U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, D.C. 20590

JUN 01 2016

Mr. Jason G. Hart
Health Physicist
Occupational Safety and Health, East Team
Headquarter, Human Resource Management
U.S. Customs and Border Protection
U.S. Department of Homeland Security
510 Sable Trace Way
Acworth, GA 30102

Reference No. 16-0016

Dear Mr. Hart:

This letter is in response to your January 29, 2016 email and March 4, 2016 telephone call with a member of my staff requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you ask how to classify and prepare for transportation a number of sealed button Class 7 (radioactive) sources each containing 1 microcurie of Cesium-137 (Cs-137). We have paraphrased your questions and answered them in the order you provided.

You state your agency purchased these button sources over a span of approximately 10 years from a variety of vendors for use in devices designed to verify that personal radiation devices (PRDs) are functioning properly but retained neither the documentation that describes the activity nor any certified forms. You also state when a button source no longer emits sufficient gamma rays to cause a PRD to alarm, it is removed replaced, and stored onsite.

Q1. You state that, based on § 173.421, Cs-137's activity threshold for Class 7 radioactive material is 0.27 microcuries.

A1. The definition of "radioactive material," shown below and found in § 173.403 of the HMR rather than the regulatory text in § 173.421, provides the basis for determining whether a source is considered a radioactive material and when it would be regulated in transport.

> *Radioactive material* means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the table in § 173.436 or values derived according to the instructions in § 173.433.

To determine if these sealed button sources are exempt from the HMR when offered for transportation, those persons preparing them for shipment must first determine the consignment activity and activity concentration using the methods prescribed in § 173.433(a). Please note, calculation of a radioactive material's activity concentration should only account for the radioactive material itself and not take into account the mass of the encasing, surrounding, or packaging materials. Per the information you provided regarding their total activity as being 0.27 microcuries, your sealed button sources would be above the exempt consignment activity limit.

Q2. You state it is your understanding that the upper range of "limited quantity" for the button source is up to 540,000 microcuries.

A2. This is incorrect. It is based on the A_1 value found in § 173.435. If the source is certified as "special form" radioactive material, the correct value would be approximately 54,000 microcuries. If the source is "normal form" radioactive material, then the A_2 value must be used and the correct upper limit would be approximately 16,000 microcuries.

You provided no information as to whether the source is certified as special form radioactive material, as defined in § 173.403, and meets the test requirements of § 173.469; therefore, this source must be considered to be normal form. If you determine that the sealed sources are special form, please note that in accordance with § 173.476(a), each offeror of special form Class 7 (radioactive) materials must maintain on file for at least two years after the offeror's latest shipment, and provide to the Associate Administrator on request, a complete safety analysis, including documentation of any tests, demonstrating that the special form material meets the requirements of § 173.469. An International Atomic Energy Agency Certificate of Competent Authority issued for the special form material may be used to satisfy this requirement. Lastly, footnote "b" to the Table in § 173.435 states:

> The values of A_1 and A_2 in curies (Ci) are approximate and for information only; the regulatory standard units are Terabecquerels (TBq), (see § 171.10).

The conventional units provided in the § 173.435 Table have slight rounding errors; therefore, the International System of Units (SI) values in TBq must be used for calculation purposes rather than the conventional Ci units.

Q3. You state your understanding that when shipping these sealed sources in boxes by themselves, the exterior surface of the box must be tested for surface contamination according to § 173.421(c) and in conformance with, and not to exceed the limits specified in § 173.443(a). In addition, you ask if such testing is truly required.

A3. The shipper must either make one or more package wipe measurements in conformance with § 173.443(a)(1)(i) and compare the results against the limits in Table 9, or use the provision in § 173.443(a)(1)(ii) that allows the level of non-fixed contamination to be determined by using other methods of equal or greater efficiency. Non-fixed (removable) radioactive surface contamination on the external surface of an

excepted package of limited quantity Class 7 (radioactive) material must meet the requirements specified in § 173.443(a), which has both a quantitative upper limit and an "as low as reasonably achievable" component (see § 173.421(c)). Section 173.443(a)(1) requires that the level of non-fixed radioactive contamination may not exceed the limits set forth in Table 9 of § 173.443. The physical wipe survey technique is an efficient methodology to ensure compliance with the § 173.443(a)(1) requirement. However, some shippers achieve compliance by instituting alternative requirements allowed under § 173.443(a)(1)(ii).

Q4. You ask if a shipper of the sealed buttons that uses brand new boxes from a reputable vendor (such as FedEx) would be excepted from having to perform a wipe test.

A4. New boxes that are received, stored, handled, and prepared for shipment in a manner that assures they have not been exposed to any contamination (e.g., such as ensuring the sources are contamination free, undamaged, and then packaged in a contamination free area) do not require the wipe tests prescribed in § 173.443(a)(1)(i). As previously stated, in accordance with § 173.443(a)(1)(ii), the level of non-fixed contamination may be determined by using other methods of equal or greater efficiency. However, such an alternative practice does not relieve the shipper of meeting the contamination limits of § 173.443(a)(1)(i). If a package were to be discovered to exceed the contamination limits of § 173.443(a)(1)(i), then the shipper would not be compliant with the provisions in § 173.443(a)(1)(ii).

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

T. Glenn Foster
Chief, Regulatory Review and Reinvention Branch
Standard and Rulemaking Division

Edmonson
§173.421
Limited Quantities
16-0016

Dodd, Alice (PHMSA)

From: Geller, Shelby CTR (PHMSA)
Sent: Monday, February 01, 2016 11:20 AM
To: Hazmat Interps
Subject: FW: Request For Clarification On Shipping Radioactive Materials via Common Carrier Transport [FedEX, UPS, etc.]
Attachments: 20160129_105314.jpg; Wall Mounted PRD Verification Block.jpg

Importance: High

Dear Shante and Alice,

Forwarded is a request for a formal letter of interpretation. Mr. Hart spoke with Jordan. His mailing address is:

510 Sable Trace Way
Acworth, GA 30102

Thanks,
Shelby

From: HART, JASON G [mailto:JASON.G.HART@cbp.dhs.gov]
Sent: Friday, January 29, 2016 2:30 PM
To: PHMSA HM InfoCenter
Subject: Request For Clarification On Shipping Radioactive Materials via Common Carrier Transport [FedEX, UPS, etc.]
Importance: High

To whom it may concern,

Good afternoon. I am contacting you today to follow up on a discussion I had with a DOT employee a few days ago. Attached you will find a picture of the label found on a 1 microcurie Cs-137 sealed button source. An additional photo of the source as it is mounted on the side of a Leucite block has been added as well. Based on what I have found in 49 CFR 173.421, Cs-137's activity threshold for Class 7 radioactive material is 0.27 microcuries. Anything below 0.27 microcuries is not considered radioactive, everything above that threshold is; essentially creating a "limited quantity" activity range of 0.27 microcuries up to 540,000 microcuries for Cs-137. Looking at the referenced Table A-2—Exempt Material Activity Concentrations and Exempt Consignment Activity Limits for Radionuclides, it appears as though the NRC states that their exemption for sealed sources is **0.27 microcuries**, supporting what other information what we discussed on the need to perform these contamination smear tests.

By all given references [cited experts below], when shipping these sealed sources in boxes by themselves, it appears as though the exterior surface of the box must be tested for surface contamination according to 49 CFR 173.421 (c). While it may be possible to perform this surface contamination testing, it certainly seems to be an overbearingly difficult requirement to meet for an exempt quantity sealed source. Can you please advise me if this is truly the case with this particular source that is pictured? I hope to hear from you soon.

Best regards,
Jason G. Hart

Health Physicist

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§173.421 Excepted packages for limited quantities of Class 7 (radioactive) materials.

A Class 7 (radioactive) material with an activity per package which does not exceed the limited quantity package limits specified in Table 4 in §173.425, and its packaging, are excepted from requirements in this subchapter for specification packaging, marking (except for the UN identification number marking requirement described in §173.422(a)), labeling, and if not a hazardous substance or hazardous waste, shipping papers, and the requirements of this subpart if:

(a) Each package meets the general design requirements of §173.410;

(b) The radiation level at any point on the external surface of the package does not exceed 0.005 mSv/h (0.5 mrem/h);

(c) The non-fixed contamination on the external surface of the package does not exceed the limits specified in §173.443(a);

(d) The outside of the inner packaging or, if there is no inner packaging, the outside of the packaging itself bears the marking "Radioactive;"

(e) The package does not contain fissile material unless excepted by §173.453; and

(f) The material is otherwise prepared for shipment as specified in accordance with §173.422.

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§173.422 Additional requirements for excepted packages containing Class 7 (radioactive) materials.

An excepted package of Class 7 (radioactive) material that is prepared for shipment under the provisions of §173.421, §173.424, §173.426, or §173.428, or a small quantity of another hazard class transported by highway or rail (as defined in §173.4) which also meets the requirements of one of these sections, is not subject to any additional requirements of this subchapter, except for the following:

(a) The outside of each package must be marked with:

(1) The UN identification number for the material preceded by the letters UN, as shown in column (4) of the Hazardous Materials Table in §172.101 of this subchapter; and

(2) The letters "RQ" on a non-bulk packaging containing a hazardous substance.

(b) Sections 171.15 and 171.16 of this subchapter, pertaining to the reporting of incidents;

(c) Sections 174.750, 175.705, and 176.710 of this subchapter (depending on the mode of transportation), pertaining to the reporting of decontamination;

(d) The training requirements of subpart H of part 172 of this subchapter; and

(e) For a material that meets the definition of a hazardous substance or a hazardous waste, the shipping paper requirements of subpart C of part 172 of this subchapter, except that such shipments are not subject to shipping paper requirements applicable to Class 7 (radioactive) materials in §§172.202(a)(5), 172.202(a)(6), 172.203(d) and 172.204(c)(4).

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from **10 CFR 71 – Packaging and Transportation of Radioactive Material**. Specifically, June 2015's revision of 10 CFR 71.0 and 10 CFR 71.14, which I found somewhat interesting [in bold below]. **§ 71.0 Purpose and scope.**

(a) This part establishes—

(1) Requirements for packaging, preparation for shipment, and transportation of licensed material; and

(2) Procedures and standards for NRC approval of packaging and shipping procedures for fissile material and for a quantity of other licensed material in excess of a Type A quantity.

(b) The packaging and transport of licensed material are also subject to other parts of this chapter (e.g., 10 CFR parts 20, 21, 30, 40, 70, and 73) and to the regulations of other agencies (e.g., the U.S. Department of Transportation (DOT) and the U.S. Postal Service)[1] having jurisdiction over means of transport. The requirements of this part are in addition to, and not in substitution for, other requirements.

(c) The regulations in this part apply to any licensee authorized by specific or general license issued by the Commission 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 NRC license, or transports that material on public highways. No provision of this part authorizes possession of licensed material.

(d)(1) Exemptions from the requirement for license in § 71.3 are specified in § 71.14. General licenses for which no NRC package approval is required are issued in §§ 71.21 through 71.23. The general license in § 71.17 requires that an NRC certificate of compliance or other package approval be issued for the package to be used under this general license.

(2) Application for package approval must be completed in accordance with subpart D of this part, demonstrating that the design of the package to be used satisfies the package approval standards contained in subpart E of this part, as related to the tests of subpart F of this part.

(3) A licensee transporting licensed material, or delivering licensed material to a carrier for transport, shall comply with the operating control requirements of subpart G of this part; the quality assurance requirements of subpart H of this part; and the general provisions of subpart A of this part, including DOT regulations referenced in § 71.5.

(e) The regulations of this part apply to any person holding, or applying for, a certificate of compliance, issued pursuant to this part, for a package intended for the transportation of radioactive material, outside the confines of a licensee's facility or authorized place of use.

(f) The regulations in this part apply to any person required to obtain a certificate of compliance, or an approved compliance plan, pursuant to part 76 of this chapter, 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.

(g) This part also gives notice to all persons who knowingly provide to any licensee, certificate holder, quality assurance program approval holder, applicant for a license, certificate, or quality assurance program approval, or to a contractor, or subcontractor of any of them, components, equipment, materials, or other goods or services, that relate to a licensee's, certificate holder's, quality assurance program approval holder's, or applicant's activities subject to this part, that they may be individually subject to NRC enforcement action for violation of § 71.8.

[1] Postal Service Manual (Domestic Mail Manual), section 124, which is incorporated by reference at 39 CFR 111.1.

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§ 71.14 Exemption for low-level materials.

(a) A licensee is exempt from all the requirements of this part with respect to shipment or carriage of the following low-level materials:

(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. [Per A-2 Cs-137 exemption = 2.7 e-7 curies = 0.27 microcuries]

(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.

(b) A licensee is exempt from all the requirements of this part, other than §§ 71.5 and 71.88, with respect to shipment or carriage of the following packages, provided the packages do not contain any fissile material, or the material is exempt from classification as fissile material under § 71.15:

(1) A package that contains no more than a Type A quantity of radioactive material;

(2) A package transported within the United States that contains no more than 0.74 TBq (20 Ci) of special form plutonium-244; or

(3) The package contains only LSA or SCO radioactive material, provided—

(i) That the LSA or SCO material has an external radiation dose of less than or equal to 10 mSv/h (1 rem/h), at a distance of 3 m from the unshielded material; or

(ii) That the package contains only LSA-I or SCO-I material.

[80 FR 34012, Jun. 12, 2015]

§ 173.443 Contamination control.

(a) The level of non-fixed (removable) radioactive contamination on the external surfaces of each package offered for transport must be kept as low as reasonable achievable. The level of non-fixed radioactive contamination may not exceed the limits set forth in Table 9 and must be determined by either:

(1) Wiping an area of 300 cm2 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, divided by the surface area wiped and divided by the efficiency of the wipe procedure (the fraction of removable contamination transferred from the surface to the absorbent material), may not exceed the limits set forth in Table 9 at any time during transport. For this purpose the actual wipe efficiency may be used, or the wipe efficiency may be assumed to be 0.10; or

(2) Alternatively, the level of non-fixed radioactive contamination may be determined by using other methods of equal or greater efficiency.

Table 9 is as follows:

TABLE 9—NON-FIXED EXTERNAL RADIOACTIVE CONTAMINATION LIMITS FOR PACKAGES

Contaminant	Maximum permissible limits	Bq/cm2	uCi/cm2	dpm/ cm2
1. Beta and gamma emitters and low toxicity alpha emitters		4	10¥4	220
2. All other alpha emitting radionuclides		0.4	10¥5	22

(b) Except as provided in paragraph (d) of this section, in the case of packages transported as exclusive use shipments by rail or public highway only, the removable (non-fixed) radioactive contamination on any package at any time during transport may not exceed ten times the levels prescribed in paragraph (a) of this section. The levels at the beginning of transport may not exceed the levels prescribed in paragraph (a) of this section.

(c) Except as provided in paragraph (d) of this section, each transport vehicle used for transporting Class 7 (radioactive) materials as an exclusive use shipment that utilizes the provisions of paragraph (b) of this section 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 (non-fixed) radioactive surface contamination as specified in paragraph (a) of this section.

(d) Paragraphs (b) and (c) of this section do not apply to any closed transport vehicle used solely for the transportation by highway or rail of Class 7 (radioactive) material packages with contamination levels that do not exceed 10 times the levels prescribed in paragraph (a) of this section if—

(1) 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 (10 mrem per hour) at the surface or 0.02 mSv per hour (2 mrem per hour) at 1 m (3.3 feet) from the surface;

(2) Each vehicle is stenciled with the words ''For Radioactive Materials Use Only'' in letters at least 76 millimeters (3 inches) high in a conspicuous place on both sides of the exterior of the vehicle; and

(3) Each vehicle is kept closed except for loading or unloading.

NRC's Clarification of Several Aspects of Removable Radioactive Surface Contamination Limits for Transport Packages

See IE Information Notice No. 85-46 entitled as above and dated June 10, 1985. Clarification and guidance are provided on (1) averaging of wipe samples, (2) use of higher efficiency (>10%) wipe sampling methods, (3) wrapping of packages (casks), and (4) exclusive-use vehicle surveys for surface contamination.

AVERAGING OF WIPE SAMPLES:

The DOT regulations currently state in 49 CFR 173.443 (a) that "... the amount of radioactivity measured on any single wiping material when averaged over the surface wiped ..." shall not exceed the limits of 49 CFR 173.443, Table 10. Prior to the regulatory amendments by DOT in 1983 (Docket HM-169, 48 FR 10238, March 10, 1983), formerly applicable 173.397 (a) provided that wipe samples could be "... averaged over any area of 300 cm2 of any part of the package surface."

We understand that it was "not" DOT's intention to disallow such averaging and further that DOT will consider processing a future rule change to restore such a provision to 173.443. In the interim, until the text has been formally modified, we will continue to consider that averaging of multiple wipe samples over any 300 cm2 area of a package surface is an acceptable practice. [Note: Never changed in DOT 49 CFR 173.443 (a) (1). See 10 CFR 71.87 (h) (i) (1). NRC adopted DOT language.]

USE OF HIGHER EFFICIENCY WIPE SAMPLES:

49 CFR 173.433 (a) states: "Other methods of assessment of equal or greater efficiency may be used. When other methods are used, the detection efficiency of the method used shall be taken into account and in no case shall the nonfixed contamination on the external surfaces of the package exceed ten times the limits listed in Table 10." DOT considers that the statement "other methods of assessment of equal or greater efficiency may be used," also includes other wipe sampling methods wherein the efficiency has actually been demonstrated to be greater than 10%. Therefore, in effect, the wipe sample limits stated in 173.443 (a) and (b) and Table 10 therein, are limits "by default," which do not take advantage of utilizing an efficiency greater than 10%.

In evaluations of licensees' package surveys, NRC plans to accept assessments based on efficiencies which have been appropriately demonstrated to have an efficiency higher than 10%. The higher efficiency of the wipe sampling method must be documented and in no case may the removable levels exceed 10 times the values in Table 10 of 49 CFR 173.443.

WRAPPING OF PACKAGES (CASKS):

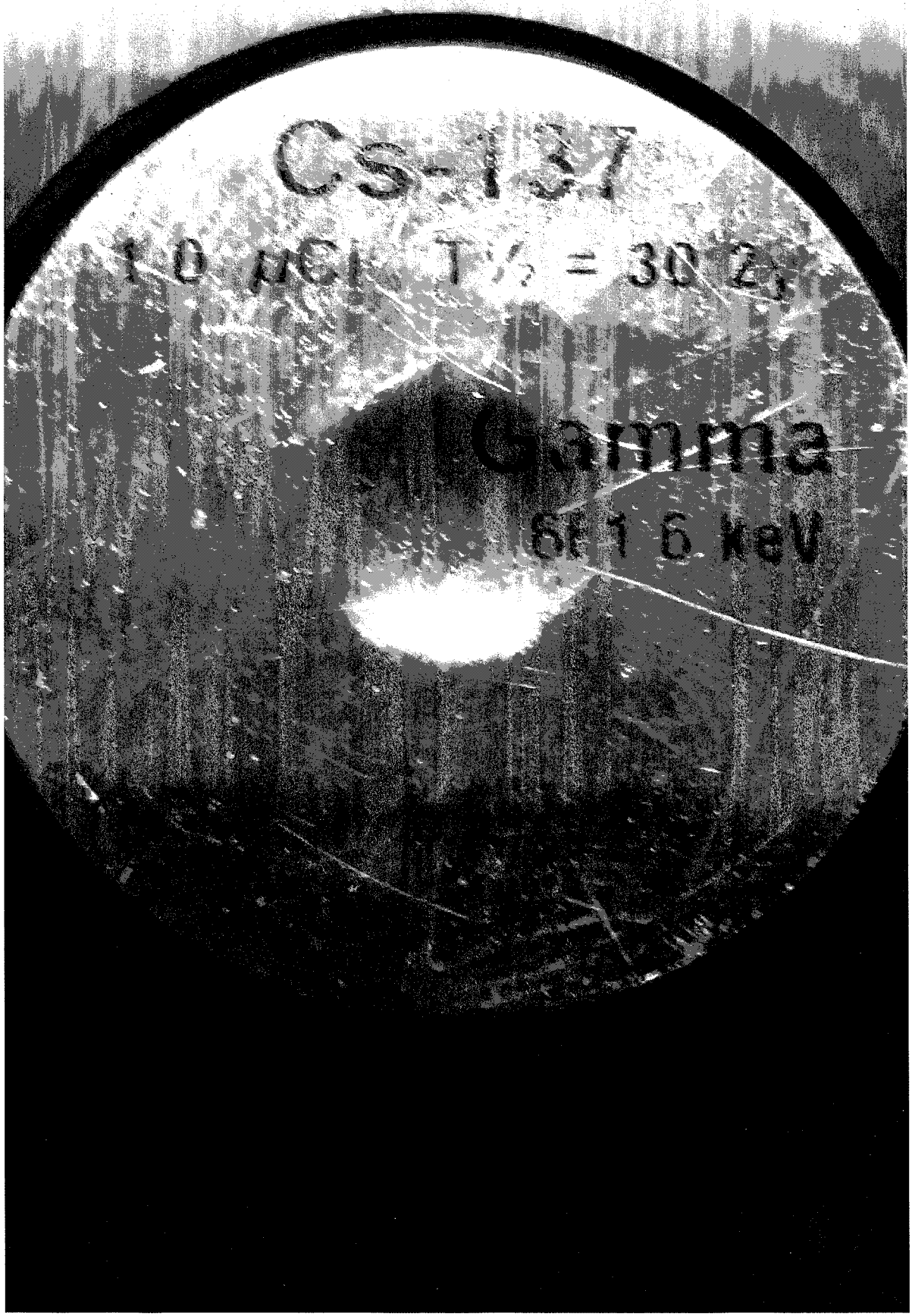
"Weeping" of contamination may occur on casks that have been immersed in spent fuel storage pools. The issue of whether exterior "wrapping" of casks can be used to achieve compliance with removable contamination limits has been raised on a number of occasions. The reply from DOT on this matter read as follows: "For both NRC-certified and non-NRC-certified packages, any wrapping must be addressed in the package design evaluation" (e.g., heat retention since the contents are a heat source). "For NRC-certified packages this would include specific mention in the certificate of compliance.

For DOT Specification 7A, Type A, packages, the shipper's package safety evaluation would have to document the ability of the wrapping to successfully pass the Type A tests" (e.g., the wrapping would maintain its closure integrity during normal conditions of transport).

EXCLUSIVE-USE VEHICLE SURVEYS FOR SURFACE CONTAMINATION:

For packages shipped as exclusive-use by rail or highway, the provision of 173.443 (b) provides that the removable (nonfixed) radioactive surface contamination at any time "during transport" may not exceed "10 times" the limits of 49 CFR 173.443 Table 10. At the "beginning" of transport, however, the levels may not exceed those stated above.

Further, pursuant to 173.443 (c), any transport vehicle in which packages are transported within the "factor of 10" higher values (e.g., above the Table 10 limits), must be surveyed with appropriate radiation detection instruments after each use and shall not be returned to service until the radiation dose rate is below 0.5 mrem/hr and the removable contamination is below the limits stated above (49 CFR 173.443, Table 10). An exception to this vehicle survey requirement is provided by 173.443 (d) for closed transport vehicles (highway) which are dedicated solely to the transport of radioactive material packages and are appropriately marked on the exterior of the vehicle. Also, in such cases the removable surface contamination on packages within such vehicles may be at the "factor of 10" limits at the "start" of transport.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Gamma
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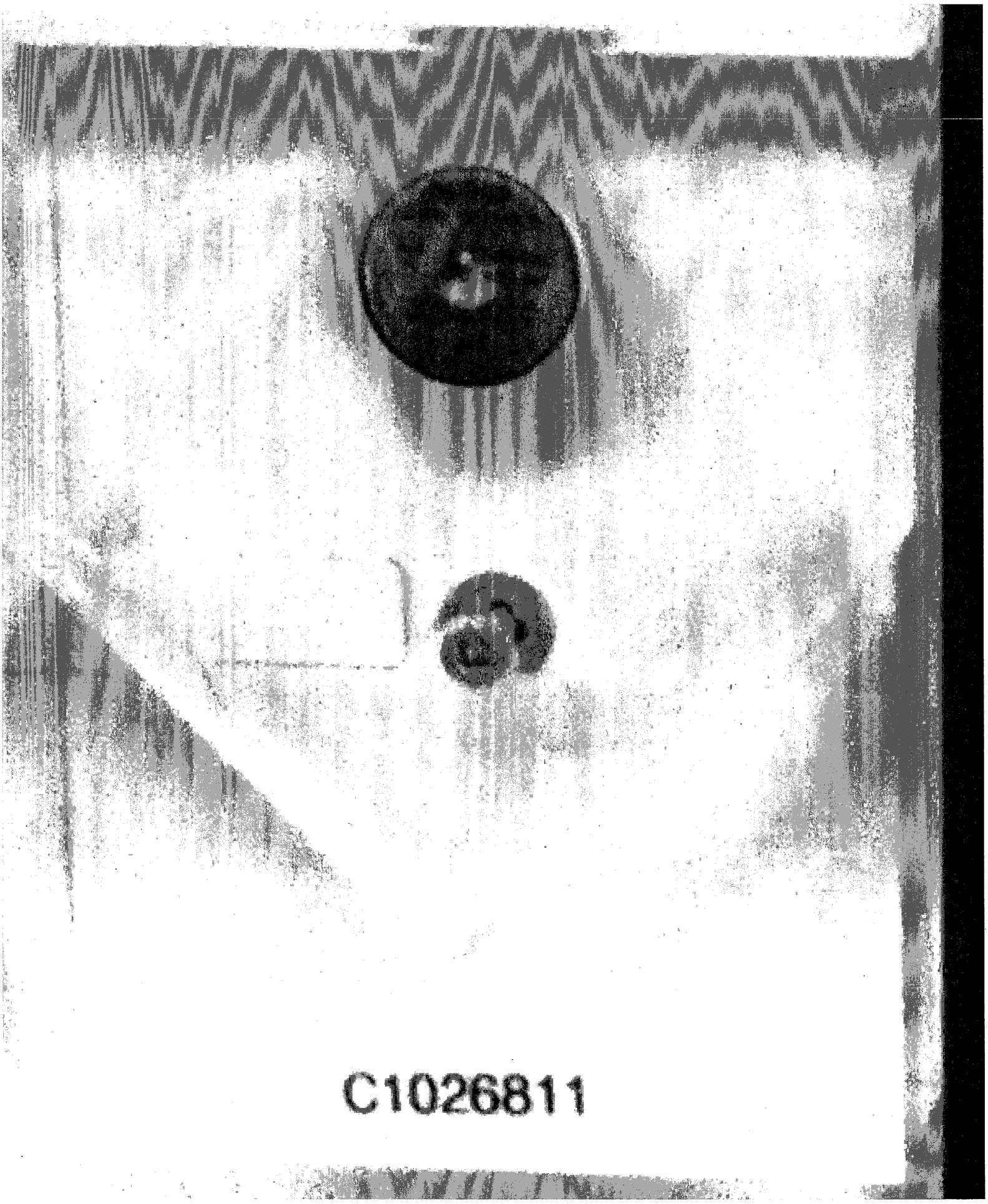

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