		0.3	8.11	3×10^{-2}	0.811	2.1×10^{-5}	5.7×10^{-4}
Bi-210		0.6	16.2	0.5	13.5	4.6×10^{3}	1.2×10^{5}
Bi-212		0.3	8.11	0.3	8.11	5.4×10^{5}	1.5×10^{7}
Bk-247	Berkelium (97)	2	54.1	2×10^{-4}	5.41×10^{-3}	3.8×10^{-2}	1
Bk-249		40	1080	8×10^{-2}	2.16	6.1×10^{1}	1.6×10^{3}
Br-76	Bromine (35)	0.3	8.11	0.3	8.11	9.4×10^{4}	2.5×10^{6}
Br-77		3	81.1	3	81.1	2.6×10^{4}	7.1×10^{5}
Br-82		0.4	10.8	0.4	10.8	4.0×10^{4}	1.1×10^{6}
C-11	Carbon (6)	1	27	0.5	13.5	3.1×10^{7}	8.4×10^{8}
C-14		40	1080	2	54.1	1.6×10^{-1}	4.5
Ca-41	Calcium (20)	40	1080	40	1080	3.1×10^{-3}	8.5×10^{-2}
Ca-45		40	1080	0.9	24.3	6.6×10^{2}	1.8×10^{4}
Ca-47		0.9	24.3	0.5	13.5	2.3×10^{4}	6.1×10^{5}
Cd-109	Cadmium (48)	40	1080	1	27	9.6×10^{1}	2.6×10^{3}
Cd-113m		20	541	9×10^{-2}	2.43	8.3	2.2×10^{2}
Cd-115m		0.3	8.11	0.3	8.11	9.4×10^{2}	2.5×10^{4}
Cd-115		4	108	0.5	13.5	1.9×10^{4}	5.1×10^{5}
Ce-139	Cerium (58)	6	162	6	162	2.5×10^{2}	6.8×10^{3}
Ce-141		10	270	0.5	13.5	1.1×10^{3}	2.8×10^{4}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Ce-143		0.6	16.2	0.5	13.5	2.5×10^{4}	6.6×10^{5}
Ce-144		0.2	5.41	0.2	5.41	1.2×10^{2}	3.2×10^{3}
Cf-248	Californium (98)	30	811	3×10^{-3}	8.11×10^{-2}	5.8×10^{1}	1.6×10^{3}
Cf-249		2	54.1	2×10^{-4}	5.41×10^{-3}	1.5×10^{-1}	4.1
Cf-250		5	135	5×10^{-4}	1.35×10^{-2}	4	1.1×10^{2}
Cf-251		2	54.1	2×10^{-4}	5.41×10^{-3}	5.9×10^{-2}	1.6
Cf-252		0.1	2.7	1×10^{-3}	2.70×10^{-2}	2.0×10^{1}	5.4×10^{2}
Cf-253		40	1080	6×10^{-2}	1.62	1.1×10^{3}	2.9×10^{4}
Cf-254		3×10^{-3}	8.11×10^{-2}	6×10^{-4}	1.62×10^{-2}	3.1×10^{2}	8.5×10^{3}
Cl-36	Chlorine (17)	20	541	0.5	13.5	1.2×10^{-3}	3.3×10^{-2}
Cl-38		0.2	5.41	0.2	5.41	4.9×10^{6}	1.3×10^{8}
Cm-240	Curium (96)	40	1080	2×10^{-2}	0.541	7.5×10^{2}	2.0×10^{4}
Cm-241		2	54.1	0.9	24.3	6.1×10^{2}	1.7×10^{4}
Cm-242		40	1080	1×10^{-2}	0.27	1.2×10^{2}	3.3×10^{3}
Cm-243		3	81.1	3×10^{-4}	8.11×10^{-3}	1.9	5.2×10^{1}
Cm-244		4	108	4×10^{-4}	1.08×10^{-2}	3	8.1×10^{1}
Cm-245		2	54.1	2×10^{-4}	5.41×10^{-3}	6.4×10^{-3}	1.7×10^{-1}
Cm-246		2	54.1	2×10^{-4}	5.41×10^{-3}	1.1×10^{-2}	3.1×10^{-1}
Cm-247		2	54.1	2×10^{-4}	5.41×10^{-3}	3.4×10^{-6}	9.3×10^{-5}
Cm-248		4×10^{-2}	1.08	5×10^{-5}	1.35×10^{-3}	1.6×10^{-4}	4.2×10^{-3}
Co-55	Cobalt (27)	0.5	13.5	0.5	13.5	1.1×10^{5}	3.1×10^{6}
Co-56		0.3	8.11	0.3	8.11	1.1×10^{3}	3.0×10^{4}
Co-57		8	216	8	216	3.1×10^{2}	8.4×10^{3}
Co-58m		40	1080	40	1080	2.2×10^{5}	5.9×10^{6}
Co-58		1	27	1	27	1.2×10^{3}	3.2×10^{4}
Co-60		0.4	10.8	0.4	10.8	4.2×10^{1}	1.1×10^{3}
Cr-51	Chromium (24)	30	811	30	811	3.4×10^{3}	9.2×10^{4}
Cs-129	Cesium (55)	4	108	4	108	2.8×10^{4}	7.6×10^{5}
Cs-131		40	1080	40	1080	3.8×10^{3}	1.0×10^{5}
Cs-132		1	27	1	27	5.7×10^{3}	1.5×10^{5}
Cs-134m		40	1080	9	243	3.0×10^{5}	8.0×10^{6}
Cs-134		0.6	16.2	0.5	13.5	4.8×10^{1}	1.3×10^{3}
Cs-135		40	1080	0.9	24.3	4.3×10^{-5}	1.2×10^{-3}
Cs-136		0.5	13.5	0.5	13.5	2.7×10^{3}	7.3×10^{4}
Cs-137		2	54.1	0.5	13.5	3.2	8.7×10^{1}
Cu-64	Copper (29)	5	135	0.9	24.3	1.4×10^{5}	3.9×10^{6}
Cu-67		9	243	0.9	24.3	2.8×10^{4}	7.6×10^{5}
Dy-159	Dysprosium (66)	20	541	20	541	2.1×10^{2}	5.7×10^{3}
Dy-165		0.6	16.2	0.5	13.5	3.0×10^{5}	8.2×10^{6}
Dy-166		0.3	8.11	0.3	8.11	8.6×10^{3}	2.3×10^{5}
Er-169	Erbium (68)	40	1080	0.9	24.3	3.1×10^{3}	8.3×10^{4}
Er-171		0.6	16.2	0.5	13.5	9.0×10^{4}	2.4×10^{6}
Es-253	Einsteinium (99){a}	200	5400	2×10^{-2}	5.41×10^{-1}		
Es-254		30	811	3×10^{-3}	8.11×10^{-2}		
Es-254m		0.6	16.2	0.4	10.8		
Es-255							
Eu-147	Europium (63)	2	54.1	2	54.1	1.4×10^{3}	3.7×10^{4}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Eu-148		0.5	13.5	0.5	13.5	6.0×10^{2}	1.6×10^{4}
Eu-149		20	541	20	541	3.5×10^{2}	9.4×10^{3}
Eu-150		0.7	18.9	0.7	18.9	6.1×10^{4}	1.6×10^{6}
Eu-152m.....		0.6	16.2	0.5	13.5	8.2×10^{4}	2.2×10^{6}
Eu-152		0.9	24.3	0.9	24.3	6.5	1.8×10^{2}
Eu-154		0.8	21.6	0.5	13.5	9.8	2.6×10^{2}
Eu-155		20	541	2	54.1	1.8×10^{1}	4.9×10^{2}
Eu-156		0.6	16.2	0.5	13.5	2.0×10^{3}	5.5×10^{4}
F-18	Fluorine (9)	1	27	0.5	13.5	3.5×10^{6}	9.5×10^{7}
Fe-52	Iron (26).....	0.2	5.41	0.2	5.41	2.7×10^{5}	7.3×10^{6}
Fe-55		40	1080	40	1080	8.8×10^{1}	2.4×10^{3}
Fe-59		0.8	21.6	0.8	21.6	1.8×10^{3}	5.0×10^{4}
Fe-60		40	1080	0.2	5.41	7.4×10^{-4}	2.0×10^{-2}
Fm-255	Fermium (100){b}	40	1080	0.8	21.6		
Fm-257		10	270	8×10^{-3}	2.16×10^{-1}		
Ga-67.....	Gallium (31)....	6	162	6	162	2.2×10^{4}	6.0×10^{5}
Ga-68.....		0.3	8.11	0.3	8.11	1.5×10^{6}	4.1×10^{7}
Ga-72.....		0.4	10.8	0.4	10.8	1.1×10^{5}	3.1×10^{6}
Gd-146	Gadolinium (64)	0.4	10.8	0.4	10.8	6.9×10^{2}	1.9×10^{4}
Gd-148		3	81.1	3×10^{-4}	8.11×10^{-3}	1.2	3.2×10^{1}
Gd-153		10	270	5	135	1.3×10^{2}	3.5×10^{3}
Gd-159		4	108	0.5	13.5	3.9×10^{4}	1.1×10^{6}
Ge-68.....	Germanium (32)	0.3	8.11	0.3	8.11	2.6×10^{2}	7.1×10^{3}
Ge-71.....		40	1080	40	1080	5.8×10^{3}	1.6×10^{5}
Ge-77.....		0.3	8.11	0.3	8.11	1.3×10^{5}	3.6×10^{6}
H-3	Hydrogen (1)...	See T-Tritium					
Hf-172	Hafnium (72)...	0.5	13.5	0.3	8.11	4.1×10^{1}	1.1×10^{3}
Hf-175		3	81.1	3	81.1	3.9×10^{2}	1.1×10^{4}
Hf-181		2	54.1	0.9	24.3	6.3×10^{2}	1.7×10^{4}
Hf-182		4	108	3×10^{-2}	0.811	8.1×10^{-6}	2.2×10^{-4}
Hg-194	Mercury (80) ...	1	27	1	27	1.3×10^{-1}	3.5
Hg-195m		5	135	5	135	1.5×10^{4}	4.0×10^{5}
Hg-197m		10	270	0.9	24.3	2.5×10^{4}	6.7×10^{5}
Hg-197		10	270	10	270	9.2×10^{3}	2.5×10^{5}
Hg-203		4	108	0.9	24.3	5.1×10^{2}	1.4×10^{4}
Ho-163	Holmium (67) ..	40	1080	40	1080	2.7	7.6×10^{1}
Ho-166m		0.6	16.2	0.3	8.11	6.6×10^{-2}	1.8
Ho-166		0.3	8.11	0.3	8.11	2.6×10^{4}	7.0×10^{5}
I-123.....	Iodine (53).....	6	162	6	162	7.1×10^{4}	1.9×10^{6}
I-124.....		0.9	24.3	0.9	24.3	9.3×10^{3}	2.5×10^{5}
I-125.....		20	541	2	54.1	6.4×10^{2}	1.7×10^{4}
I-126.....		2	54.1	0.9	24.3	2.9×10^{3}	8.0×10^{4}
I-129.....		Unlimited	Unlimited	Unlimited	Unlimited	6.5×10^{-6}	1.8×10^{-4}
I-131.....		3	81.1	0.5	13.5	4.6×10^{3}	1.2×10^{5}
I-132.....		0.4	10.8	0.4	10.8	3.8×10^{5}	1.0×10^{7}
I-133.....		0.6	16.2	0.5	13.5	4.2×10^{4}	1.1×10^{6}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
I-134		0.3	8.11	0.3	8.11	9.9×10^{5}	2.7×10^{7}
I-135		0.6	16.2	0.5	13.5	1.3×10^{5}	3.5×10^{6}
In-111	Indium (49)	2	54.1	2	54.1	1.5×10^{4}	4.2×10^{5}
In-113m		4	108	4	108	6.2×10^{5}	1.7×10^{7}
In-114m		0.3	8.11	0.3	8.11	8.6×10^{2}	2.3×10^{4}
In-115m		6	162	0.9	24.3	2.2×10^{5}	6.1×10^{6}
Ir-189	Iridium (77)	10	270	10	270	1.9×10^{3}	5.2×10^{4}
Ir-190		0.7	18.9	0.7	18.9	2.3×10^{3}	6.2×10^{4}
Ir-192		1	27	0.5	13.5	3.4×10^{2}	9.2×10^{3}
Ir-193m		10	270	10	270	2.4×10^{3}	6.4×10^{4}
Ir-194		0.2	5.41	0.2	5.41	3.1×10^{4}	8.4×10^{5}
K-40	Potassium (19)	0.6	16.2	0.6	16.2	2.4×10^{-7}	6.4×10^{-6}
K-42		0.2	5.41	0.2	5.41	2.2×10^{5}	6.0×10^{6}
K-43		1	27	0.5	13.5	1.2×10^{5}	3.3×10^{6}
Kr-81	Krypton (36)	40	1080	40	1080	7.8×10^{-4}	2.1×10^{-2}
Kr-85m		6	162	6	162	3.0×10^{5}	8.2×10^{6}
Kr-85		20	541	10	270	1.5×10^{1}	3.9×10^{2}
Kr-87		0.2	5.41	0.2	5.41	1.0×10^{6}	2.8×10^{7}
La-137	Lanthanum (57)	40	1080	2	54.1	1.6×10^{-3}	4.4×10^{-2}
La-140		0.4	10.8	0.4	10.8	2.1×10^{4}	5.6×10^{5}
Lu-172	Lutetium (71)	0.5	13.5	0.5	13.5	4.2×10^{3}	1.1×10^{5}
Lu-173		8	216	8	216	5.6×10^{1}	1.5×10^{3}
Lu-174m		20	541	8	216	2.0×10^{2}	5.3×10^{3}
Lu-174		8	216	4	108	2.3×10^{1}	6.2×10^{2}
Lu-177		30	811	0.9	24.3	4.1×10^{3}	1.1×10^{5}
MFP	For mixed fission products use formula for mixtures or Table A-2						
Mg-28	Magnesium (12)	0.2	5.41	0.2	5.41	2.0×10^{5}	5.4×10^{6}
Mn-52	Manganese (25)	0.3	8.11	0.3	8.11	1.6×10^{4}	4.4×10^{5}
Mn-53		Unlimited	Unlimited	Unlimited	Unlimited	6.8×10^{-5}	1.8×10^{-3}
Mn-54		1	27	1	27	2.9×10^{2}	7.7×10^{3}
Mn-56		0.2	5.41	0.2	5.41	8.0×10^{5}	2.2×10^{7}
Mo-93	Molybdenum (42)	40	1080	7	189	4.1×10^{-2}	1.1
Mo-99		0.6	16.2	0.5	13.5{c}	1.8×10^{4}	4.8×10^{5}
N-13	Nitrogen (7)	0.6	16.2	0.5	13.5	5.4×10^{7}	1.5×10^{9}
Na-22	Sodium (11)	0.5	13.5	0.5	13.5	2.3×10^{2}	6.3×10^{3}
Na-24		0.2	5.41	0.2	5.41	3.2×10^{5}	8.7×10^{6}
Nb-92m	Niobium (41)	0.7	18.9	0.7	18.9	5.2×10^{3}	1.4×10^{5}
Nb-93m		40	1080	6	162	8.8	2.4×10^{2}
Nb-94		0.6	16.2	0.6	16.2	6.9×10^{-3}	1.9×10^{-1}
Nb-95		1	27	1	27	1.5×10^{3}	3.9×10^{4}
Nb-97		0.6	16.2	0.5	13.5	9.9×10^{5}	2.7×10^{7}
Nd-147	Neodymium (60)	4	108	0.5	13.5	3.0×10^{3}	8.1×10^{4}
Nd-149		0.6	16.2	0.5	13.5	4.5×10^{5}	1.2×10^{7}
Ni-59	Nickel (28)	40	1080	40	1080	3.0×10^{-3}	8.0×10^{-2}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Ni-63		40	1080	30	811	2.1	5.7×10^{1}
Ni-65		0.3	8.11	0.3	8.11	7.1×10^{5}	1.9×10^{7}
Np-235	Neptunium (93)	40	1080	40	1080	5.2×10^{1}	1.4×10^{3}
Np-236		7	189	1×10^{-3}	2.70×10^{-2}	4.7×10^{-4}	1.3×10^{-2}
Np-237		2	54.1	2×10^{-4}	5.41×10^{-3}	2.6×10^{-5}	7.1×10^{-4}
Np-239		6	162	0.5	13.5	8.6×10^{3}	2.3×10^{5}
Os-185	Osmium (76)	1	27	1	27	2.8×10^{2}	7.5×10^{3}
Os-191m		40	1080	40	1080	4.6×10^{4}	1.3×10^{6}
Os-191		10	270	0.9	24.3	1.6×10^{3}	4.4×10^{4}
Os-193		0.6	16.2	0.5	13.5	2.0×10^{4}	5.3×10^{5}
Os-194		0.2	5.41	0.2	5.41	1.1×10^{1}	3.1×10^{2}
P-32	Phosphorus (15)	0.3	8.11	0.3	8.11	1.1×10^{4}	2.9×10^{5}
P-33		40	1080	0.9	24.3	5.8×10^{3}	1.6×10^{5}
Pa-230	Protactinium (91)	2	54.1	0.1	2.7	1.2×10^{3}	3.3×10^{4}
Pa-231		0.6	16.2	6×10^{-5}	1.62×10^{-3}	1.7×10^{-3}	4.7×10^{-2}
Pa-233		5	135	0.9	24.3	7.7×10^{2}	2.1×10^{4}
Pb-201	Lead (82)	1	27	1	27	6.2×10^{4}	1.7×10^{6}
Pb-202		40	1080	2	54.1	1.2×10^{-4}	3.4×10^{-3}
Pb-203		3	81.1	3	81.1	1.1×10^{4}	3.0×10^{5}
Pb-205		Unlimited	Unlimited	Unlimited	Unlimited	4.5×10^{-6}	1.2×10^{-4}
Pb-210		0.6	16.2	9×10^{-3}	0.243	2.8	7.6×10^{1}
Pb-212		0.3	8.11	0.3	8.11	5.1×10^{4}	1.4×10^{6}
Pd-103	Palladium (46)	40	1080	40	1080	2.8×10^{3}	7.5×10^{4}
Pd-107		Unlimited	Unlimited	Unlimited	Unlimited	1.9×10^{-5}	5.1×10^{-4}
Pd-109		0.6	16.2	0.5	13.5	7.9×10^{4}	2.1×10^{6}
Pm-143	Promethium (61)	3	81.1	3	81.1	1.3×10^{2}	3.4×10^{3}
Pm-144		0.6	16.2	0.6	16.2	9.2×10^{1}	2.5×10^{3}
Pm-145		30	811	7	189	5.2	1.4×10^{2}
Pm-147		40	1080	0.9	24.3	3.4×10^{1}	9.3×10^{2}
Pm-148m		0.5	13.5	0.5	13.5	7.9×10^{2}	2.1×10^{4}
Pm-149		0.6	16.2	0.5	13.5	1.5×10^{4}	4.0×10^{5}
Pm-151		3	81.1	0.5	13.5	2.7×10^{4}	7.3×10^{5}
Po-208	Polonium (84)	40	1080	2×10^{-2}	0.541	2.2×10^{1}	5.9×10^{2}
Po-209		40	1080	2×10^{-2}	0.541	6.2×10^{-1}	1.7×10^{1}
Po-210		40	1080	2×10^{-2}	0.541	1.7×10^{2}	4.5×10^{3}
Pr-142	Praseodymium (59)	0.2	5.41	0.2	5.41	4.3×10^{4}	1.2×10^{6}
Pr-143		4	108	0.5	13.5	2.5×10^{3}	6.7×10^{4}
Pt-188	Platinum (78)	0.6	16.2	0.6	16.2	2.5×10^{3}	6.8×10^{4}
Pt-191		3	81.1	3	81.1	8.7×10^{3}	2.4×10^{5}
Pt-193m		40	1080	9	243	5.8×10^{3}	1.6×10^{5}
Pt-193		40	1080	40	1080	1.4	3.7×10^{1}
Pt-195m		10	270	2	54.1	6.2×10^{3}	1.7×10^{5}
Pt-197m		10	270	0.9	24.3	3.7×10^{5}	1.0×10^{7}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Pt-197		20	541	0.5	13.5	3.2×10^{4}	8.7×10^{5}
Pu-236	Plutonium (94)	7	189	7×10^{-4}	1.89×10^{-2}	2.0×10^{1}	5.3×10^{2}
Pu-237		20	541	20	541	4.5×10^{2}	1.2×10^{4}
Pu-238		2	54.1	2×10^{-4}	5.41×10^{-3}	6.3×10^{-1}	1.7×10^{1}
Pu-239		2	54.1	2×10^{-4}	5.41×10^{-3}	2.3×10^{-3}	6.2×10^{-2}
Pu-240		2	54.1	2×10^{-4}	5.41×10^{-3}	8.4×10^{-3}	2.3×10^{-1}
Pu-241		40	1080	1×10^{-2}	0.27	3.8	1.0×10^{2}
Pu-242		2	54.1	2×10^{-4}	5.41×10^{-3}	1.5×10^{-4}	3.9×10^{-3}
Pu-244		0.3	8.11	2×10^{-4}	5.41×10^{-3}	6.7×10^{-7}	1.8×10^{-5}
Ra-223	Radium (88)	0.6	16.2	3×10^{-2}	0.811	1.9×10^{3}	5.1×10^{4}
Ra-224		0.3	8.11	6×10^{-2}	1.62	5.9×10^{3}	1.6×10^{5}
Ra-225		0.6	16.2	2×10^{-2}	0.541	1.5×10^{3}	3.9×10^{4}
Ra-226		0.3	8.11	2×10^{-2}	0.541	3.7×10^{-2}	1
Ra-228		0.6	16.2	4×10^{-2}	1.08	1.0×10^{1}	2.7×10^{2}
Rb-81	Rubidium (37)	2	54.1	0.9	24.3	3.1×10^{5}	8.4×10^{6}
Rb-83		2	54.1	2	54.1	6.8×10^{2}	1.8×10^{4}
Rb-84		1	27	0.9	24.3	1.8×10^{3}	4.7×10^{4}
Rb-86		0.3	8.11	0.3	8.11	3.0×10^{3}	8.1×10^{4}
Rb-87		Unlimited	Unlimited	Unlimited	Unlimited	3.2×10^{-9}	8.6×10^{-8}
Rb (natural)		Unlimited	Unlimited	Unlimited	Unlimited	6.7×10^{6}	1.8×10^{8}
Re-183	Rhenium (75)	5	135	5	135	3.8×10^{2}	1.0×10^{4}
Re-184m		3	81.1	3	81.1	1.6×10^{2}	4.3×10^{3}
Re-184		1	27	1	27	6.9×10^{2}	1.9×10^{4}
Re-186		4	108	0.5	13.5	6.9×10^{3}	1.9×10^{5}
Re-187		Unlimited	Unlimited	Unlimited	Unlimited	1.4×10^{-9}	3.8×10^{-8}
Re-188		0.2	5.41	0.2	5.41	3.6×10^{4}	9.8×10^{5}
Re-189		4	108	0.5	13.5	2.5×10^{4}	6.8×10^{5}
Re (natural)		Unlimited	Unlimited	Unlimited	Unlimited		2.4×10^{-8}
Rh-99	Rhodium (45)	2	54.1	2	54.1	3.0×10^{3}	8.2×10^{4}
Rh-101		4	108	4	108	4.1×10^{1}	1.1×10^{3}
Rh-102m		2	54.1	0.9	24.3	2.3×10^{2}	6.2×10^{3}
Rh-102		0.5	13.5	0.5	13.5	4.5×10^{1}	1.2×10^{3}
Rh-103m		40	1080	40	1080	1.2×10^{6}	3.3×10^{7}
Rh-105		10	270	0.9	24.3	3.1×10^{4}	8.4×10^{5}
Rn-222	Radon (86)	0.2	5.41	4×10^{-3}	0.108	5.7×10^{3}	1.5×10^{5}
Ru-97	Ruthenium (44)	4	108	4	108	1.7×10^{4}	4.6×10^{5}
Ru-103		2	54.1	0.9	24.3	1.2×10^{3}	3.2×10^{4}
Ru-105		0.6	16.2	0.5	13.5	2.5×10^{5}	6.7×10^{6}
Ru-106		0.2	5.41	0.2	5.41	1.2×10^{2}	3.3×10^{3}
S-35	Sulfur (16)	40	1080	2	54.1	1.6×10^{3}	4.3×10^{4}
Sb-122	Antimony (51)	0.3	8.11	0.3	8.11	1.5×10^{4}	4.0×10^{5}
Sb-124		0.6	16.2	0.5	13.5	6.5×10^{2}	1.7×10^{4}
Sb-125		2	54.1	0.9	24.3	3.9×10^{1}	1.0×10^{3}
Sb-126		0.4	10.8	0.4	10.8	3.1×10^{3}	8.4×10^{4}
Sc-44	Scandium (21)	0.5	13.5	0.5	13.5	6.7×10^{5}	1.8×10^{7}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Sc-46		0.5	13.5	0.5	13.5	1.3×10^{3}	3.4×10^{4}
Sc-47		9	243	0.9	24.3	3.1×10^{4}	8.3×10^{5}
Sc-48		0.3	8.11	0.3	8.11	5.5×10^{4}	1.5×10^{6}
Se-75	Selenium (34)	3	81.1	3	81.1	5.4×10^{2}	1.5×10^{4}
Se-79		40	1080	2	54.1	2.6×10^{-3}	7.0×10^{-2}
Si-31	Silicon (14)	0.6	16.2	0.5	13.5	1.4×10^{6}	3.9×10^{7}
Si-32		40	1080	0.2	5.41	3.9	1.1×10^{2}
Sm-145	Samarium (62)	20	541	20	541	9.8×10^{1}	2.6×10^{3}
Sm-147		Unlimited	Unlimited	Unlimited	Unlimited	8.5×10^{-1}	2.3×10^{-8}
Sm-151		40	1080	4	108	9.7×10^{-1}	2.6×10^{1}
Sm-153		4	108	0.5	13.5	1.6×10^{4}	4.4×10^{5}
Sn-113	Tin (50)	4	108	4	108	3.7×10^{2}	1.0×10^{4}
Sn-117m		6	162	2	54.1	3.0×10^{3}	8.2×10^{4}
Sn-119m		40	1080	40	1080	1.4×10^{2}	3.7×10^{3}
Sn-121m		40	1080	0.9	24.3	2	5.4×10^{1}
Sn-123		0.6	16.2	0.5	13.5	3.0×10^{2}	8.2×10^{3}
Sn-125		0.2	5.41	0.2	5.41	4.0×10^{3}	1.1×10^{5}
Sn-126		0.3	8.11	0.3	8.11	1.0×10^{-3}	2.8×10^{-2}
Sr-82	Strontium (38)	0.2	5.41	0.2	5.41	2.3×10^{3}	6.2×10^{4}
Sr-85m		5	135	5	135	1.2×10^{6}	3.3×10^{7}
Sr-85		2	54.1	2	54.1	8.8×10^{2}	2.4×10^{4}
Sr-87m		3	81.1	3	81.1	4.8×10^{5}	1.3×10^{7}
Sr-89		0.6	16.2	0.5	13.5	1.1×10^{3}	2.9×10^{4}
Sr-90		0.2	5.41	0.1	2.7	5.1	1.4×10^{2}
Sr-91		0.3	8.11	0.3	8.11	1.3×10^{5}	3.6×10^{6}
Sr-92		0.8	21.6	0.5	13.5	4.7×10^{5}	1.3×10^{7}
T	Tritium (1)	40	1080	40	1080	3.6×10^{2}	9.7×10^{3}
Ta-178	Tantalum (73)	1	27	1	27	4.2×10^{6}	1.1×10^{8}
Ta-179		30	811	30	811	4.1×10^{1}	1.1×10^{3}
Ta-182		0.8	21.6	0.5	13.5	2.3×10^{2}	6.2×10^{3}
Tb-157	Terbium (65)	40	1080	10	270	5.6×10^{-1}	1.5×10^{1}
Tb-158		1	27	0.7	18.9	5.6×10^{-1}	1.5×10^{1}
Tb-160		0.9	24.3	0.5	13.5	4.2×10^{2}	1.1×10^{4}
Tc-95m	Technetium (43)	2	54.1	2	54.1	8.3×10^{2}	2.2×10^{4}
Tc-96m		0.4	10.8	0.4	10.8	1.4×10^{6}	3.8×10^{7}
Tc-96		0.4	10.8	0.4	10.8	1.2×10^{4}	3.2×10^{5}
Tc-97m		40	1080	40	1080	5.6×10^{2}	1.5×10^{4}
Tc-97		Unlimited	Unlimited	Unlimited	Unlimited	5.2×10^{-5}	1.4×10^{-3}
Tc-98		0.7	18.9	0.7	18.9	3.2×10^{-5}	8.7×10^{-4}
Tc-99m		8	216	8	216	1.9×10^{5}	5.3×10^{6}
Tc-99		40	1080	0.9	24.3	6.3×10^{-4}	1.7×10^{-2}
Te-118	Tellurium (52)	0.2	5.41	0.2	5.41	6.8×10^{3}	1.8×10^{5}
Te-121m		5	135	5	135	2.6×10^{2}	7.0×10^{3}
Te-121		2	54.1	2	54.1	2.4×10^{3}	6.4×10^{4}
Te-123m		7	189	7	189	3.3×10^{2}	8.9×10^{3}
Te-125m		30	811	9	243	6.7×10^{2}	1.8×10^{4}
Te-127m		20	541	0.5	13.5	3.5×10^{2}	9.4×10^{3}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Te-127		20	541	0.5	13.5	9.8×10^{4}	2.6×10^{6}
Te-129m		0.6	16.2	0.5	13.5	1.1×10^{3}	3.0×10^{4}
Te-129		0.6	16.2	0.5	13.5	7.7×10^{5}	2.1×10^{7}
Te-131m		0.7	18.9	0.5	13.5	3.0×10^{4}	8.0×10^{5}
Te-132		0.4	10.8	0.4	10.8	1.1×10^{4}	3.0×10^{5}
Th-227	Thorium (90)	9	243	1×10^{-2}	0.27	1.1×10^{3}	3.1×10^{4}
Th-228		0.3	8.11	4×10^{-4}	1.08×10^{-2}	3.0×10^{1}	8.2×10^{2}
Th-229		0.3	8.11	3×10^{-5}	8.11×10^{-4}	7.9×10^{-3}	2.1×10^{-1}
Th-230		2	54.1	2×10^{-4}	5.41×10^{-3}	7.6×10^{-4}	2.1×10^{-2}
Th-231		40	1080	0.9	24.3	2.0×10^{4}	5.3×10^{5}
Th-232		Unlimited	Unlimited	Unlimited	Unlimited	4.0×10^{-9}	1.1×10^{-7}
Th-234		0.2	5.41	0.2	5.41	8.6×10^{2}	2.3×10^{4}
Th (natural)		Unlimited	Unlimited	Unlimited	Unlimited	8.1×10^{-9}	2.2×10^{-7}
Ti-44	Titanium (22)	0.5	13.5	0.2	5.41	6.4	1.7×10^{2}
Tl-200	Thallium (81.1)	0.8	21.6	0.8	21.6	2.2×10^{4}	6.0×10^{5}
Tl-201		10	270	10	270	7.9×10^{3}	2.1×10^{5}
Tl-202		2	54.1	2	54.1	2.0×10^{3}	5.3×10^{4}
Tl-204		4	108	0.5	13.5	1.7×10^{1}	4.6×10^{2}
Tm-167	Thulium (69)	7	189	7	189	3.1×10^{3}	8.5×10^{4}
Tm-168		0.8	21.6	0.8	21.6	3.1×10^{2}	8.3×10^{3}
Tm-170		4	108	0.5	13.5	2.2×10^{2}	6.0×10^{3}
Tm-171		40	1080	10	270	4.0×10^{1}	1.1×10^{3}
U-230	Uranium (92)	40	1080	1×10^{-2}	0.27	1.0×10^{3}	2.7×10^{4}
U-232		3	81.1	3×10^{-4}	8.11×10^{-3}	8.3×10^{-1}	2.2×10^{1}
U-233		10	270	1×10^{-3}	2.70×10^{-2}	3.6×10^{-4}	9.7×10^{-3}
U-234		10	270	1×10^{-3}	2.70×10^{-2}	2.3×10^{-4}	6.2×10^{-3}
U-235		Unlimited	Unlimited	Unlimited	Unlimited	8.0×10^{-8}	2.2×10^{-6}
U-236		10	270	1×10^{-3}	2.70×10^{-2}	2.4×10^{-6}	6.5×10^{-5}
U-238		Unlimited	Unlimited	Unlimited	Unlimited	1.2×10^{-8}	3.4×10^{-7}
U (natural)		Unlimited	Unlimited	Unlimited	Unlimited	2.6×10^{-8}	7.1×10^{-7}
U (enriched 5% or less)		Unlimited	Unlimited	Unlimited	Unlimited		(See Table A-3)
U (enriched more than 5%)		10	270	1×10^{-3}	2.70×10^{-2}		(See Table A-3)
U (depleted)		Unlimited	Unlimited	Unlimited	Unlimited		(See Table A-3)
V-48	Vanadium (23)	0.3	8.11	0.3	8.11	6.3×10^{3}	1.7×10^{5}
V-49		40	1080	40	1080	3.0×10^{2}	8.1×10^{3}
W-178	Tungsten (74)	1	27	1	27	1.3×10^{3}	3.4×10^{4}
W-181		30	811	30	811	2.2×10^{2}	6.0×10^{3}
W-185		40	1080	0.9	24.3	3.5×10^{2}	9.4×10^{3}
W-187		2	54.1	0.5	13.5	2.6×10^{4}	7.0×10^{5}
W-188		0.2	5.41	0.2	5.41	3.7×10^{2}	1.0×10^{4}
Xe-122	Xenon (54)	0.2	5.41	0.2	5.41	4.8×10^{4}	1.3×10^{6}
Xe-123		0.2	5.41	0.2	5.41	4.4×10^{5}	1.2×10^{7}

Symbol of Radionuclide	Element and Atomic Number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific Activity (TBq/g)	Specific Activity (Ci/g)
Xe-127		4	108	4	108	1.0×10^3	2.8×10^4
Xe-131m		40	1080	40	1080	3.1×10^3	8.4×10^4
Xe-133		20	541	20	541	6.9×10^3	1.9×10^5
Xe-135		4	108	4	108	9.5×10^4	2.6×10^6
Y-87	Yttrium (39)	2	54.1	2	54.1	1.7×10^4	4.5×10^5
Y-88		0.4	10.8	0.4	10.8	5.2×10^2	1.4×10^4
Y-90		0.2	5.41	0.2	5.41	2.0×10^4	5.4×10^5
Y-91m		2	54.1	2	54.1	1.5×10^6	4.2×10^7
Y-91		0.3	8.11	0.3	8.11	9.1×10^2	2.5×10^4
Y-92		0.2	5.41	0.2	5.41	3.6×10^5	9.6×10^6
Y-93		0.2	5.41	0.2	5.41	1.2×10^5	3.3×10^6
Yb-169	Ytterbium (70)	3	81.1	3	81.1	8.9×10^2	2.4×10^4
Yb-175		30	811	0.9	24.3	6.6×10^3	1.8×10^5
Zn-65	Zinc (30)	2	54.1	2	54.1	3.0×10^2	8.2×10^3
Zn-69m		2	54.1	0.5	13.5	1.2×10^5	3.3×10^6
Zn-69		4	108	0.5	13.5	1.8×10^6	4.9×10^7
Zr-88	Zirconium (40)	3	81.1	3	81.1	6.6×10^2	1.8×10^4
Zr-93		40	1080	0.2	5.41	9.3×10^{-5}	2.5×10^{-3}
Zr-95		1	27	0.9	24.3	7.9×10^2	2.1×10^4
Zr-97		0.3	8.11	0.3	8.11	7.1×10^4	1.9×10^6

{a} International shipments of Einsteinium require multilateral approval of A1 and A2 values.
{b} International shipments of Fermium require multilateral approval of A1 and A2 values.
{c} 20 Ci for Mo99 for domestic use.

TABLE A-2 - GENERAL VALUES FOR A_1 AND A_2

CONTENTS	A_1		A_2	
	(TBQ)	(CI)	(TBQ)	(CI)
ONLY BETA- OR GAMMA-EMITTING NUCLIDES ARE KNOWN TO BE PRESENT	0.2	5	0.02	0.5
ALPHA-EMITTING NUCLIDES ARE KNOWN TO BE PRESENT, OR NO RELEVANT DATA ARE AVAILABLE	0.10	2.70	$2X10^{-5}$	$5.41X10^{-4}$

TABLE A-3 - ACTIVITY-MASS RELATIONSHIPS FOR URANIUM

URANIUM ENRICHMENT[1] WT % U-235 PRESENT	SPECIFIC ACTIVITY	
	TBQ/G	CI/G
0.45	1.8X10.-8	5.0X10.-7
0.72	2.6X10.-8	7.1X10.-7
1.0	2.8X10.-8	7.6X10.-7
1.5	3.7X10.-8	1.0X10.-6
5.0	1.0X10.-7	2.7X10.-6
10.0	1.8X10.-7	4.8X10.-6
20.0	3.7X10.-7	1.0X10.-5
35.0	7.4X10.-7	2.0X10.-5
50.0	9.3X10.-7	2.5X10.-5
90.0	2.2X10.-6	5.8X10.-5
93.0	2.6X10.-6	7.0X10.-5
95.0	3.4X10.-6	9.1X10.-5

[1] THE FIGURES FOR URANIUM INCLUDE REPRESENTATIVE VALUES FOR THE ACTIVITY OF THE URANIUM-234 THAT IS CONCENTRATED DURING THE ENRICHMENT PROCESS.

Effective date:
R.C. 119.032 review date:

Certified by:

_____
Jodi Govern, Secretary
Public Health Council

_____
Date

Rule promulgated under: Chapter 119
Rule authorized by: section 3748.02
Rule amplifies: section 3748.04
Prior effective date: none