

RADIOACTIVE AND NUCLEAR MATERIAL TRANSPORT SECURITY

- Awareness and application of new recommendations –

Ann-Margret Eriksson
International Atomic Energy Agency
P.O. Box 100, A-1400, Vienna, Austria

Richard R. Rawl
Consultant, Transportation Security and Safety
133 Baypath Drive, Oak Ridge, TN 37830 USA

Abstract

Transport of radioactive and nuclear material is highly regulated and transport safety regulations have been in effect for decades. Nuclear material transport security has been governed for many years on the basis of a binding international convention, the “Convention for the Physical Protection of Nuclear Material”, and its supporting document “The Physical Protection of Nuclear Material and Nuclear Facilities” INFCIRC/225, Revision 4 (corrected). On the other hand, transport security guidance for radioactive material was published in 2008 by the International Atomic Energy Agency (IAEA) as an implementing guide, “Security in the Transport of Radioactive Material”, NSS No. 9, and is just now being implemented in many countries.

Experience in implementing the radioactive material transport security guidance is being gained by countries as they make decisions on which specific security provisions to require, provide training to their regulatory staff and licensees, and begin reviewing and approving transport security plans. This experience has led to the development of practical approaches that minimize impacts as the guidance is put into practice.

The nuclear material transport security recommendations in INFCIRC/225 are in the process of being revised to update them and to incorporate recommendations based on the recent amendments made to the Convention. This revision will be published as a new recommendations level document in the IAEA Nuclear Security Series of documents.

The interface between the nuclear and radioactive material transport security documents is important in order to ensure that appropriate security measures, based on both the nuclear and radioactive properties of the material being transported, are defined and implemented.

This paper provides up to date information on the development of the IAEA transport security documents and presents information on implementation of the radioactive material transport security recommendations. It explains how the documents interface with each another and provides examples of how they should both be used in defining transport security requirements for shipments.

Security of Radioactive Material during Transport

The IAEA guidance on security of radioactive material during transport does not have long history and widespread implementation that has been accomplished in transport safety. While the security of nuclear (fissile) material¹ has been addressed since 1979 and guidance material² has been available to support implementation, the same situation does not exist for non-fissile radioactive material. Heightened awareness of the need to secure such materials during transport has led to a series of developments aimed at defining and supporting the uniform implementation of transport security requirements.

Recognizing the need for increased security following the events of September 11, 2001, the UN Committee of Experts³ introduced measures to enhance security for the transport of all dangerous goods in the 12th Revised Edition of the Model Regulations. These security measures were developed with input from many affected parties and reflect what the Committee at that time felt was a balanced approach between security improvements and operational impacts. These recommendations are contained in Chapter 1.4 where there are basic security recommendations applicable to the transport of all dangerous goods and additional recommendations for high consequence dangerous goods such as certain explosives and bulk quantities of specific dangerous good classes. An indicative list of high consequence dangerous goods is provided in the Chapter.

While the security measures and definition of high consequence radioactive material added to the Model Regulations were recognized as a very positive step, the IAEA initiated a review of these provisions to ensure they were technically sound and consistent with other approaches used in nuclear and radioactive material security. These efforts led to the publication of Nuclear Security Series No.9 “Security in Transport of Radioactive Material” (NSS No.9) in 2008⁴. This document is an “implementing guide” within the Nuclear Security Series of documents.

In the early versions of the Transport Regulations, there has been a threshold for denoting what constitutes a “large quantity” of radioactive material. In the current Transport Regulations this is 3,000 A₁ for special form material and 3,000 A₂ for non-special form material. So the IAEA at that time agreed that this was a suitable threshold for identifying high consequence radioactive material with the observation that the dangerous goods security recommendations should not apply to nuclear (fissile) material that is already subject to the physical protection requirements of the Convention for the Physical Protection of Nuclear Material and INFCIRC/225. These recommendations provided the basis for the Class 7 (radioactive material) high consequence definition in Chapter 1.4 of the Model Regulations.

¹ *The Convention on the Physical Protection of Nuclear Material*, INFCIRC/274/Rev 1, IAEA, Vienna, 1980

² *The Physical Protection of Nuclear Material and Nuclear Facilities*, INFCIRC/225, Rev 4 (Corrected), IAEA, Vienna, 1999

³ The official title of the committee is now “Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized system of Classification and Labelling of Chemicals”.

⁴ *Security in Transport of Radioactive Material*, Nuclear Security Series No.9, IAEA, Vienna, 2008

During development of NSS No.9, technical evaluations of the definition of high consequence radioactive material were performed. This is a key definition since it sets the threshold radioactivity level that separates the “basic” and “enhanced” security levels. After extensive consideration of the purpose for the threshold (preventing an undesired outcome which was a defined consequence dispersion event) a revised threshold was recommended and included in NSS No.9. Details of this analysis can be found in the Appendix of NSS No. 9. It was recommended that the threshold be revised to correspond to the IAEA “Code of Conduct on the Safety and Security of Radioactive Sources” Category 2 threshold for radionuclides covered by that Code and, for all other radionuclides, 3,000 A₂.

The new recommended threshold values as well as some additional security recommendations have been proposed by the IAEA to the UN Committee of Experts. The recommended changes are being addressed in two steps: the new threshold values were accepted by the committee at its meeting in June 2010; and the additional security recommendations will be discussed at the meeting of the committee in December 2010.

The radioactive material transport security guidance in NSS No.9 includes the following recommendations:

1. some radioactive materials, such as certain excepted packages and low specific activity materials and surface contaminated objects that can be shipped unpackaged, do not warrant security measures above prudent management practices;
2. two categories of security measures – basic and enhanced, are sufficient for specifying appropriate measures and having two categories is consistent with the approach used for other dangerous goods;
3. the threshold for high consequence radioactive material is defined on the basis of analyses done on the consequences of intentional dispersal and in consideration of developments in the safety and security of radioactive sources; and,
4. additional measures that Member States might wish to consider in view of their national Design Basis Threat, their assessment of the prevailing threat, or for shipments of material that may be particularly attractive to adversaries.

Exceptions from security recommendations

The guidance recommends that no transport security measures above prudent management practices should be required for:

- excepted packages, unless the package contains an activity above that allowed for non-special form material. As special form cannot be considered a protective measure for security purposes, not all excepted packages can be excluded from the security recommendations.
- low specific activity material in category LSA-I that can be shipped unpackaged
- surface contaminated objects in category SCO-I that can be shipped unpackaged

Two categories of security measures

Radioactive materials as they are currently transported present a very wide spectrum of attractiveness for malicious use. Materials and packages with potentially significant but limited consequences such as Type A packages, LSA-II and -III, and SCO-II have some attractiveness. Packages containing high activities such as large sealed sources or bulk quantities of radionuclides (especially in dispersible form) could be very attractive for malicious use. Even with this broad spectrum of attractiveness, it was concluded that two security categories could be used to specify appropriate measures, particularly in light of the desirability to be consistent with the security recommendations for all other classes of dangerous goods as specified in the Model Regulations. The recommendations also recognize that additional security measures are appropriate when a country determines these are warranted.

As previously noted, two security categories (or levels) are recommended – a “basic level” and an “enhanced level”. The specific security measures recommended for each level are drawn from the Model Regulations and, where necessary, tailored for application to radioactive material shipments.

At the basic level, the security measures include: security awareness training and periodic retraining of personnel who are involved in transport security; maintenance of training records; using only known carriers and properly identified personnel; and, using properly secured in-transit storage areas.

Enhanced security measures include a requirement that consignors, carriers and other persons engaged in the transport of high consequence radioactive material adopt, implement, and comply with a security plan that addresses:

- allocation of responsibilities and authority to fulfill these responsibilities
- records of material transported
- review of operations and assessment of vulnerabilities
- clear statement of measures to be used to reduce security risks
- procedures for reporting and dealing with security threats, breaches, and incidents
- testing of security plans and periodic review and update of plans
- security of information including limiting distribution of information

Recommendations on the Transport of Nuclear Material

In 2008 the IAEA initiated revision of INFCIRC225/Rev.4, “Physical Protection of Nuclear Material and Associated Facilities”. Several consultancy meetings, drafting groups and two technical meetings have been convened to prepare the revision of the document. A draft Revision 5 was distributed in April 2010 to IAEA Member States for review and comment.

A transport working group was established to ensure accurate and up to date revision of the chapter dealing with transport security recommendations. The transport working group consisted of representatives from Belgium, France, Japan, United Kingdom, the

United States and a representative from the World Nuclear Transport Institute. The transport working group met three times and assisted the revision effort by drafting proposed changes and reviewing the transport security revisions included in the various drafts.

The main task of the transport working group was to update and strengthen the security provisions where current security approaches, technology and transport practices allow and to make sure that there is as much consistency as possible between the recommendations for radioactive material transport and nuclear material transport.

The transport security chapter in Revision 5, like other chapters in the new revision, has been structured differently from the Revision 4. It starts with general provisions for all nuclear material transport and, building on that, adds specific recommendations for Category III then adds further recommendations for Category II and finally adds the most stringent recommendations for Category I. This new structure reduces repetition in the document. The recommendations on international shipments have been clarified and better reflect how these shipments are made today.

One of the most important changes is that a transport security plan is now recommended for all shipments of Category I and II nuclear material.

A technical meeting will convene 27 September – 1 October, 2010 which is expected to finalize INFCIRC 225, Revision 5.

Interface between the Transport Security Guidance Documents

The interface between the two documents for security during transport of nuclear material and radioactive material has been made more visible as there is now a cross reference between the documents. For example, in section 7.1 “Requirements for physical protection of nuclear material against unauthorized removal during transport” in INFCIRC/225, Rev. 5 it states “Levels of protection defined in this section are based on categorization of *nuclear material* for use in the construction of a nuclear explosive device. However, nuclear material is radioactive material, which has also to be protected against unauthorized removal that could have significant consequences if dispersed or used otherwise for a malicious purpose. Protection recommendations against *unauthorized removal of nuclear material* for potential subsequent off-site radiological dispersal are provided in the Nuclear Security Recommendations on Radioactive Material and Associated Facilities.” The Nuclear Security Recommendations on Radioactive Material and Associated Facilities is the recommendations level document in the Nuclear Security Series for which NSS No. 9 provides more detailed implementing guidance. This means that when defining security requirements for nuclear material both sets of recommendations should be used (in conjunction with their respective categorization approaches) and the most stringent security recommendations should be applied.

The transport of nuclear (fissile) material should be undertaken in accordance with both the recommendations in INFCIRC/225 and the guidance for security of radioactive material in transport (NSS No.9). There is some overlap between the two documents and

a comparison of INFCIRC/225, Revision 5 and the radioactive material transport guidance shows that for:

- Category I nuclear material – the security measures of INFCIRC/225 are more stringent (e.g., requiring escorts)
- Category II nuclear material – the security measures of INFCIRC/225 are roughly comparable to the enhanced security measures
- Category III nuclear material – the security measures of INFCIRC/225 are roughly comparable to the basic security measures
- Lower than Category III nuclear material – the security measures in NSS No. 9 are comparable for some quantities of nuclear material (e.g. low enriched uranium) and are more stringent for others (e.g. plutonium)

Consequently, if a package containing Category III or lower nuclear material has an activity level exceeding the transport security radioactivity threshold, it must meet additional security measures due to its radiological potential for malicious use.

Conclusion

The IAEA security guidance for transport of radioactive material was published in September 2008. Based on it and at the recommendation of the IAEA, the new threshold values were accepted by the UN Committee of Experts at its meeting in June 2010 and will be incorporated in the next revision of the UN Model Regulations. The revised security guidance for radioactive material will be presented to the UN Committee of Experts in December 2010. It is expected that these actions will lead to greater harmony between the IAEA recommendations and the Model Regulations. However, the IAEA guidance will continue to include more stringent security measures that a State may want to consider based on their national threat or if a transport may be especially attractive to potential adversaries.

Revisions have been proposed for the transport security recommendations in INFCIRC/225, Rev.4, “Physical Protection of Nuclear Material and Nuclear Facilities”. The transport security recommendations have been strengthened and current best practices have been taken into consideration. The draft INFCIRC/225, Rev.5 has been circulated for review and comment and a final technical meeting is scheduled for September 2010 that is expected to lead to the publication of the revised recommendations.

The transport community should be aware that as international organizations and countries move to implement these recommendations and guidance, there may be changes in transport security requirements, both internationally and within any given country.