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N14 PACKAGING AND TRANSPORTATION OF RADIOACTIVE AND HAZARDOUS MATERIAL

American National Standard

For Radioactive Materials — Guidance for Packaging Type A Quantities of Radioactive Materials

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American National Standard
for Radioactive Materials —

Guidance for Packaging Type A Quantities of Radioactive Materials

Secretariat

Institute for Nuclear Materials Management

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FOREWORD*

Subcommittee N14.7, "Guidance for Packaging Type A Quantities of Radioactive Material," developed this standard as guidance under the procedures of the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) N14, "Packaging and Transportation of Radioactive and Non-Nuclear Hazardous Materials." The Institute of Nuclear Materials Management is the sponsoring organization and secretariat for ANSI ASC N14, which has the following scope:

> *Preparation of standards for the packaging and transportation of fissile and radioactive materials, non-nuclear hazardous materials including waste and mixed materials, but not including movement or handling during processing and manufacturing operations.*

Each day thousands of shipments of radioactive materials are transported within the United States (US) and internationally. These consignments, which are carried by road, rail, sea, air, and waterways, can range from small quantities of radioactive materials requiring an excepted packaging to large quantities requiring a Type B packaging. The majority of the packagings used in the United States carry Type A quantities of radioactive materials for nuclear medicine applications. Type A packages are intended to provide economical transport for large numbers of low activity consignments while at the same time achieving a high level of safety. The safety record of these radioactive material shipments has historically been excellent. Very few serious injuries, overexposures, or environmental consequences have been attributed to the radioactive nature of the materials being transported or to accidents in transport of such materials. Nevertheless, the US Department of Transportation has recognized the need for effective implementation of current Type A package regulations. To ensure continuation of the excellent performance record of Type A packages in all modes of transportation, the ANSI Nuclear Standards Management Board identified subjects in the area of radioactive materials transport for which standards would be helpful. Preparation of this standard, as well as others, resulted from that decision.

This standard was prepared to provide guidance to individuals responsible for developing the design of packagings for transport of radioactive material limited to Type A quantities of radioactive material including fissile material that does not exceed the limits authorized under the general license sections of the US Nuclear Regulatory Commission regulation for packaging and transportation of radioactive material. This standard is also intended to assist those who test, evaluate, fabricate, fill, ship, or otherwise perform functions related to Type A packages in accordance with applicable regulatory requirements. The designer and shipper/offeror should also apply radiation protection principles so that exposure during loading of the packaging and its use is as low as reasonably achievable. An underlying assumption is that trained and qualified individuals are classifying the material to be shipped; determining the packaging selection; marking, labeling, and placarding the transport vehicle as appropriate; and completing all necessary requirements for the shipping papers.

A matrix in Annex A has been provided to assist in understanding the training requirements identified in 49 CFR 172.704 for performing the various functions discussed in this standard. The matrix includes training for those who design, test, fabricate, and ship Type A packagings that meet the requirements of 49 CFR 178.350, Specification 7A, general packaging, Type A.

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*This foreword is not a part of American National Standard ANSI N14.7, *Guidance for Packaging Type A Quantities of Radioactive Materials.*

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1. INTRODUCTION

Type A packaging is one of the most commonly used packagings for shipment of radioactive material by industry and the government. Type A packaging is intended to provide containment of contents and shielding integrity during routine and normal conditions of transportation, including rough handling or minor mishaps (loading/unloading operations). Type A package safety standards are based on the following two fundamental principles.

- Type A packages are designed, constructed, and prepared for shipment so that the radioactive material will not leak from the package and any necessary shielding will remain effective under specified tests and conditions. These tests simulate routine (incident free) and normal (minor mishaps) conditions of transport, including environmental conditions of high and low temperature, rain and snow, and changes in atmospheric pressure that may be encountered during transport and rough handling by transport workers.
- The Type A quantity of radioactive material is based on the "Q system" prescribed in the International Atomic Energy Agency (IAEA) *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Materials, TS-G-1.1 (ST-2)*. The Q system defines the quantity limits in terms of the "A_1" and "A_2" values of a radionuclide that is allowed in a Type A package. The regulations provide the content limits for a Type A package so that the radiological consequences of severe damage to a Type A package are within acceptable limits and design approval by the competent authority is not required except for packages containing fissile material.

The US Department of Transportation (DOT) does not provide authorization for Type A packages. However, DOT allows self-certification of a Type A package provided that the shipper/offeror of the package offered for transportation ensures that it fully meets applicable DOT regulations. The self-certification or an approval for transportation is a result of fully documented demonstration of performance—through testing, evaluation, or analysis—of a package design, including its specific content. Each time the content (e.g., content mass, form, or geometry) or the packaging components change, the capability of the new package design is to be fully evaluated with respect to Type A performance criteria before a Type A designation is applied to the package. This evaluation is to be documented and may range from complete retesting to an engineering analysis. In all cases, the technical data and computational methods used, as well as the engineering reasoning that leads to the conclusion that the packaging complies with Type A requirements, is documented.

1.1 INTERNATIONAL TRANSPORT REGULATIONS

International regulations for the transport of radioactive materials are based on the IAEA regulations for the safe transport of radioactive material (TS-R-1). Most IAEA member states base their national regulations on these international regulations.

US authorities actively participate in the development of the IAEA regulations, and DOT regulations are based upon the IAEA regulations with some technical and administrative differences. US regulations allow shipments that meet the IAEA regulations into and out of the United States. As there are technical differences between DOT and IAEA regulations, it is recommended that the user of the package refer to the IAEA regulations for international shipments.

In keeping with the changes occurring in the international transport of radioactive materials, both conventional and International System (SI) units of measurement are presented in this standard. This dual presentation is intended to make it easier for shippers and carriers to transition to use of the SI units.

1.2 PURPOSE

The purpose of the standard is to provide guidance on compliance with the DOT regulations for radioactive materials packaging identified in 49 CFR 178.350.

1.3 SCOPE

This standard was prepared to provide guidance to individuals responsible for developing the design of packagings for transport of radioactive material limited to Type A quantities including fissile material that does not exceed the limits authorized under the general license sections of the US Nuclear Regulatory Commission regulation for packaging and transportation of radioactive material. This standard is also intended to assist those who test, evaluate, fabricate, fill, ship, or otherwise perform functions related to Type A packages in accordance with applicable regulatory requirements.

The scope does not include Type A packaging containing fissile material in accordance with 10 CFR 71.55 that requires a certificate of compliance from the NRC or DOE.

This standard is not a substitute for any regulations. Following the guidance in this document does not exempt an individual from complying with applicable federal and state requirements governing the transportation of radioactive materials.