Revisions to Transportation Safety Requirements and Harmonization with International Atomic Energy Agency Transportation Requirements; Including Corrections
10 CFR Part 71
(80 FR 33987, Published June 12, 2015 and 80 FR 48683, Published August 14, 2015)
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Effective Date: July 13, 2015
Date Due for State Adoption: July 13, 2018

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§ 71.0(d)(1) Revised	Purpose and Scope	D	**In § 71.0, paragraph (d)(1), remove the reference ''§§ 71.20 through 71.23'' and add, in its place, the reference ''§§ 71.21 through 71.23''.**		N/A
§ 71.4 New	Definition: Contamination	[B]	**In § 71.4, add the definition of ''contamination'' to read as follows:** *Contamination* means the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm^2 (1x10^{-5} µCi/cm^2) for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm^2 (1x10^{-6} µCi/cm^2) for all other alpha emitters. (1) *Fixed contamination* means contamination that cannot be removed from a surface during normal conditions of transport. (2) *Non-fixed contamination* means contamination that can be removed from a surface during normal conditions of transport.	13-002 Definitions	Contamination means the presence of a radioactive substance on a surface in quantities in excess of 0.4 ~~Bq~~ becquerel (Bq)/cm2 (1x10-5 µCi/cm2) for beta and gamma emitters and low toxicity alpha emitters, or 0.04 ~~Bq~~ becquerel (Bq)/cm2 (1x10-6 µCi/cm2) for all other alpha emitters. (1) Fixed contamination means contamination that cannot be removed from a surface during normal conditions of transport. (2) Non-fixed contamination means contamination that can be removed from a surface during normal conditions of transport.
§ 71.4 Revised	Definition: Criticality Safety Index (CSI)	[B]	**In § 71.4, revise the definition of ''Criticality Safety Index (CSI)'' to read as follows:**	13-002 Definitions	Criticality Safety Index (CSI) means the dimensionless number (rounded up to the next tenth) assigned to and placed

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			Criticality Safety Index (CSI) means the dimensionless number (rounded up to the next tenth) assigned to and placed on the label of a fissile material package, to designate the degree of control of accumulation of packages, overpacks or freight containers containing fissile material during transportation. Determination of the criticality safety index is described in §§ 71.22, 71.23, and 71.59. The criticality safety index for an overpack, freight container, consignment or conveyance containing fissile material packages is the arithmetic sum of the criticality safety indices of all the fissile material packages contained within the overpack, freight container, consignment or conveyance.		on the label of a fissile material package, to designate the degree of control of accumulation of packages, overpacks or freight containers containing fissile material during transportation. Determination of the criticality safety index is described in 180 NAC 13-011 and 13-012, and 10 CFR 71.59. The criticality safety index for an overpack, freight container, consignment or conveyance containing fissile material packages is the arithmetic sum of the criticality safety indices of all the fissile material packages contained within the overpack, freight container, consignment or conveyance.
§ 71.4 Revised	Definition: Low Specific Activity (LSA) material	[B]	**In § 71.4, revise the definition of "Low Specific Activity (LSA) material" to read as follows:** *Low Specific Activity (LSA) material* means radioactive material with limited specific activity which is nonfissile or is excepted under § 71.15, and which satisfies the descriptions and limits set forth in the following section. Shielding materials surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents. The LSA material must be in one of three groups: (1) LSA-I.	13-002 Definitions	Low ~~s~~Specific ~~a~~Activity (LSA) Material means radioactive material with limited specific activity which is nonfissile or is excepted under 180 NAC 13-004.04, and which satisfies the descriptions and limits set forth below. Shielding materials surrounding the ~~LSA~~ Low Specific Activity (LSA) material may not be considered in determining the estimated average specific activity of the package contents. ~~LSA~~ Low Specific Activity (LSA) material must be in one of three groups: (1) ~~LSA~~ Low Specific Activity (LSA)-I:

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			(i) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radionuclides that are intended to be processed for the use of these radionuclides; (ii) Natural uranium, depleted uranium, natural thorium or their compounds or mixtures, provided they are unirradiated and in solid or liquid form; (iii) Radioactive material other than fissile material, for which the A_2 value is unlimited; or (iv) Other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the value for exempt material activity concentration determined in accordance with appendix A. (2) LSA-II. (i) Water with tritium concentration up to 0.8 TBq/liter (20.0 Ci/liter); or (ii) Other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids. (3) LSA-III. Solids (e.g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of § 71.77, in which: (i) The radioactive material is distributed throughout a solid or a		(a) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radioactive radionuclides ~~which are not intended to be processed for the use of these radionuclides~~ that are intended to be processed for the use of these radionuclides; (b) ~~Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures~~ Natural uranium, depleted uranium, natural thorium or their compounds or mixtures, provided they are unirradiated and in solid or liquid form; (c) Radioactive material other than fissile material, for which the A_2 value is unlimited; or (d) Other radioactive material in which the activity is distributed throughout and the estimated average

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			collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.); (ii) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that even under loss of packaging, the loss of radioactive material per package by leaching when placed in water for 7 days will not exceed 0.1 A_2; and (iii) The estimated average specific activity of the solid, excluding any shielding material, does not exceed 2×10^{-3} A_2/g.		specific activity does not exceed 30 times the value for exempt material activity concentration determined in accordance with Appendix 13-A. (2) ~~LSA~~ Low Specific Activity (LSA)-II: (a) Water with tritium concentration up to 0.8 ~~TBq~~ terabecquerel (TBq) /liter (20.0 ~~Ci~~ Curie (Ci)/liter); or (b) Other radioactive material in which the activity is distributed throughout, and the average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids. (3) ~~LSA~~ Low Specific Activity (LSA)-III solids (e g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of 10 CFR 71.77 in which: (a) The radioactive material is distributed throughout

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					a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.); and (b) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that, even under loss of packaging, the loss of radioactive material per package leaching, when placed in water for 7 days, would not exceed 0.1 A_2; and (c) The estimated average specific activity of the solid, excluding any shielding material, does not exceed 2 E-3 A_2/g.
§ 71.4 Revised	Definition: Special form radioactive material	[B]	**In § 71.4, revise the definition of ''Special form radioactive material'' to read as follows:** *Special form radioactive material* means radioactive material that satisfies the following conditions: (1) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule;	13-002 Definitions	Special Form Radioactive Material means radioactive material that satisfies the following conditions: (1) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule;

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			(2) The piece or capsule has at least one dimension not less than 5 mm (0.2 in); and (3) It satisfies the requirements of §71.75. A special form encapsulation designed in accordance with the requirements of § 71.4 in effect on June 30, 1983 (see 10 CFR part 71, revised as of January 1, 1983), and constructed before July 1, 1985; a special form encapsulation designed in accordance with the requirements of § 71.4 in effect on March 31, 1996 (see 10 CFR part 71, revised as of January 1, 1996), and constructed before April 1, 1998; and special form material that was successfully tested before September 10, 2015 in accordance with the requirements of § 71.75(d) of this section in effect before September 10, 2015 may continue to be used. Any other special form encapsulation must meet the specifications of this definition.		(2) The piece or capsule has at least one dimension not less than 5 mm (0.2 in); and (3) It satisfies the requirements of 10 CFR 71.75. A special form encapsulation designed in accordance with the requirements of 10 CFR 71.4 in effect on June 30, 1983 (see 10 CFR part 71, revised as of January 1, 1983), and constructed before July 1, 1985; a special form encapsulation designed in accordance with the requirements of 10 CFR 71.4 in effect on March 31, 1996 (see 10 CFR part 71, revised as of January 1, 1996), and constructed before April 1, 1998; and special form material that was successfully tested before September 10, 2015 in accordance with the requirements of 10 CFR 71.75(d) of this section in effect before September 10, 2015 may continue to be used. Any other special form encapsulation must meet the specifications of this definition.
§ 71.4 Revised	Definition: Uranium – natural,	[B]	**In § 71.4, revise the definition of ''Uranium—natural, depleted, enriched'' to read as follows:**	13-002 Definitions	Uranium - natural, depleted, enriched (1) Natural uranium means uranium (which may be

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	depleted, enriched		*Uranium – natural, depleted, enriched*. (1) Natural uranium means uranium (which may be chemically separated) with the naturally occurring distribution of uranium isotopes (approximately 0.711 weight percent uranium-235 and the remainder by weight essentially uranium-238). (2) Depleted uranium means uranium containing less uranium-235 than the naturally occurring distribution of uranium isotopes. (3) Enriched uranium means uranium containing more uranium-235 than the naturally occurring distribution of uranium isotopes.		chemically separated) with the naturally occurring distribution of uranium isotopes (approximately 0.711 weight percent uranium-235, and the remainder by weight essentially uranium-238).
§ 71.6 Revised	Information Collection Requirements: OMB Approval	D	**In § 71.6, revise paragraph (b) to read as follows:** (b) The approved information collection requirements contained in this part appear in §§ 71.5, 71.7, 71.9, 71.12, 71.17, 71.19, 71.22, 71.23, 71.31, 71.33, 71.35, 71.37, 71.38, 71.39, 71.41, 71.47, 71.85, 71.87, 71.89, 71.91, 71.93, 71.95, 71.97, 71.101, 71.103, 71.105, 71.106, 71.107, 71.109, 71.111, 71.113, 71.115, 71.117, 71.119, 71.121, 71.123, 71.125, 71.127, 71.129, 71.131, 71.133, 71.135, 71.137, and appendix A, paragraph II.	N/A	N/A
§ 71.14(a)(1) – (a)(3) Revised, New	Exemption for low-level materials	[B]	**In § 71.14, revise paragraphs (a)(1) and (2), and add paragraph (a)(3) to read as follows:**	13.004.03	13-004.03 Exemption for low-level materials: Any licensee is exempt from the requirements of 180 NAC 13 with

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			(a) * * * (1) Natural material and ores containing naturally occurring radionuclides that are either in their natural state, or have only been processed for purposes other than for the extraction of the radionuclides, and which are not intended to be processed for the use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the applicable radionuclide activity concentration values specified in appendix A, Table A-2, or Table A-3 of this part. (2) Materials for which the activity concentration is not greater than the activity concentration values specified in appendix A, Table A-2, or Table A-3 of this part, or for which the consignment activity is not greater than the limit for an exempt consignment found in appendix A, Table A-2, or Table A-3 of this part. (3) Non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the levels cited in the definition of contamination in § 71.4.		respect to shipment or carriage of the following low-level materials: 1. Natural material and ores containing naturally occurring radionuclides that are ~~not intended to be processed for use of these radionuclides,~~ either in their natural state, or have only been processed for purposes other than for the extraction of the radionuclides, and which are not intended to be processed for the use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in Appendix 13-A, Table A-2 or Table A-3. 2. Materials for which the activity concentration is not greater than the activity concentration values specified in Appendix 13-A, Table A-2 or Table A-3 or for which the consignment activity

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					is not greater than the limit for an exempt consignment found in Appendix 13-A, Table A-2 or Table A-3. 3. Non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the levels cited in the definition of contamination in 180 NAC 13-002.
§ 71.15(d) Revised	Exemption from classification as fissile material	[B]	**In § 71.15, revise paragraph (d) to read as follows:** (d) Uranium enriched in uranium-235 to a maximum of 1 percent by weight, and with total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5 percent of the uranium mass, and that the fissile material is distributed homogeneously and does not form a lattice arrangement within the package.	13.004.04, item 4	4. Uranium enriched in uranium-235 to a maximum of 1% by weight, and with total plutonium and uranium-233 content of up to 1% of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5% of the uranium mass, and that the fissile material is distributed homogeneously and does not form a lattice arrangement within the package.
§ 71.17 Revised, Removal of Brackets on	General license: NRC approved package	B Note: The	**The Compatibility Category for all of § 71.17 has changed from [B] to B signifying that Agreement States should ensure that they have regulations compatible with**	13-007.02 and 13-007.03, Item 3 (Re-numbered to reflect CFR)	13-007.02 This general license applies only to a licensee who has a quality assurance program approved by the U.S. Nuclear Regulatory

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Compatibility Category.		Compatibility Category for §71.17 has changed from [B] to B.	**this section that are collocated with their transportation regulations. In § 71.17, revise paragraph (c) to read as follows:** (a) A general license is issued to any licensee of the Commission to transport, or to deliver to a carrier for transport, licensed material in a package for which a license, certificate of compliance (CoC), or other approval has been issued by the NRC. (b) This general license applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the provisions of subpart H of this part. (c) Each licensee issued a general license under paragraph (a) of this section shall— (1) Maintain a copy of the Certificate of Compliance, or other approval of the package, and 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) Comply with the terms and conditions of the license, certificate, or other approval, as applicable, and the applicable requirements of subparts A, G, and H of this part; and (3) Submit in writing before the first use of the package to: ATTN: Document Control Desk, Director,		Commission as satisfying the provisions of 180 NAC 13-021. 13-007.~~02~~03 This general license applies only to a licensee who: 1. Has a copy of the specific license, certificate of compliance, or other approval by the ~~NRC~~ U. S. Nuclear Regulatory Commission (NRC) 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 prior to shipment; 2. Complies with the terms and conditions of the license, certificate, or other approval by the ~~NRC~~ U. S. Nuclear Regulatory Commission (NRC), as applicable, and the applicable requirements of 180 NAC 13; 3. ~~Prior to the licensee's first use of the~~

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			Division of Spent Fuel Storage and Transportation, Office of Nuclear Material Safety and Safeguards, using an appropriate method listed in § 71.1(a), 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 NRC before April 1, 1996, the general license is subject to the additional restrictions of § 71.19.		~~package, has registered with the NRC~~ Submit in writing before the first use of the package to: ATTN: Document Control Desk, Director, Division of Spent Fuel Storage and Transportation, Office of Nuclear Material Safety and Safeguards, using an appropriate method listed in 10 CFR 71.1(a), the licensee's name and license number and the package identification number specified in the package approval~~;~~ ~~and~~ ~~4. Has a quality assurance program that 180 NAC 13-021.~~
§ 71.19 Revised	Previously approved package	NRC	**In § 71.19, redesignate paragraphs (b) through (e) as paragraphs (a) through (d), and revise newly redesignated paragraph (b)(2) to read as follows:** (b) * * * (2) A package used for a shipment to a location outside the United States is subject to multilateral approval as defined in the DOT's regulations at 49 CFR 173.403.	N/A	N/A

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§ 71.21 Revised, Removal of Brackets on Compatibility Category	General license: Use of foreign approved package	B Note: The Compatibility Category for §71.21 has changed from [B] to B.	**The Compatibility Category for all of § 71.21 has changed from [B] to B signifying that Agreement States should ensure that they have regulations compatible with this section that are collocated with their transportation regulations. In § 71.21, revise paragraphs (a) and (d) to read as follows:** (a) A general license is issued to any licensee of the Commission 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 the DOT as meeting the applicable requirements of 49 CFR 171.23. (b) Any physician licensed by a State to dispense drugs in the practice of medicine is exempt from T.5 with respect to transport by the physician of licensed material for use in the practice of medicine. However, any physician operating under this exemption must be licensed under Part G, 10 CFR Part 35 or the equivalent Agreement State regulations. (c) This general license applies only to shipments made to or from locations outside the United States. (d) Each licensee issued a general license under paragraph (a) of this section shall—	13-010	13-010.04 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 prior to shipment; and 2. Complies with the terms and conditions of the certificate and revalidation and with the applicable requirements of 180 NAC 13. ~~With respect to the quality assurance provision of 180 NAC 7-021, the licensee is exempt from design, construction, and fabrication considerations.~~

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			(1) Maintain 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; and (2) Comply with the terms and conditions of the certificate and revalidation, and with the applicable requirements of subparts A, G, and H of this part.		
§ 71.31(b) Revised	Contents of application	NRC	**In § 71.31, paragraph (b), remove the reference "§ 71.13" and add, in its place, the reference "§ 71.19."**	N/A	N/A
§ 71.38 Retitled, Revised	Renewal of a certificate of compliance	NRC	**Revise § 71.38 to read as follows:** § 71.38 Renewal of a certificate of compliance. (a) Except as provided in paragraph (b) of this section, each Certificate of Compliance expires at the end of the day, in the month and year stated in the approval. (b) In any case in which a person, not less than 30 days before the expiration of an existing Certificate of Compliance issued pursuant to the part, has filed an application in proper form for renewal, the existing Certificate of Compliance for which the renewal application was filed shall not be deemed to have expired until final action on the application for renewal has been taken by the Commission.	N/A	N/A

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			(c) In applying for renewal of an existing Certificate of Compliance, an applicant may be required to submit a consolidated application that is comprised of as few documents as possible. The consolidated application should incorporate all changes to its certificate, including changes that are incorporated by reference in the existing certificate.		
§ 71.70 New	Incorporations by reference	NRC	**Add § 71.70 to subpart F to read as follows:** § 71.70 Incorporations by reference. (a) The materials listed in this section are incorporated by reference in the corresponding sections noted and made a part of the regulations in part 71. These incorporations by reference were approved by the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. These materials are incorporated as they exist on the date of the approval. A notice of any changes made to the material incorporated by reference will be published in the Federal Register, and the material must be available to the public. The materials can be examined, by appointment, at the NRC's Technical Library, which is located at Two White Flint North, 11545 Rockville Pike, Rockville, Maryland 20852; telephone: 301–415–7000; email: *Library.Resource@nrc.gov*. The	N/A	N/A

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			materials are also available from the sources listed below. All approved material is available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 1–202–741–6030 or go to *http://www.archives.gov/federal-register/cfr/ibr-locations.html.* (b) International Organization for Standardization, ISO Central Secretariat, Chemin de Blandonnet 8 CP 401, 1214 Vernier, Geneva, Switzerland; email: *central@iso.org;* phone: +41 22 749 01 11; Web site: *http://www.iso.org.* (1) ISO 9978:1992(E), ''Radiation protection—Sealed radioactive sources—Leakage test methods,'' First Edition (February 15, 1992), incorporation by reference approved for § 71.75(a), is available for purchase from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, 212–642–4900, *http://www.ansi.org,* or *info@ansi.org.* (2) ISO 2919:1999(E), ''Radiation protection—Sealed radioactive sources—General requirements and classification,'' Second Edition (February 15, 1999), incorporation by reference approved for § 71.75(d), is available on *http://www.amazon.com.*		

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§ 71.75 Revised	Qualification of special form radioactive material	NRC	**In § 71.75, revise paragraphs (a)(5), (b)(2)(ii), (b)(2)(iii), (d)(1), and (d)(2) to read as follows:** (a) * * * (5) A specimen that comprises or simulates radioactive material contained in a sealed capsule need not be subjected to the leaktightness procedure specified in this section, provided it is alternatively subjected to any of the tests prescribed in ISO 9978:1992(E), "Radiation protection—Sealed radioactive sources—Leakage test methods" (incorporated by reference, see § 71.70). (b) * * * (2) * * * (ii) The flat face of the billet must be 25 millimeters (mm) (1 inch) in diameter with the edge rounded off to a radius of 3 mm ± 0.3 mm (0.12 in ± 0.012 in); (iii) The lead must be hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm (1 inch) thick, and must cover an area greater than that covered by the specimen; * * * * * (d) * * * (1) The impact test and the percussion test of this section, provided that the specimen is: (i) Less than 200 grams and alternatively subjected to the Class 4 impact test prescribed in ISO 2919:1999(E), "Radiation	N/A	N/A

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			protection—Sealed radioactive sources—General requirements and classification" (incorporated by reference, see § 71.70); or (ii) Less than 500 grams and alternatively subjected to the Class 5 impact test prescribed in ISO 2919:1999(E), "Radioactive protection—Sealed radioactive sources—General requirements and classification" (incorporated by reference, see § 71.70); and (2) The heat test of this section, provided the specimen is alternatively subjected to the Class 6 temperature test specified in ISO 2919:1999(E), "Radioactive protection—Sealed radioactive sources—General requirements and classification" (incorporated by reference, see § 71.70).		
§71.85(a) – (c) Revised, Compatibility Change	Preliminary determinations	NRC Note: The Compatibility Category for §71.85(a) – (c) has	**In § 71.85, revise paragraphs (a), (b), and (c) to read as follows:** (a) The certificate holder 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 35 kPa (5 lbf/in^2) gauge, the certificate holder shall test the containment system at an internal pressure at least 50 percent higher than the maximum normal operating pressure, to verify the capability of	N/A	N/A

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		changed from [B] to NRC.	that system to maintain its structural integrity at that pressure; (c) The certificate holder shall conspicuously and durably mark the packaging with its model number, serial number, gross weight, and a package identification number assigned by the NRC. Before applying the model number, the certificate holder shall determine that the packaging has been fabricated in accordance with the design approved by the Commission; and		
§ 71.85(d) New	Preliminary determinations	B	**In § 71.85, add paragraph (d) to read as follows:** (d) The licensee shall ascertain that the determinations in paragraphs (a) through (c) of this section have been made.	13-014	13-014.05 The licensee shall ascertain that the determinations in 13-014.01 through 13-014.03 of this section have been made.
§ 71.91(a) Revised, Compatibility Change	Records	C Note: The Compatibility Category for § 71.91(a) has changed	**In § 71.91, in paragraph (a) introductory text, remove the reference "§ 71.10" and add, in its place, the reference "§ 71.14."**	13-018	13-018 SHIPMENT RECORDS: 13-018.01 Each licensee must maintain for a period of three years after shipment a record of each shipment of licensed material not exempt under 180 NAC 13-004.03, showing, where applicable: 1. Identification of the packaging by model number and serial number; 2. Verification that the packaging, as shipped, has no significant defects;

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		from D to C.			3. Volume and identification of coolant; 4. Type and quantity of licensed material in each package, and the total quantity of each shipment; 5. Date of the shipment; 6. Name and address of the transferee; 7. Address to which the shipment was made; and 8. Results of the determinations required by 180 NAC 13-015 and by the conditions of the package approval.
§ 71.91(b) Compatibility Change	Records	NRC Note: The Compatibility Category for § 71.91(b) has changed from D to	**The Compatibility Category has changed.** b) Each certificate holder shall maintain, for a period of 3 years after the life of the packaging to which they apply, records identifying the packaging by model number, serial number, and date of manufacture.	N/A	N/A

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		NRC.			
§ 71.91(c) and (d) Compatibility Change	Records	C Note: The Compatibility Category for § 71.91(c) and (d) has changed from D to C.	**The Compatibility Category has changed.** (c) The licensee, certificate holder, and an applicant for a CoC, shall make available to the Commission for inspection, upon reasonable notice, all records required by this part. Records are only valid if stamped, initialed, or signed and dated by authorized personnel, or otherwise authenticated. (d) The licensee, certificate holder, and an applicant for a CoC 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 § 71.85; 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. These records must be retained for 3 years after the life of the packaging to which they apply.	13-018.02 - 03	13-018.02 The licensee shall make available for inspection, upon reasonable notice, all records required by this part. Records are only valid if stamped, initialed, or signed and dated by authorized personnel, or otherwise authenticated. 13-018.03 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 13-014; 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. These records must be retained for 3 years after the life of the packaging to which they apply.

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
§ 71.101(a) Revised, Compatibility Change	Quality assurance requirements	C** Note: The Compatibility Category for § 71.101(a) has changed from D or C to only C. ** See last page for additional note.	**In § 71.101, revise paragraph (a) to read as follows:** (a) *Purpose.* This subpart describes quality assurance requirements applying to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of components of packaging that are important to safety. As used in this subpart, “quality assurance” comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements. Each certificate holder and applicant for a package approval is responsible for satisfying the quality assurance requirements that apply to design, fabrication, testing, and modification of packaging subject to this subpart. Each licensee is responsible for satisfying the quality assurance requirements that apply to its use of a packaging for the shipment of licensed material subject to this subpart.	13-021.01	13-021.01 This section describes quality assurance requirements applying to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of components of packaging that are important to safety. As used in this section, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements. Each certificate holder and applicant for a package approval is responsible for satisfying the quality assurance requirements that apply to design, fabrication, testing, and modification of packaging subject to this section. Each licensee is responsible for satisfying the quality assurance requirements that apply to its use of a packaging for the shipment of licensed material subject to this section.

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
§ 71.101(b) and (c)(1) Compatibility Change	Quality assurance requirements	C** Note: The Compatibility Category for § 71.101(b) and (c)(1) has changed from D or C to only C. ** See last page for additional note.	**The Compatibility Category has changed.** (b) *Establishment of program.* Each licensee, certificate holder, and applicant for a CoC shall establish, maintain, and execute a quality assurance program satisfying each of the applicable criteria of §§ 71.101 through 71.137 and satisfying any specific provisions that are applicable to the licensee's activities including procurement of packaging. The licensee, certificate holder, and applicant for a CoC shall execute the applicable criteria in a graded approach to an extent that is commensurate with the quality assurance requirement's importance to safety. (c) *Approval of program.* (1) Before the use of any package for the shipment of licensed material subject to this subpart, each licensee shall obtain Commission approval of its quality assurance program. Using an appropriate method listed in § 71.1(a), each licensee shall file a description of its quality assurance program, including a discussion of which requirements of this subpart are applicable and how they will be satisfied, by submitting the description to: ATTN: Document Control Desk, Director, Division of Spent Fuel Management, Office of Nuclear Material Safety and Safeguards.	13-021.02-03	13-021.01 ~~1~~ 2 Unless otherwise authorized by the Department, each licensee~~, certificate holder and applicant for a CoC~~ must 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.~~ satisfying each of the applicable criteria of 10 CFR 71.101 through 71.137 and satisfying any specific provisions that are applicable to the licensee's activities including procurement of packaging. The licensee shall execute the applicable criteria in a graded approach to an extent that is commensurate with the quality assurance requirement's importance to safety. 13-021.03 Before the use of any package for the shipment of licensed material subject to this section, each licensee shall obtain Departmental approval of its quality assurance program. Using an appropriate method listed in 10 CFR 71.1(a), each licensee shall file a description of its quality assurance program, including a discussion of which

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
					requirements of this section are applicable and how they will be satisfied, by submitting the description to: ATTN: Document Control Desk, Director, Division of Spent Fuel Management, Office of Nuclear Material Safety and Safeguards.
§ 71.101(c)(2) Revised	Quality assurance requirements	NRC	**In § 71.101, revise paragraphs (c)(2) to read as follows:** (c) * * * (2) Before the fabrication, testing, or modification of any package for the shipment of licensed material subject to this subpart, each certificate holder, or applicant for a Certificate of Compliance shall obtain Commission approval of its quality assurance program. Each certificate holder or applicant for a CoC shall, in accordance with § 71.1, file a description of its quality assurance program, including a discussion of which requirements of this subpart are applicable and how they will be satisfied.	13-021.06	N/A
§ 71.101(g) Compatibility Note Revised	Quality assurance requirements	C** ** See last page for note.	**The Compatibility Category note has been revised.** (g) Radiography containers. A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of § 34.31(b) of this chapter or equivalent	13-021.08	No changes needed – compatibility change only.

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
			Agreement State requirement, is deemed to satisfy the requirements of §§ 71.17(b) and 71.101(b).		
§ 71.103(a) Revised, Compatibility Change	Quality assurance organization	C** Note: The Compatibility Category for § 71.103(a) has changed from D or [C] to only C. ** See last page for additional note.	**In § 71.103, revise paragraph (a) to read as follows:** (a) The licensee, certificate holder, and applicant for a Certificate of Compliance shall be responsible for the establishment and execution of the quality assurance program. The licensee, certificate holder, and applicant for a Certificate of Compliance may delegate to others, such as contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part of the quality assurance program, but shall retain responsibility for the program. These activities include performing the functions associated with attaining quality objectives and the quality assurance functions.	13-021.09	13-021.09 The licensee shall be responsible for the establishment and execution of the quality assurance program. The licensee may delegate to others, such as contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part of the quality assurance program, but shall retain responsibility for the program. The licensee shall clearly establish and delineate, in writing, the authority and duties of persons and organizations performing activities affecting the safety-related functions of structures, systems, and components. These activities include performing the functions associated with attaining quality objectives and the quality assurance functions. While the term licensee is used in these criteria, the requirements are applicable to whatever design, fabrication, assembly, and testing of the package is accomplished with respect to a package before the time a package approval is issued.

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
§ 71.103(b) Compatibility Note Revised	Quality assurance organization	C** ** See last page for note.	**The Compatibility Category note has been revised.** (b) The quality assurance functions are-- (1) Assuring that an appropriate quality assurance program is established and effectively executed; and (2) Verifying, by procedures such as checking, auditing, and inspection, that activities affecting the functions that are important to safety have been correctly performed.	13-021.10	13-021.010 The quality assurance functions are: 1. Assuring that an appropriate quality assurance program is established and effectively executed; and 2. Verifying, by procedures such as checking, auditing, and inspection, that activities affecting the safety-related functions have been performed correctly.
§ 71.106 New	Changes to quality assurance program	C	**Add § 71.106 to subpart H to read as follows:** § 71.106 Changes to quality assurance program. (a) Each quality assurance program approval holder shall submit, in accordance with § 71.1(a), a description of a proposed change to its NRC-approved quality assurance program that will reduce commitments in the program description as approved by the NRC. The quality assurance program approval holder shall not implement the change before receiving NRC approval. (1) The description of a proposed change to the NRC-approved quality assurance program must identify the change, the reason for the change, and the basis for concluding that the	13-022.01 - 03	13-022 CHANGES TO QUALITY ASSURANCE PROGRAM. 13-022.01 Each quality assurance program approval holder shall submit a description of a proposed change to its Department approved quality assurance program that will reduce commitments in the program description as approved by the Department. The quality assurance program approval holder shall not implement the change before receiving Department approval. 1. The description of a proposed change to the Department approved quality assurance

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
			revised program incorporating the change continues to satisfy the applicable requirements of subpart H of this part. (2) [Reserved] (b) Each quality assurance program approval holder may change a previously approved quality assurance program without prior NRC approval, if the change does not reduce the commitments in the quality assurance program previously approved by the NRC. Changes to the quality assurance program that do not reduce the commitments shall be submitted to the NRC every 24 months, in accordance with § 71.1(a). In addition to quality assurance program changes involving administrative improvements and clarifications, spelling corrections, and non-substantive changes to punctuation or editorial items, the following changes are not considered reductions in commitment: (1) The use of a quality assurance standard approved by the NRC that is more recent than the quality assurance standard in the certificate holder's or applicant's current quality assurance program at the time of the change; (2) The use of generic organizational position titles that clearly denote the position function, supplemented as necessary by descriptive text, rather		program must identify the change, the reason for the change, and the basis for concluding that the revised program incorporating the change continues to satisfy the applicable requirements of 13-021. 13-022.02 Each quality assurance program approval holder may change a previously approved quality assurance program without prior Department approval, if the change does not reduce the commitments in the quality assurance program previously approved by the Department. Changes to the quality assurance program that do not reduce the commitments shall be submitted to the Department every 24 months. In addition to quality assurance program changes involving administrative improvements and clarifications, spelling corrections, and nonsubstantive changes to punctuation or editorial items, the following changes are not considered reductions in commitment: 1. The use of a quality assurance standard approved by the

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
			than specific titles, provided that there is no substantive change to either the functions of the position or reporting responsibilities; (3) The use of generic organizational charts to indicate functional relationships, authorities, and responsibilities, or alternatively, the use of descriptive text, provided that there is no substantive change to the functional relationships, authorities, or responsibilities; (4) The elimination of quality assurance program information that duplicates language in quality assurance regulatory guides and quality assurance standards to which the quality assurance program approval holder has committed to on record; and (5) Organizational revisions that ensure that persons and organizations performing quality assurance functions continue to have the requisite authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety considerations. (c) Each quality assurance program approval holder shall maintain records of quality assurance program changes.		Department that is more recent than the quality assurance standard in the licensee's current quality assurance program at the time of the change; 2. The use of generic organizational position titles that clearly denote the position function, supplemented as necessary by descriptive text, rather than specific titles, provided that there is no substantive change to either the functions of the position or reporting responsibilities; 3. The use of generic organizational charts to indicate functional relationships, authorities, and responsibilities, or alternatively, the use of descriptive text, provided that there is no substantive change to the functional

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
					relationships, authorities, or responsibilities; 4. The elimination of quality assurance program information that duplicates language in quality assurance regulatory guides and quality assurance standards to which the quality assurance program approval holder has committed to on record; and 5. Organizational revisions that ensure that persons and organizations performing quality assurance functions continue to have the requisite authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety considerations.

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
					13.022.03 Each quality assurance program approval holder shall maintain records of quality assurance program changes.
§ 71.135 Revised, Compatibility Change	Quality assurance records	C** Note: The Compatibility Category for § 71.135 has changed from D or C to only C. ** See last page for additional note.	**Revise § 71.135 to read as follows:** The licensee, certificate holder, and applicant for a Certificate of Compliance shall maintain sufficient written records to describe the activities affecting quality. These records must include changes to the quality assurance program as required by § 71.106, the instructions, procedures, and drawings required by § 71.111 to prescribe quality assurance activities, and closely related specifications such as required qualifications of personnel, procedures, and equipment. The records must include the instructions or procedures that establish a records retention program that is consistent with applicable regulations and designates factors such as duration, location, and assigned responsibility. The licensee, certificate holder, and applicant for a Certificate of Compliance shall retain these records for 3 years beyond the date when the licensee, certificate holder, and applicant for a Certificate of Compliance last engage in the activity for which the quality assurance program was developed.	13-021.16	13-021.~~11~~16 Quality assurance records: The licensee~~, certificate holder, and applicant for a CoC~~ must maintain sufficient written records to describe the activities affecting quality. These records must include changes to the quality assurance program as required by 13-022. The records must include the instruction, procedures, and drawings to prescribe quality assurance activities and must include closely related specifications such as required qualification of personnel, procedures, and equipment. The records must include the instructions or procedures, which establish a records retention program that is consistent with applicable regulations and designates factors such as duration, location, and assigned responsibility. The licensee~~, certificate holder, and applicant for a~~ CoC must retain these records for three years beyond the date which the licensee~~, certificate holder, and applicant for a CoC~~ last engage in the activity for which the quality assurance program was

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
			If any portion of the quality assurance program, written procedures or instructions is superseded, the licensee, certificate holder, and applicant for a Certificate of Compliance shall retain the superseded material for 3 years after it is superseded.		developed. If any portion of the written procedures or instruction is superseded, the licensee~~, certificate holder, and applicant for a CoC~~ must retain the superseded material for three years after it is superseded.
Appendix A Revised	Determination of A1 and A2	[B]	**In appendix A to part 71, revise paragraphs IV.a. and IV.b., redesignate paragraphs IV.c. through IV.f. as paragraphs IV.d. through IV.g., add new paragraph IV.c., revise newly redesignated paragraphs IV.d. through IV.g., redesignate paragraph V. as paragraph V.a., and add new paragraph V.b..** Revisions detailed below under "Appendix A to Part 71 — Determination of A1 and A2."	13-A Determination of A1 and A2	(See below – pgs. 38-40)
Appendix A, Table A–1 Revised	A1 and A2 Values for Radionuclides	[B]	**In Table A-1 of Appendix A, add an entry for Kr-79 in alphanumeric order; revise the entries for Cf 252, Ir-192, Kr-81, and Mo 99; revise footnotes a and c; remove footnote h; and redesignate footnote i as footnote h.** Revisions detailed below under "Table A–1—A1 and A2 VALUES FOR RADIONUCLIDES."	APPENDIX 13-A, TABLE A-1 - A1 AND A2 VALUES FOR RADIONUCLIDES	(See below – pgs 41-43)
Appendix A, Table A–2	Exempt Material	[B]	**In Table A-2 of Appendix A, add the entry for Kr-79 in**	APPENDIX 13-A, TABLE	(See below – pgs 44-45)

NRC Section	Title	Cat.	Summary of Change to CFR	NE Reference	Nebraska
Revised	Activity Concentrations and Exempt Consignment Activity Limits for Radionuclides.		**alphanumeric order, revise the entries for Kr 81 and Te 121m, and revise footnote b.** Revisions detailed below under "Table A–2—EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES."	A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES	
Appendix A, Table A–3 Revised	General Values for A1 and A2	[B]	**In Table A-3 of Appendix A, revise the second and third entries and add a new footnote a.** Revisions detailed below under "TABLE A-3—GENERAL VALUES FOR A1 and A2."	APPENDIX 13-A, TABLE -A-3: GENERAL VALUES FOR A_1 AND A_2	a. If beta or gamma emitting nuclides are known to be present, the A1 value of 0.1 terabecquerel (TBq) (2.7 curie (Ci)) should be used.

** Note: §71.101(g) indicates that QA programs for industrial radiography Type B package users are covered by §34.31(b). It also indicated that this section satisfies §71.17(b) and therefore will satisfy those sections referenced in this provision (§§71.101 through 71.137).

Appendix A to Part 71 — Determination of A_1 and A_2

* * * * *

IV. * * *

a. For special form radioactive material, the maximum quantity transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_1(i)} \leq 1$$

where B(i) is the activity of radionuclide i in special form, and $A_1(i)$ is the A_1 value for radionuclide i.

b. For normal form radioactive material, the maximum quantity transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_2(i)} \leq 1$$

where B(i) is the activity of radionuclide i in normal form, and $A_2(i)$ is the A_2 value for radionuclide i.

c. If the package contains both special and normal form radioactive material, the activity that may be transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$$

where B(i) is the activity of radionuclide i as special form radioactive material, $A_1(i)$ is the A_1 value for radionuclide i, C(j) is the activity of radionuclide j as normal form radioactive material, and $A_2(j)$ is the A_2 value for radionuclide j.

d. Alternatively, the 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 for radionuclide i in the mixture and $A_1(i)$ is the appropriate A_1 value for radionuclide i.

e. Alternatively, the 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 for radionuclide i in the mixture and $A_2(i)$ is the appropriate A_2 value for radionuclide i.

f. The exempt activity concentration for mixtures of nuclides may be determined as follows:

$$\text{Exempt activity concentration for mixture} = \frac{1}{\sum_i \frac{f(i)}{[A](i)}}$$

where f(i) is the fraction of activity concentration of radionuclide i in the mixture and [A](i) is the activity concentration for exempt material containing radionuclide i.

g. The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows:

$$\text{Exempt consignment activity limit for mixture} = \frac{1}{\sum_i \frac{f(i)}{A(i)}}$$

where f(i) is the fraction of activity of radionuclide i in the mixture and A(i) is the activity limit for exempt consignments for radionuclide i.

V. * * *

b. 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] (activity concentration for exempt material) or A (activity limit for exempt consignment) value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph IV of this appendix. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest [A] or A values for the alpha emitters and beta/gamma emitters, respectively.

* * * * *

Table A–1—A1 and A2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity	
						(TBq/g)	(Ci/g)
*	*	*		*	*	*	*
Cf-252		$1.0x10^{-1}$	2.7	$3.0x10^{-3}$	$8.1x10^{-2}$	$2.0x10^{1}$	$5.4x10^{2}$
*	*	*		*	*	*	*
Ir-192		[c]1.0	[c]$2.7x10^{1}$	$6.0x10^{-1}$	$1.6x10^{1}$	$3.4x10^{2}$	$9.2x10^{3}$
*	*	*		*	*	*	*
Kr-79	Krypton (36)	4.0	$1.1x10^{2}$	2.0	$5.4x10^{1}$	$4.2x10^{4}$	$1.1x10^{6}$
Kr-81		$4.0x10^{1}$	$1.1x10^{3}$	$4.0x10^{1}$	$1.1x10^{3}$	$7.8x10^{-4}$	$2.1x10^{-2}$
*	*	*		*	*	*	*
Mo-99 [a h]		1.0	$2.7x10^{1}$	$6.0x10^{-1}$	$1.6x10^{1}$	$1.8x10^{4}$	$4.8x10^{5}$
*	*	*		*	*	*	*

[a] A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 days, as listed in the following:

Mg-28	Al-28
Ca-47	Sc-47
Ti-44	Sc-44
Fe-52	Mn-52m
Fe-60	Co-60m
Zn-69m	Zn-69
Ge-68	Ga-68
Rb-83	Kr-83m
Sr-82	Rb-82
Sr-90	Y-90
Sr-91	Y-91m
Sr-92	Y-92
Y-87	Sr-87m
Zr-95	Nb-95m
Zr-97	Nb-97m, Nb-97
Mo-99	Tc-99m
Tc-95m	Tc-95
Tc-96m	Tc-96
Ru-103	Rh-103m
Ru-106	Rh-106
Pd-103	Rh-103m
Ag-108m	Ag-108
Ag-110m	Ag-110
Cd-115	In-115m
In-114m	In-114
Sn-113	In-113m
Sn-121m	Sn-121
Sn-126	Sb-126m
Te-127m	Te-127
Te-129m	Te-129
Te-131m	Te-131
Te-132	I-132
I-135	Xe-135m

Xe-122	I-122
Cs-137	Ba-137m
Ba-131	Cs-131
Ba-140	La-140
Ce-144	Pr-144m, Pr-144
Pm-148m	Pm-148
Gd-146	Eu-146
Dy-166	Ho-166
Hf-172	Lu-172
W-178	Ta-178
W-188	Re-188
Re-189	Os-189m
Os-194	Ir-194
Ir-189	Os-189m
Pt-188	Ir-188
Hg-194	Au-194
Hg-195m	Hg-195
Pb-210	Bi-210
Pb-212	Bi-212, Tl-208, Po-212
Bi-210m	Tl-206
Bi-212	Tl-208, Po-212
At-211	Po-211
Rn-222	Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Po-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Ra-225	Ac-225, Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ra-226	Rn-222, Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-228	Ac-228
Ac-225	Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ac-227	Fr-223
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Th-234	Pa-234m, Pa-234
Pa-230	Ac-226, Th-226, Fr-222, Ra-222, Rn-218, Po-214
U-230	Th-226, Ra-222, Rn-218, Po-214
U-235	Th-231
Pu-241	U-237
Pu-244	U-240, Np-240m
Am-242m	Am-242, Np-238
Am-243	Np-239
Cm-247	Pu-243
Bk-249	Am-245
Cf-253	Cm-249

* * * * *

[c] The activity of Ir-192 in special form may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

* * * * *

[h] A_2 = 0.74 TBq (20 Ci) for Mo-99 for domestic use.

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Table A–2—EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
*	*	*	**	*	*
Kr-79	Krypton (36)	$1.0x10^{3}$	$2.7x10^{-8}$	$1.0x10^{5}$	$2.7x10^{-6}$
Kr-81		$1.0x10^{4}$	$2.7x10^{-7}$	$1.0x10^{7}$	$2.7x10^{-4}$
*	*	*	**	*	*
Te-121m		$1.0x10^{2}$	$2.7x10^{-9}$	$1.0x10^{6}$	$2.7x10^{-5}$
*	*	*	**	*	*

* * * * *

[b] Parent nuclides and their progeny included in secular equilibrium are listed as follows:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Ag-108m	Ag-108
Cs-137	Ba-137m
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212(0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

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TABLE A-3—GENERAL VALUES FOR A1 and A2

Contents	A_1		A_2		Activity concen-tration for exempt material (Bq/g)	Activity concen-tration for exempt material (Ci/g)	Activity limits for exempt consign-ments (Bq)	Activity limits for exempt consign-ments (Ci)
	(TBq)	(Ci)	(TBq)	(Ci)				
*		*	*	*	*	*		*
Alpha emitting nuclides, but no neutron emitters, are known to be present [a]	$2x10^{-1}$	$5.4x10^{0}$	$9x10^{-5}$	$2.4x10^{-3}$	$1x10^{-1}$	$2.7x10^{-12}$	$1x10^{3}$	$2.7x10^{-8}$
Neutron emitting nuclides are known to be present or no relevant data are available	$1x10^{-3}$	$2.7x10^{-2}$	$9x10^{-5}$	$2.4x10^{-3}$	$1x10^{-1}$	$2.7x10^{-12}$	$1x10^{3}$	$2.7x10^{-8}$

[a] If beta or gamma emitting nuclides are known to be present, the A_1 value of 0.1 TBq (2.7 Ci) should be used.

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APPENDIX 13-A

Nebraska Revisions

DETERMINATION OF A_1 AND A_2

I. Values of A_1 and A_2 for individual radionuclides, which are the bases for many activity limits elsewhere in these regulations, are given in Table A-1. The curie (Ci) values specified are obtained by converting from the Terabecquerel (TBq) value. The curie values are expressed to three significant figures to assure that the difference in the ~~TBq~~ Terabecquerel (TBq)and ~~Ci~~ curie (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.

II.
a. For individual radionuclides whose identities are known, but which are not listed in Table A-1, the A_1 and A_2 values contained in Appendix 13-A, Table A-3 may be used. Otherwise the licensee must obtain prior Department approval of the A_1 and A_2 values for radionuclides not listed in Table A-1, before shipping the material.
b. For individual radionuclides whose identities are known, but which are not listed in Table A-2, the exempt material activity concentration and exempt consignment activity values contained in Appendix 13-A, Table A-3 may be used. Otherwise, the licensee must obtain prior Department approval of the exempt material activity concentration and exempt consignment activity values for radionuclides not listed in Table A-2, before shipping the material.
c. The licensee must submit requests for prior approval, described under paragraphs II.a. and II.b. of this Appendix, to the Department, in accordance with 180 NAC 1-012.

III. 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 radionuclide has a half-life either longer than 10 days, or longer than that of the parent radionuclide, must be considered as a single radionuclide, and the activity to be taken into account, and the A_1 and A_2 value to be applied must be those corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter radionuclide has a half-life either longer than 10 days, or greater than that of the parent radionuclide, the parent and those daughter radionuclides must be considered as mixtures of different nuclides.

IV. For mixtures of radionuclides whose identities and respective activities are known, the following conditions apply:

a. For special form radioactive material, the maximum quantity transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_1(i)} \leq 1$$

where B(i) is the activity of radionuclide i in special form, and $A_1(i)$ is the A_1 value for radionuclide i.

b. For normal form radioactive material, the maximum quantity transported in a Type A package is a follows:

$$\sum_i \frac{B(i)}{A_2(i)} \leq 1$$

~~$\sum B(i)/A_{(2)}i \leq 1$~~ **(Equation is new but not able to RED underline)**

where B(i) is the activity of radionuclide i in normal form, and $A_2(i)$ is the A_2 value for radionuclide i.

c. If the package contains both special and normal form radioactive material, the activity that may be transported in a Type A package is as follows:

(Equation is new but not able to RED underline)

$$\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$$

where B(i) is the activity of radionuclide i as special form radioactive material, A1(i) is the A1 value for radionuclide i, C(j) is the activity of radionuclide j as normal form radioactive material, and A2(j) is the A2 value for radionuclide j.

~~c~~d. Alternatively, the 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 for radionuclide I in the mixture, and $A_2(i)$ is the appropriate A_1 value for radionuclide I.

~~d~~e. Alternatively, the 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 radionuclide I in the mixture, and $A_2(i)$ is the appropriate A_2 value for radionuclide I.

~~e~~f. The exempt activity concentration for mixtures of nuclides may be determined as follows:

~~Exempt activity concentration for mixture $= \frac{1}{\sum_i \frac{f(i)}{[A](i)}}$~~

(Equation is new but not able to RED underline)

$$\text{Exempt activity concentration for mixture} = \frac{1}{\sum_i \frac{f(i)}{[A](i)}}$$

Where f(i) is the fraction of activity concentration of radionuclide I in the mixture, and ~~[A]~~ [A](i) is the activity concentration for exempt material containing radionuclide I.

~~f~~g. The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows:

~~$$\text{Exempt consignment activity limits for mixture} = \frac{1}{\sum_i \frac{f(i)}{A(i)}}$$~~

$$\text{Exempt consignment activity limit for mixture} = \frac{1}{\sum_i \frac{f(i)}{A(i)}}$$

(Equation is new but not able to RED underline)

where f(i) is the fraction of activity of radionuclide I in the mixture, and ~~A~~ A(i) is the activity limit for exempt consignments for radionuclide I.

V.

a. 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.

b. 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] (activity concentration for exempt material) or A (activity limit for exempt consignment) value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph IV of this appendix. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest [A] or A values for the alpha emitters and beta/gamma emitters, respectively.

Cd-113m		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	8.3	$2.2X10^{2}$
Cd-115 (a)		3.0	$8.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.9X10^{4}$	$5.1X10^{5}$
Cd-115m		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$9.4X10^{2}$	$2.5X10^{4}$
Ce-139	Cerium (58)	7.0	$1.9X10^{2}$	2.0	$5.4X10^{1}$	$2.5X10^{2}$	$6.8X10^{3}$
Ce-141		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.1X10^{3}$	$2.8X10^{4}$
Ce-143		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{4}$	$6.6X10^{5}$
Ce-144 (a)		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.2X10^{2}$	$3.2X10^{3}$
Cf-248	Californium (98)	$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$5.8X10^{1}$	$1.6X10^{3}$
Cf-249		3.0	$8.1X10^{1}$	$8.0X10^{-4}$	$2.2X10^{-2}$	$1.5X10^{-1}$	4.1
Cf-250		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	4.0	$1.1X10^{2}$
Cf-251		7.0	$1.9X10^{2}$	$7.0X10^{-4}$	$1.9X10^{-2}$	$5.9X10^{-2}$	1.6
Cf-252 (h)		~~$5.0X10^{-2}$~~ $1.0x10^{-1}$	~~1.35~~ 2.7	$3.0X10^{-3}$	$8.1X10^{-2}$	$2.0X10^{1}$	$5.4X10^{2}$
In-114m (a)		$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$8.6X10^{2}$	$2.3X10^{4}$
In-115m		7.0	$1.9X10^{2}$	1.0	$2.7X10^{1}$	$2.2X10^{5}$	$6.1X10^{6}$
Ir-189 (a)	Iridium (77)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$1.9X10^{3}$	$5.2X10^{4}$
Ir-190		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.3X10^{3}$	$6.2X10^{4}$
Ir-192 (c)		~~1.0~~ 1.0 [c]	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.4X10^{2}$	$9.2X10^{3}$
Ir-194		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$3.1X10^{4}$	$8.4X10^{5}$
K-40	Potassium (19)	$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$2.4X10^{-7}$	$6.4X10^{-6}$
K-42		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$2.2X10^{5}$	$6.0X10^{6}$
K-43		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{5}$	$3.3X10^{6}$
Kr-79	Krypton (36)	4.0	$1.1x10^{2}$	2.0	$5.4x10^{1}$	$4.2x10^{4}$	$1.1x10^{6}$
Kr-81		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$7.8X10^{-4}$	$2.1X10^{-2}$
Kr-85		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$1.5X10^{1}$	$3.9X10^{2}$
Kr-85m		8.0	$2.2X10^{2}$	3.0	$8.1X10^{1}$	$3.0X10^{5}$	$8.2X10^{6}$
Kr-87		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.0X10^{6}$	$2.8X10^{7}$
La-137	Lanthanum (57)	$3.0X10^{1}$	$8.1X10^{2}$	6.0	$1.6X10^{2}$	$1.6X10^{-3}$	$4.4X10^{-2}$
La-140		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.1X10^{4}$	$5.6X10^{5}$
Lu-172	Lutetium (71)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{3}$	$1.1X10^{5}$
Lu-173		8.0	$2.2X10^{2}$	8.0	$2.2X10^{2}$	$5.6X10^{1}$	$1.5X10^{3}$
Lu-174		9.0	$2.4X10^{2}$	9.0	$2.4X10^{2}$	$2.3X10^{1}$	$6.2X10^{2}$
Lu-174m		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$2.0X10^{2}$	$5.3X10^{3}$
Lu-177		$3.0X10^{1}$	$8.1X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.1X10^{3}$	$1.1X10^{5}$
Mg-28 (a)	Magnesium (12)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.0X10^{5}$	$5.4X10^{6}$
Mn-52	Manganese (25)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.6X10^{4}$	$4.4X10^{5}$
Mn-53		Unlimited	Unlimited	Unlimited	Unlimited	$6.8X10^{-5}$	$1.8X10^{-3}$
Mn-54		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$2.9X10^{2}$	$7.7X10^{3}$
Mn-56		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$8.0X10^{5}$	$2.2X10^{7}$
Mo-93	Molybdenum (42)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	$4.1X10^{-2}$	1.1
~~Mo-99 (a) (i)~~ Mo-99 [a h]		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.8X10^{4}$	$4.8X10^{5}$
N-13	Nitrogen (7)	$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.4X10^{7}$	$1.5X10^{9}$
Na-22	Sodium (11)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.3X10^{2}$	$6.3X10^{3}$
Na-24		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$3.2X10^{5}$	$8.7X10^{6}$
Nb-93m	Niobium (41)	$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	8.8	$2.4X10^{2}$
Nb-94		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.9X10^{-3}$	$1.9X10^{-1}$
Nb-95		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.5X10^{3}$	$3.9X10^{4}$
Nb-97		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.9X10^{5}$	$2.7X10^{7}$
Nd-147	Neodymium (60)	6.0	$1.6X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{3}$	$8.1X10^{4}$
Nd-149		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$4.5X10^{5}$	$1.2X10^{7}$

Ni-59	Nickel (28)	Unlimited	Unlimited	Unlimited	Unlimited	$3.0X10^{-3}$	$8.0X10^{-2}$
Ni-63		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	2.1	$5.7X10^{1}$
Ni-65		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$7.1X10^{5}$	$1.9X10^{7}$
Np-235	Neptunium (93)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.2X10^{1}$	$1.4X10^{3}$
Np-236 (short-lived)		$2.0X10^{1}$	$5.4X10^{2}$	2.0	$5.4X10^{1}$	$4.7X10^{-4}$	$1.3X10^{-2}$
Np-236 (long-lived)		$9.0X10^{0}$	$2.4X10^{2}$	$2.0x10^{-2}$	$5.4X10^{-1}$	$4.7X10^{-4}$	$1.3X10^{-2}$
Np-237		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	$2.6X10^{-5}$	$7.1X10^{-4}$
Np-239		7.0	$1.9X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$8.6X10^{3}$	$2.3X10^{5}$
Os-185	Osmium (76)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$2.8X10^{2}$	$7.5X10^{3}$

NOTES:

(a) A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 days, as listed in the following:

Mg-28	Al-28
Ca-47	Sc-47
Ti-44	Sc-44
Fe-52	Mn-52m
Fe-60	Co-60m
Zn-69m	Zn-69
Ge-68	Ga-68
Rb-83	Kr-83m
Sr-82	Rb-82
Sr-90	Y-90
Sr-91	Y-91m
Sr-92	Y-92
Y-87	Sr-87m
Zr-95	Nb-95m
Zr-97	Nb-97m, Nb-97
Mo-99	Tc-99m
Tc-95m	Tc-95
Tc-96m	Tc-96
Ru-103	Rh-103m
Ru-106	Rh-106
Pd-103	Rh-103m
Ag-108m	Ag-108
Ag-110m	Ag-110
Cd-115	In-115m
In-114m	In-114
Sn-113	In-113m
Sn-121m	Sn-121
Sn-126	Sb-126m
Te-127m	Te-127
Te-129m	Te-129
Te-131m	Te-131
Te-132	I-132
I-135	Xe-135m
Xe-122	I-122
Cs-137	Ba-137m
Ba-131	Cs-131
Ba-140	La-140
Ce-144	Pr-144m, Pr-144

Pm-148m	Pm-148
Gd-146	Eu-146
Dy-166	Ho-166
Hf-172	Lu-172
W-178	Ta-178
W-188	Re-188
Re-189	Os-189m
Os-194	Ir-194
Ir-189	Os-189m
Pt-188	Ir-188
Hg-194	Au-194
Hg-195m	Hg-195
Pb-210	Bi-210
Pb-212	Bi-212, Tl-208, Po-212
Bi-210m	Tl-206
Bi-212	Tl-208, Po-212
At-211	Po-211
Rn-222	Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Po-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Ra-225	Ac-225, Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ra-226	Rn-222, Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-228	Ac-228
Ac-225	Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ac-227	Fr-223
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Th-234	Pa-234m, Pa-234
Pa-230	Ac-226, Th-226, Fr-222, Ra-222, Rn-218, Po-214
U-230	Th-226, Ra-222, Rn-218, Po-214
U-235	Th-231
Pu-241	U-237
Pu-244	U-240, Np-240m
Am-242m	Am-242, Np-238
Am-243	Np-239
Cm-247	Pu-243
Bk-249	Am-245
Cf-253	Cm-249

(b) The values of A_1 and/or A_2 in Curies (Ci) are approximate and for ~~infomraiton~~ information only; the regulatory standard units are Terabecquerel (TBq), (see Appendix 13-A – Determination of A_1 and/or A_2, Section 1)

(c) ~~The quantity~~ The activity of Ir-192 in special form may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

(d) These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2 and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

(e) These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

(f) These values apply to all compounds of uranium other than those specified in notes (d) and (e) of this table.

(g) These values apply to unirradiated uranium only.

~~(h) A_1 = 0.1 TBq (2.7 Ci) and A_2 = 0.001 TBq (0.027 Ci) for Cf-252 for domestic use.~~

~~(i)~~ (h) A_2 = 0.74 ~~TBq~~ Terabecquerel (TBq) (20 ~~Ci~~ curie (Ci)) for Mo-99 for domestic use.

K-42		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
K-43		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Kr-79	Krypton (36)	$1.0x10^{3}$	$2.7x10^{-8}$	~~$1.0x10^{5}$~~	~~$2.7x10^{-6}$~~
Kr-81		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$

Te-121	Tellurium (52)	~~$1.0X10^{1}$~~ $1.0x10^{2}$	~~$2.7X10^{-10}$~~ $2.7x10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-121m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Te-123m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-125m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-127		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$

NOTES:

(a) [Reserved]

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Cs-137	Ba-137m
~~Ce-134~~	~~La-134~~
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
~~Rn-220~~	~~Po-216~~
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
~~Th-226~~	~~Ra-222, Rn-218, Po-214~~
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210

~~U-240~~	~~Np-240m~~
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239