



Security in the transport of radioactive material - Interim Guidance for Comment

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While the IAEA has provided specific guidance for physical protection in the transport of nuclear material, its previous publications have only provided some general guidelines for security of non-nuclear radioactive material in transport. Some basic practical advice has been provided in the requirements of the *International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources* (BSS) [1]. These guidelines were primarily directed toward such issues as unintentional exposure to radiation, negligence and inadvertent loss. Recently, the IAEA published a document on the security of sources, which included some general guidance on providing security during transport of the sources.

However, it is clear that more guidance is needed for security during the transport of radioactive material in addition to those already existing for nuclear material. Member States have requested guidance on the type and nature of security measures that might be put in place for radioactive material in general during its transport and on the methodology to be used in choosing and implementing such measures.

The purpose of the TECDOC on *Security in the Transport of Radioactive Material* being developed by the IAEA is to provide an initial response to that request. This interim guidance is being developed with a view to harmonizing the security guidance — as much as possible — with existing guidance from the IAEA for the transport of radioactive sources and nuclear material. It is also intended to harmonize with model requirements developed in 2002–2003 by the United Nations Economic and Social Council's Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonised System of Classification and Labelling of Chemicals which was issued as general security guidelines for all dangerous goods, including radioactive material, and that will shortly be implemented as binding regulations by the international modal authorities.

The publication of this document will allow comment on the measures that might be taken to enhance security during the transport of radioactive material that may ultimately be incorporated into a more formal guidance document.

1. BASIS AND OBJECTIVES

The TECDOC builds on the principles set forth in the UN “*Model Regulations*” [2] published in 2003 and the already existing IAEA security documents such as the *Physical Protection Objectives and Fundamental Principles* [3] approved by the Board of Governors in 2001, INFCIRC/225/Rev4 [4] issued in 1999, the *Revised Code of Conduct on the Safety and Security of Radioactive Sources* [5] issued in 2004, and the interim guidance on the *Security of radioactive sources* [6], IAEA-TECDOC-1355, issued for comment in 2003.

A primary objective of this document is to provide interim recommendations to international organizations and national authorities on security measures that may need to be applied to provide adequate levels of security for shipments of radioactive material. However, the document is also intended to provide guidance to consignors, carriers and consignees of radioactive material.

The transport security measures recommended in this document are aimed at the prevention and countering of unauthorized access to, theft of, loss of or malicious act involving the transport of radioactive material through a combination of deterrence, detection, delay and response measures to attempts of such acts, complemented by mitigation of consequences and appropriate measures to respond to such acts, including recovery. In all cases, the goal is that the likelihood of harm attributable to such exposure will be minimized. This document focuses on measures necessary to accomplish this goal.

Many safety standards and security procedures for the transport of radioactive material are intimately linked. Thus, it is recognized that many of the measures designed to address one will also, in fact, address the other. For this reason, the safety measures and procedures already in place as a result of the broad and effective application of

the IAEA *Transport Safety Regulations* at the modal level internationally and at the State level are necessary measures to be considered to meet the security goals. However, this guidance was developed acknowledging that additional measures may be needed to enhance physical protection measures with a view to ensuring adequate security during the transport of radioactive material.

2. SCOPE

The generic guidance contained in the TECDOC uses the radioactivity level of the contents of an individual package of radioactive material for defining, in addition to prudent management practices, two security levels to which specific security measures are recommended. However, if the radioactive material is a nuclear material covered by INFCIRC/225, recommendations of INFCIRC/225 should be applied.

For excepted packages no security measures are recommended beyond prudent management practices already implemented by consignors and carriers. For any larger quantity of radioactive material in a package, the next higher (i.e. basic) security level is recommended. For radioactive material packaged in large quantities, such that are deemed to be “high consequence dangerous goods”, the recommendation is to apply both the basic security measures as well as additional higher-level (i.e. enhanced) security measures.

The enhanced security level should be applied to packages containing radioactive material having a total activity greater than 50 A₁ or 3000 A₂, whichever is the lower and irrespective of the form of the material (i.e. irrespective of whether the material is special form radioactive material or other than special form radioactive material).

3. RECOMMENDED MEASURES

3.1 Strategy

The responsibility for security rests entirely within the State, which should establish a regulatory framework with a comprehensive and consistent set of security requirements covering any kind of radioactive material, consistently applicable whether the material is in use, storage and transport.

The requirements for the security of radioactive material against malicious acts should follow the concept of risk assessment in evaluating the credibility of the threat to the material and its potential to generate unacceptable consequences. Depending on potential consequences, some types and quantities of material could be more attractive targets for malicious acts than others. This could be effectively addressed by a graded system of requirements.

Categorization of material according to associated potential consequences provides a logical and transparent basis for developing a graded and consistent system to decide on adequate levels of protection. The guidance for security measures should be based on providing a limitation of radiological health effects to individuals, should a malicious act succeed. In addition to health effects, States may consider potential for economic, environmental, or social harm and disruption resulting from malicious acts.

Security measures should be designed in multiple layers to deter attempts of malicious acts, prevent their success if they occur; and respond to any loss of control over radioactive material. Malicious acts to be considered are acts to remove the material from authorized control (theft) and acts directed against the material, or a shipment of material, which could endanger public health of personnel, the public and the environment by exposure to radiation, release or dispersal of radioactive substances (sabotage).

Designing an adequate transport security system should consider defence-in-depth principles and provisions such as administrative procedures; communications and notifications; system design; transport operations, schedules and routing restrictions; information confidentiality; specific security measures intended to deter, detect and delay a malicious act; capacity for enforcement; recovery measures and response to radiological emergencies.

In particular, for the design and evaluation of security measures of radioactive material in transport, the following factors, among others, should be considered: quantity or activity, physical form of the radioactive material, mode(s) of transport; and package(s).

3.2 Responsibilities

3.2.1 State responsibilities

The establishment of an adequate security protection regime for the transport of radioactive material is the responsibility of each State. The responsibilities of the State include establishing basic requirements for legal and governmental infrastructures for transport security, including the designation of a regulatory body, the definition of its domestic threat and the prescription of requirements for the design and evaluation of security measures. Responsibilities relating to security must be assigned unequivocally to the State and to persons involved in the transport of radioactive material.

In addition, the State should take appropriate measures to ensure the promotion of a security culture for all involved in the transport of radioactive material.

For international transport, States should co-operate, consult and exchange information on security techniques and practices; aid each other in security and in recovery should such aid be requested; and establish appropriate arrangements for the exchange of information between all involved States and with relevant intergovernmental organizations to fulfil security obligations and promote co-operation, and to ensure that material under their jurisdiction is adequately protected. The designated regulatory body should be identified to other States and to the IAEA.

3.2.2 Operator [Licensee] responsibilities

The operator using, storing or shipping radioactive material is responsible for planning, designing, implementing, operating, and maintaining security measures.

Emergency measures for recovery of lost or stolen material and for mitigation of consequences have to be established in advance and provided by operators and by the State.

For international transport, operators will need to ensure in advance that the State-by-State variations in security measures are applied as the radioactive material package progresses on its journey and also clearly define the point at which responsibility for the package is transferred.

3.3 Definition of security measures

A State has different options available for defining the security measures that should be applied to a shipment of radioactive material. The use of a dual approach, which is compliance based and performance based, is recommended. While the security system envisaged must first comply with the administrative and technical security requirements as prescribed by regulations, the installed system must also perform as licensed by the regulatory body. Performance of the system is evaluated against a set of threats of reference, the design basis threat (DBT), defined by the State.

The basic steps for defining and designing security measures include at the State level, the evaluation of the potential consequences of a loss of control of radioactive materials, the assessment of potential threat, the categorization of materials, the definition of administrative and technical security requirements for each category, and the approval of security measures implemented by the operators.

Operators are responsible for identifying the radionuclides and their activity in each radioactive material package in a shipment and the mode (s) of transport to be used in the shipment; assigning the material to given categories; performing a vulnerability analysis for the specific radioactive material packages against the given DBT and determining — according to vulnerability and potential consequences — the need for additional security measures.

Security measures may also be established using only a compliance-based approach, defining security levels and default security measures commensurate with the assumed threat and level of risk acceptance based solely on the

potential (radiological or non-radiological) consequences of the malicious use of a radioactive material. In such cases, recommendations proposed in the TECDOC might provide an acceptable approach for defining security measures that a State could use for transport operations.

4. BASIC SECURITY LEVEL

The TECDOC provides the following recommendations for shipment of packages under the basic security level:

General

Radioactive material packages should be transferred to appropriately identified carriers/consignees. Radioactive material packages in temporary transit (i.e. in transit) facilities should be properly secured.

Security devices

Unless there are overriding safety, volume, or weight considerations, radioactive material packages should be carried in a locked conveyance or freight container.

Security training

The training specified for individuals in the “*Model Regulations*” should also include elements of security awareness. This training should address the nature of security risks, recognizing methods to address and reduce such risks and actions to be taken in the event of a security breach. It should include awareness of security plans (as appropriate) commensurate with the responsibilities of individuals and their part in implementing these plans. Such training should be provided or verified upon employment in a position involving radioactive material transport and should be periodically supplemented with retraining. Records of all security training undertaken should be kept by the employer and made available to the employee if requested.

Personnel identity verification

Each crewmember of road vehicles, trains and inland waterway craft transporting radioactive material should carry with them means of positive identification during transport.

Security verification

Carriers should verify that the security measures on transport units are taken at the appropriate times and are effective during transport.

Written instructions

Carriers should provide to appropriate crewmembers written instructions on how to respond to a security incident in transport.

Security related information

Carriers, consignors and consignees should co-operate with each other and with appropriate authorities to exchange information, as appropriate, for applying security measures, and responding to security incidents.

5. ENHANCED SECURITY LEVEL

The TECDOC provides the following additional recommendations for shipment of packages under the enhanced security level:

Carrier/consignor identification

In implementing national security provisions for shipments of radioactive material needing the enhanced security level, competent authorities should establish a programme for identifying consignors or carriers engaged in the transport of radioactive material packages needing the enhanced security level for the purpose of communicating security related information.

Security plans

All legal entities, operator organisations (e.g. consignors, carriers, consignees), and persons engaged in the transport of radioactive material packages needing the enhanced security level should develop and adopt, implement, periodically review as necessary, and comply with the provisions of a security plan.

The security plan should comprise complementary elements such as allocation of responsibilities, records of material transported, description of security measures including confidentiality and emergency response.

The security plan should be modified as needed to reflect the threat level at the time of its application and potential changes to the transport programme: Information required in a security plan under these provisions may be incorporated into plans developed for other purposes.

Communication

The consignor should provide notification, in advance, to the consignee of the planned shipment, mode of transport, and expected delivery time. The consignee should confirm its ability and readiness to accept delivery at the expected time, prior to commencement of transport and notify the consignor on receipt or non-receipt within the expected delivery time frame. The consignor, if requested by a competent authority, should provide shipment notifications.

Tracking devices

When appropriate, the use of transport telemetry or other tracking methods or devices should be used to monitor the movement of conveyances containing radioactive material needing the enhanced security level.

Communications from the conveyance

During transport, the carrier should provide, in the conveyance, the capability for personnel to communicate to a designated contact point specified in the security plan.

Additional security provisions for transport by road, rail and inland waterway of radioactive material packages needing the enhanced security level

The carrier should ensure, for transport by road, rail and inland waterway conveyances, that the application of devices, equipment or arrangements to deter, detect, delay and respond to theft of the conveyance or its cargo are operational and effective at all times.

Unless there are overriding safety or operational considerations or other compensatory security measures in place, packages of radioactive material needing enhanced security level should be carried in locked, closed conveyances; however, carriage of such packages individually weighing more than 500 kg that are sealed and secured to the conveyances may be transported on an open conveyance. Verification of integrity of locks and seals should be accomplished before dispatch.

The carrier should maintain continuous attendance of the road conveyance during transport.

During any planned extended stoppages, the vehicle should be properly secured, preferably in a well-illuminated area that is not readily accessible to the general public.

6. OUTSTANDING ISSUES AND CONCLUSIONS

As a result of the deliberations of experts that led to the TECDOC on *Security in the Transport of Radioactive Material*, some issues were not fully resolved. They include, among others, consistency and relationships with other international and IAEA documents dealing with security during transport.

- ✓ The content of the guidance is not identical in wording, but is as consistent as possible with the in the UN *Model Regulations* and the already existing IAEA security documents. Since it is expected that the new UN *Model Regulations* security requirements will in due course become internationally binding when they are implemented by the modal transport authorities concerned, emphasis has been placed on ensuring consistency with those requirements wherever possible. It is expected that in the future, updated versions of this TECDOC would be used as input to the United Nations Economic and Social Council's Committee of Experts on the Transport of Dangerous Goods.

- ✓ The generic guidelines presented in the TECDOC are consistent with the UN Model Regulations requirements in respect of the number of security levels and the security measures proposed, although the threshold values and some details of the security measures proposed differ from those published in the UN Model Regulations requirements. In addition, the threshold values for the enhanced security level recommended here are essentially consistent with the highest category of sources specified in the revised *Code of Conduct on the Safety and Security of Radioactive Sources*.

It was agreed at the Technical Meeting held in Vienna in November 2003 that the threshold between the basic and enhanced security levels should be a low multiple of A1 and a larger multiple of A2. Consideration was given to several different sets of multiples to determine if there was one that would include all sources in Category 1 of the revised *Code of Conduct*. The result suggested that values of no more than 50 A1 coupled with a large multiple of A2 could provide that consistency. It was agreed that the threshold values should be selected to place, if possible, all Code of Conduct Category 1 sources in the enhanced security level.

However, in respect of the security levels, it appears that the number recommended, two, is not consistent with those provided in other IAEA security publications, three, such as INFCIRC/225 and IAEA-TECDOC-1355. The introduction of a third security level, when updating the "Grey Book" INFCIRC 225 was issued as the first Agency security material in 1975, provided flexibility and allowed a better graduation of security measures. This issue of number of security levels will have to be resolved in the future revisions and would provide bases for further harmonization of the security measures for radioactive material in use, storage or transport.

- ✓ In addition, the TECDOC on Security in the Transport of Radioactive Material recommends when a consignment of radioactive material contains more than one package, the consignment should be operated using the highest security level measures of the respective packages carried in the consignment. This provision is not consistent with other IAEA security publications that recommend the sum of the quantity or activity transported to determine the level of security to be applied. In addition, this provision does not follow basic physical protection principles that recommend designing security measures on potential consequences of loss of control of material.

The publication of this document will allow Member States to comment on the proposed measures to be taken to enhance security during the transport of radioactive material and will provide feedback on first implementation of these measures. As a consequence the Secretariat will convene a Technical Meeting in 2005 to take these comments and the feedback into account, and finally to provide Member States with more formal guidance on security of radioactive material during transport.

REFERENCES

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