

IAEA Recommendations and Guidance on Security in Transport of Nuclear and Other Radioactive Material

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Abstract

Revision of the International Atomic Energy Agency (IAEA) recommendations for security of nuclear and other radioactive material has resulted in the need to ensure that the supporting transport security guidance is kept up to date. Several activities have been completed in this regard and the results are being implemented throughout the world.

The IAEA publication "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)", Nuclear Security Series No. 13, has been revised to take into account recent developments, including the amendments to the Convention on the Physical Protection of Nuclear Material (CPPNM). Nuclear Security Series No. 13 is a recommendations-level document in the IAEA Nuclear Security Series of documents and was published in 2011. Transport security recommendations are included in the scope of the document and were extensively revised from the recommendations contained in the previous version (Revision 4, corrected).

An implementing guide "Physical Protection of Nuclear Material during Transport" has been developed to assist States in their implementation of the new transport security recommendations. The guide provides more detailed information on how the recommendations can be put into practice. The interface between the nuclear and radioactive material transport security documents is also covered 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.

Similarly, recommendations for security of other (non-nuclear) radioactive material have been developed as the "Nuclear Security Recommendations on Radioactive Material and Associated Facilities" (Nuclear Security Series No. 14). While an implementing guide on radioactive material transport security has been available for several years, it is being reviewed to ensure it is up to date and fully consistent with the recommendations.

This paper provides information on the IAEA nuclear and radioactive material transport security recommendations and guidance, including future plans to keep this information up to date.

IAEA Nuclear Security Series of Documents

The IAEA has developed a structured approach for its nuclear security documents. This approach helps ensure that suitable information is available to Member States at all topical levels – from high level essential elements of a State's nuclear security regime to detailed technical guidance on specific subjects.

The document structure includes the following levels of documents:

- *Nuclear Security Fundamentals* contain objectives, concepts and principles of nuclear security and provide the basis for security recommendations.
- *Recommendations* present best practices that should be adopted by Member States in the application of the Nuclear Security Fundamentals.
- *Implementing Guides* provide further elaboration of the Recommendations in broad areas and suggest measures for their implementation.
- *Technical Guidance* publications include: Reference Manuals, with detailed measures and/or guidance on how to apply the Implementing Guides in specific fields or activities; Training Guides, covering the syllabus and/or manuals for IAEA training courses in the area of nuclear security; and Service Guides, which provide guidance on the conduct and scope of IAEA nuclear security advisory missions.

Transport security is included in the Nuclear Security Fundamentals document¹, is included in the recommendations-level documents for security of nuclear and radioactive material and has detailed guidance available (or under development) in two implementing guides.

Security of Radioactive Material in Transport

The IAEA guidance on security of radioactive material during transport does not have the long history and widespread implementation that has been accomplished in transport safety. While the security of nuclear (fissile) material has been addressed since 1979² and recommendations-level information³ 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 Experts⁴ introduced measures to enhance security for the transport of all dangerous goods in the 13th Edition (2003) 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, including radioactive material.

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” in 2008⁵. This document is an “implementing guide” within the Nuclear Security Series of documents.

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”⁶ Category 2 threshold for radionuclides covered by that Code and, for all other radionuclides, 3,000 A₂.

The IAEA proposed the new recommended threshold values to the UN Committee of Experts and the proposal was accepted. Revised threshold values were included in the 17th Edition of the Model Regulations (2011).

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) or easily portable package containing radioactive sources (such as radiography cameras) could be very attractive to adversaries. 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 UN Model Regulations. The recommendations also recognize that additional security measures are appropriate when a country determines these are warranted based on its assessment of threat or the nature of the material.

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

When a State determines, on the basis of threat or nature of the material, that additional security measures are warranted, the measures recommended for consideration include:

- additional training, especially on implementing security responsibilities
- licensing of carriers, auditing their security procedures and formal review and approval of their security plans

- automated and real time tracking, including a control centre to monitor the movement of the conveyance and its status
- guards, suitably equipped and trained (especially if they are armed)
- search of conveyances prior to loading and shipment
- specially designed conveyances with additional security features
- review and exercising of the response plan
- additional information security measures such as secure communications

NSS No. 9 should be consulted for the complete list of additional security measures recommended for consideration.

Subsequent to the development of the transport security implementing guide, NSS No. 9, the IAEA developed a comprehensive set of recommendations on security of radioactive material and associated facilities⁷ (also known as NSS No. 14). The recommendations and the implementing guide are generally consistent with each other despite the guide being developed first. Experience in using the implementing guide has highlighted some improvements that can be made and the IAEA has initiated an effort to determine how it should be updated.

Security of Nuclear Material in Transport

In 2008 the IAEA initiated revision of INFCIRC225/Rev.4 (Corrected), “Physical Protection of Nuclear Material and Associated Facilities”. Several consultancy meetings, drafting groups and two technical meetings were convened to prepare the revision of the document.

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 INFCIRC/225/Revision 5 (published as IAEA Nuclear Security Series No. 13), like other chapters in the new revision, has been structured differently from 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 more significant changes is that a

transport security plan is now recommended for all shipments of Category I and II nuclear material.

The levels of protection to prevent unauthorized removal are based on the categorization the nuclear material for use in the construction of a nuclear explosive device (NSS No. 13, paragraph 6.1). However, some nuclear material does not warrant stringent physical protection protections based on its nuclear characteristics but does represent a significant radiological dispersal hazard. NSS No. 13 recognizes this and specifies that both sets of recommendations (NSS Nos. 13 and 14) should be considered and the more stringent of the recommendations should be applied. A comparison of NSS No. 13 (and its draft transport implementing guide) with NSS No. 14 (and its existing transport implementing guide (NSS No. 9)) shows that, in general, for:

- Category I nuclear material – the security measures of NSS No. 13 are more stringent (e.g., requiring guards/escorts, a transport control center, etc.)
- Category II nuclear material – the security measures of NSS No. 13 are roughly comparable to the NSS No. 9 enhanced security level measures (e.g. a transport security plan)
- Category III nuclear material – the security measures of NSS No. 13 are less stringent than the NSS No. 9 enhanced security level and are roughly comparable to NSS No. 9 basic security level
- Lower than Category III nuclear material – the security measures of NSS No. 13 are less stringent than the NSS No. 9 enhanced security level (e.g. for small quantities of plutonium) and are comparable to the NSS No. 9 basic security level (e.g. for low enriched uranium)

Consequently, if a package containing Category III or lower nuclear material has an activity level exceeding the transport security radioactivity threshold (putting it into the enhanced security level), it must meet additional security measures due to its potential radiological consequences. In all cases the recommendations in each document should be considered since they call for different security measures.

In addition to detailed recommendations to prevent unauthorized removal of nuclear material during transport, NSS No. 13 also contains recommendations on:

- measures to locate and recover nuclear material missing or stolen during transport
- physical protection of nuclear material against sabotage during transport
- measures to mitigate or minimize the radiological consequences of sabotage during transport

A technical meeting was held 27 September – 1 October, 2010 to finalize the draft and provide the IAEA with any further revisions felt to be desirable. After the results were integrated into the final draft, the document was published in February 2011.

Soon after NSS No. 13 was published, activities were undertaken to develop a transport security implementing guide. A series of consultants meetings prepared a draft document and an IAEA technical meeting held 23 – 27 July 2012 reviewed the draft and provided comments on it. The comments from the technical meeting were taken into account and a final draft was circulated in February 2013 to Member States for 120-day review. Those

comments have been received by the IAEA and are being taken into account while finalizing the document for publication.

The draft implementing guide is structured along the lines of NSS 13 since it supports the implementation of that document. It describes:

- the transport significance of the fundamental principles in a State's physical protection regime
- approaches for characterizing nuclear material for transport security
 - nuclear material categorization and aggregation
 - potential radiological consequences (Category III and lower)
 - potential radiological consequences of sabotage
 - identification of the applicable (i.e., most stringent) physical protection measures taking all characteristics into account
- roles and responsibilities of the shipper, carrier and receiver
- measures against unauthorized removal of nuclear material in transport
 - mode independent provisions
 - mode dependent provisions (road, rail, maritime and air transport)
- measures to locate and recover missing or stolen material
- measures for protection against sabotage
- measures to mitigate or minimize the radiological consequences of sabotage
- an Annex with suggested elements to include in a transport security plan
- an Annex on performing a transport security vulnerability assessment

Conclusion

The IAEA implementing guide for security of radioactive material in transport 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 and were incorporated in the 17th Edition of the UN Model Regulations (2011).

Revisions have been made to the transport security recommendations in INFCIRC/225, Rev.4 (Corrected), “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 document has been published as IAEA NSS No. 13, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)” and drafting of a transport security implementing guide is well advanced.

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.

References

- ¹ *Objective and Essential Elements of a State's Nuclear Security Regime*, Nuclear Security Series No. 20, IAEA, Vienna, 2013
- ² *The Convention on the Physical Protection of Nuclear Material*, INFCIRC/274/Rev 1, IAEA, Vienna, 1980
- ³ *Recommendations for the Physical Protection of Nuclear Material*, INFCIRC/225, IAEA, Vienna, 1975, and its revisions
- ⁴ 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”
- ⁵ *Security in Transport of Radioactive Material*, Nuclear Security Series No. 9, IAEA, Vienna, 2008
- ⁶ *Code of Conduct on the Safety and Security of Radioactive Sources*, IAEA, Vienna, 2004
- ⁷ *Nuclear Security Recommendations on Security of Radioactive Material and Associated Facilities*, Nuclear Security Series No. 14, IAEA, Vienna, 2011