

IAEA Safety Standards

for protecting people and the environment

Compliance Assurance for the Safe Transport of Radioactive Material

Safety Guide
No. TS-G-1.5



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COMPLIANCE ASSURANCE FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL

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The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world".

IAEA SAFETY STANDARDS SERIES No. TS-G-1.5

COMPLIANCE ASSURANCE FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL

SAFETY GUIDE

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2009

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Sales and Promotion, Publishing Section
International Atomic Energy Agency
Wagramer Strasse 5
P.O. Box 100
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fax: +43 1 2600 29302
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© IAEA, 2009

Printed by the IAEA in Austria
May 2009
STI/PUB/1361

IAEA Library Cataloguing in Publication Data

Compliance assurance for the safe transport of radioactive material :
safety guide. — Vienna : International Atomic Energy Agency, 2009.
p. ; 24 cm. — (IAEA safety standards series, ISSN 1020-525X ;
no. TS-G-1.5)
STI/PUB/1361
ISBN 978-92-0-110208-9
Includes bibliographical references.

1. Radioactive substances — Transportation — Safety measures.
2. Radioactive substances — Packaging — Safety measures.
3. Radioactive substances — Safety regulations. I. International Atomic Energy Agency. II. Series.

IAEAL

09-00574

FOREWORD

by Mohamed ElBaradei
Director General

The IAEA's Statute authorizes the Agency to establish safety standards to protect health and minimize danger to life and property — standards which the IAEA must use in its own operations, and which a State can apply by means of its regulatory provisions for nuclear and radiation safety. A comprehensive body of safety standards under regular review, together with the IAEA's assistance in their application, has become a key element in a global safety regime.

In the mid-1990s, a major overhaul of the IAEA's safety standards programme was initiated, with a revised oversight committee structure and a systematic approach to updating the entire corpus of standards. The new standards that have resulted are of a high calibre and reflect best practices in Member States. With the assistance of the Commission on Safety Standards, the IAEA is working to promote the global acceptance and use of its safety standards.

Safety standards are only effective, however, if they are properly applied in practice. The IAEA's safety services — which range in scope from engineering safety, operational safety, and radiation, transport and waste safety to regulatory matters and safety culture in organizations — assist Member States in applying the standards and appraise their effectiveness. These safety services enable valuable insights to be shared and I continue to urge all Member States to make use of them.

Regulating nuclear and radiation safety is a national responsibility, and many Member States have decided to adopt the IAEA's safety standards for use in their national regulations. For the contracting parties to the various international safety conventions, IAEA standards provide a consistent, reliable means of ensuring the effective fulfilment of obligations under the conventions. The standards are also applied by designers, manufacturers and operators around the world to enhance nuclear and radiation safety in power generation, medicine, industry, agriculture, research and education.

The IAEA takes seriously the enduring challenge for users and regulators everywhere: that of ensuring a high level of safety in the use of nuclear materials and radiation sources around the world. Their continuing utilization for the benefit of humankind must be managed in a safe manner, and the IAEA safety standards are designed to facilitate the achievement of that goal.

THE IAEA SAFETY STANDARDS

BACKGROUND

Radioactivity is a natural phenomenon and natural sources of radiation are features of the environment. Radiation and radioactive substances have many beneficial applications, ranging from power generation to uses in medicine, industry and agriculture. The radiation risks to workers and the public and to the environment that may arise from these applications have to be assessed and, if necessary, controlled.

Activities such as the medical uses of radiation, the operation of nuclear installations, the production, transport and use of radioactive material, and the management of radioactive waste must therefore be subject to standards of safety.

Regulating safety is a national responsibility. However, radiation risks may transcend national borders, and international cooperation serves to promote and enhance safety globally by exchanging experience and by improving capabilities to control hazards, to prevent accidents, to respond to emergencies and to mitigate any harmful consequences.

States have an obligation of diligence and duty of care, and are expected to fulfil their national and international undertakings and obligations.

International safety standards provide support for States in meeting their obligations under general principles of international law, such as those relating to environmental protection. International safety standards also promote and assure confidence in safety and facilitate international commerce and trade.

A global nuclear safety regime is in place and is being continuously improved. IAEA safety standards, which support the implementation of binding international instruments and national safety infrastructures, are a cornerstone of this global regime. The IAEA safety standards constitute a useful tool for contracting parties to assess their performance under these international conventions.

THE IAEA SAFETY STANDARDS

The status of the IAEA safety standards derives from the IAEA's Statute, which authorizes the IAEA to establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection

of health and minimization of danger to life and property, and to provide for their application.

With a view to ensuring the protection of people and the environment from harmful effects of ionizing radiation, the IAEA safety standards establish fundamental safety principles, requirements and measures to control the radiation exposure of people and the release of radioactive material to the environment, to restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation, and to mitigate the consequences of such events if they were to occur. The standards apply to facilities and activities that give rise to radiation risks, including nuclear installations, the use of radiation and radioactive sources, the transport of radioactive material and the management of radioactive waste.

Safety measures and security measures¹ have in common the aim of protecting human life and health and the environment. Safety measures and security measures must be designed and implemented in an integrated manner so that security measures do not compromise safety and safety measures do not compromise security.

The IAEA safety standards reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation. They are issued in the IAEA Safety Standards Series, which has three categories (see Fig. 1).

Safety Fundamentals

Safety Fundamentals present the fundamental safety objective and principles of protection and safety, and provide the basis for the safety requirements.

Safety Requirements

An integrated and consistent set of Safety Requirements establishes the requirements that must be met to ensure the protection of people and the environment, both now and in the future. The requirements are governed by the objective and principles of the Safety Fundamentals. If the requirements are not met, measures must be taken to reach or restore the required level of safety. The format and style of the requirements facilitate their use for the establishment, in a harmonized manner, of a national regulatory framework. The safety requirements use ‘shall’ statements together with statements of

¹ See also publications issued in the IAEA Nuclear Security Series.

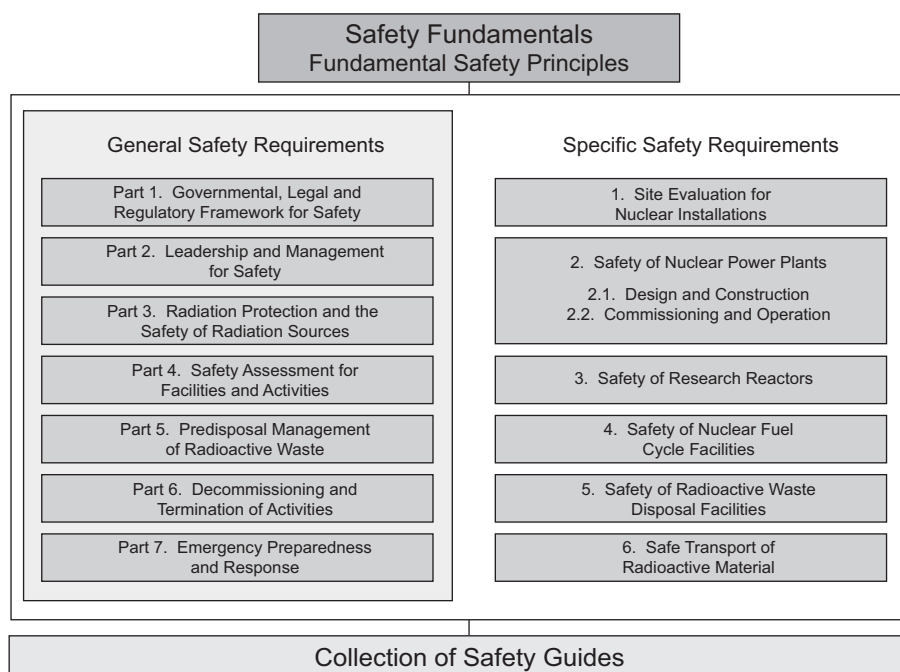


FIG. 1. The long term structure of the IAEA Safety Standards Series.

associated conditions to be met. Many requirements are not addressed to a specific party, the implication being that the appropriate parties are responsible for fulfilling them.

Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it is necessary to take the measures recommended (or equivalent alternative measures). The Safety Guides present international good practices, and increasingly they reflect best practices, to help users striving to achieve high levels of safety. The recommendations provided in Safety Guides are expressed as ‘should’ statements.

APPLICATION OF THE IAEA SAFETY STANDARDS

The principal users of safety standards in IAEA Member States are regulatory bodies and other relevant national authorities. The IAEA safety

standards are also used by co-sponsoring organizations and by many organizations that design, construct and operate nuclear facilities, as well as organizations involved in the use of radiation and radioactive sources.

The IAEA safety standards are applicable, as relevant, throughout the entire lifetime of all facilities and activities — existing and new — utilized for peaceful purposes and to protective actions to reduce existing radiation risks. They can be used by States as a reference for their national regulations in respect of facilities and activities.

The IAEA's Statute makes the safety standards binding on the IAEA in relation to its own operations and also on States in relation to IAEA assisted operations.

The IAEA safety standards also form the basis for the IAEA's safety review services, and they are used by the IAEA in support of competence building, including the development of educational curricula and training courses.

International conventions contain requirements similar to those in the IAEA safety standards and make them binding on contracting parties. The IAEA safety standards, supplemented by international conventions, industry standards and detailed national requirements, establish a consistent basis for protecting people and the environment. There will also be some special aspects of safety that need to be assessed at the national level. For example, many of the IAEA safety standards, in particular those addressing aspects of safety in planning or design, are intended to apply primarily to new facilities and activities. The requirements established in the IAEA safety standards might not be fully met at some existing facilities that were built to earlier standards. The way in which IAEA safety standards are to be applied to such facilities is a decision for individual States.

The scientific considerations underlying the IAEA safety standards provide an objective basis for decisions concerning safety; however, decision makers must also make informed judgements and must determine how best to balance the benefits of an action or an activity against the associated radiation risks and any other detrimental impacts to which it gives rise.

DEVELOPMENT PROCESS FOR THE IAEA SAFETY STANDARDS

The preparation and review of the safety standards involves the IAEA Secretariat and four safety standards committees, for nuclear safety (NUSSC), radiation safety (RASSC), the safety of radioactive waste (WASSC) and the safe transport of radioactive material (TRANSSC), and a Commission on

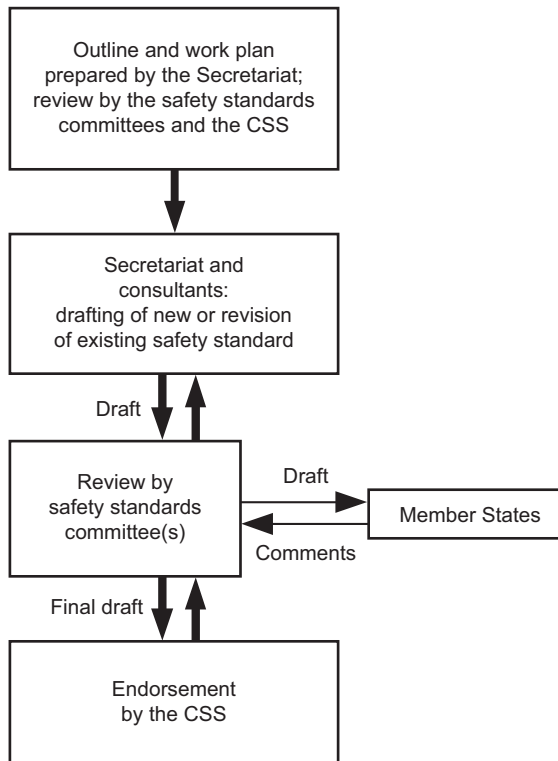


FIG. 2. The process for developing a new safety standard or revising an existing standard.

Safety Standards (CSS) which oversees the IAEA safety standards programme (see Fig. 2).

All IAEA Member States may nominate experts for the safety standards committees and may provide comments on draft standards. The membership of the Commission on Safety Standards is appointed by the Director General and includes senior governmental officials having responsibility for establishing national standards.

A management system has been established for the processes of planning, developing, reviewing, revising and establishing the IAEA safety standards. It articulates the mandate of the IAEA, the vision for the future application of the safety standards, policies and strategies, and corresponding functions and responsibilities.

INTERACTION WITH OTHER INTERNATIONAL ORGANIZATIONS

The findings of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the recommendations of international expert bodies, notably the International Commission on Radiological Protection (ICRP), are taken into account in developing the IAEA safety standards. Some safety standards are developed in cooperation with other bodies in the United Nations system or other specialized agencies, including the Food and Agriculture Organization of the United Nations, the United Nations Environment Programme, the International Labour Organization, the OECD Nuclear Energy Agency, the Pan American Health Organization and the World Health Organization.

INTERPRETATION OF THE TEXT

Safety related terms are to be understood as defined in the IAEA Safety Glossary (see <http://www-ns.iaea.org/standards/safety-glossary.htm>). Otherwise, words are used with the spellings and meanings assigned to them in the latest edition of The Concise Oxford Dictionary. For Safety Guides, the English version of the text is the authoritative version.

The background and context of each standard in the IAEA Safety Standards Series and its objective, scope and structure are explained in Section 1, Introduction, of each publication.

Material for which there is no appropriate place in the body text (e.g. material that is subsidiary to or separate from the body text, is included in support of statements in the body text, or describes methods of calculation, procedures or limits and conditions) may be presented in appendices or annexes.

An appendix, if included, is considered to form an integral part of the safety standard. Material in an appendix has the same status as the body text, and the IAEA assumes authorship of it. Annexes and footnotes to the main text, if included, are used to provide practical examples or additional information or explanation. Annexes and footnotes are not integral parts of the main text. Annex material published by the IAEA is not necessarily issued under its authorship; material under other authorship may be presented in annexes to the safety standards. Extraneous material presented in annexes is excerpted and adapted as necessary to be generally useful.

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1. INTRODUCTION

BACKGROUND

1.1. The transport of radioactive material involves potential radiological hazards. To ensure the protection and safety of people, property and the environment, appropriate regulations, both at the national level and at the international level, are necessary. Government authorities regulate the transport of radioactive material by means of national regulations, in which the relevant international regulations and recommendations are taken into account. This Safety Guide provides recommendations for ensuring that the transport of radioactive material, both domestic and international, is carried out in compliance with the IAEA Regulations for the Safe Transport of Radioactive Material (the Transport Regulations) [1].

1.2. This Safety Guide is intended to be used by competent authorities that are establishing or further developing programmes to ensure compliance with the Transport Regulations. The recommendations provided will also be useful to competent authorities with established programmes that are seeking greater harmony internationally in the implementation of the Transport Regulations. Additionally, the Safety Guide will assist users of the Transport Regulations in their interactions with competent authorities. As this Safety Guide relates to the 2005 Edition of the Transport Regulations, future changes to the Transport Regulations may compromise some specific advice provided in this Safety Guide. Competent authorities should therefore be alert to any future changes in the Transport Regulations and should take into account such changes in following the recommendations provided in this Safety Guide in their own compliance assurance programmes¹.

1.3. The Safety Requirements publication on The Management System for Facilities and Activities [2] establishes requirements for establishing, implementing, assessing and continually improving a management system that integrates safety, health, environmental, security, quality and economic elements to ensure that safety is properly taken into account in all the activities of an organization. This Safety Guide also uses the concept of a ‘management

¹ Compliance assurance is a systematic programme of measures applied by a competent authority that is aimed at ensuring that the provisions of the Transport Regulations [1] are met in practice.

system', which reflects and includes the initial concept of 'quality control' (controlling the quality of products) and its evolution through 'quality assurance' (the system for ensuring the quality of products) and 'quality management' (the system for managing quality). The terms 'quality assurance programme' and 'management system' have often been used, with cultural and national variations, to mean the same thing.

1.4. It is expected that competent authorities will need to utilize relevant parts of the management systems of users² when implementing the compliance assurance programme. Indeed, auditing by the competent authority of the management system established by the user to fulfil a regulatory requirement is one of the most effective methods available for monitoring the compliance of the user with the Transport Regulations.

OBJECTIVE

1.5. The objectives of this Safety Guide are to assist competent authorities in the development and maintenance of compliance assurance programmes in connection with the transport of radioactive material, and to assist applicants, licensees and organizations in their interactions with competent authorities. In order to increase cooperation between competent authorities and to promote the uniform application of international regulations and recommendations, it is desirable to adopt a common approach to regulatory activities. This Safety Guide is intended to assist in accomplishing such a uniform application by recommending most of the actions for which competent authorities need to provide in their programmes for ensuring compliance with the Transport Regulations.

SCOPE

1.6. This Safety Guide addresses radiation safety aspects of the transport of radioactive material; that is, the subjects that are covered by the Transport Regulations. Radioactive material may have other dangerous properties, however, such as explosiveness, flammability, pyrophoricity, chemical toxicity

² In the context of this Safety Guide, a 'user' is a person who or an organization that designs, tests, assesses, manufactures, services, maintains, consigns, carries or otherwise uses a package in connection with the transport of radioactive material.

and corrosiveness; these properties are required to be taken into account in the regulatory control of the design and transport of packages (see, e.g., paras 109, 305 and 507 of the Transport Regulations [1]).

1.7. Physical protection and systems for accounting for and control of nuclear material are also discussed in this Safety Guide (see paras 2.3, 2.14, 2.15, 3.12 and 3.13). These subjects are not within the scope of the Transport Regulations, but information on them is included here because they must be taken into account in the overall regulatory control of transport, especially when the regulatory framework is being established.

STRUCTURE

1.8. Section 2 provides recommendations on the responsibilities and functions of the competent authority. Section 3 provides information on the various national and international regulations and guides for the transport of radioactive material. Section 4 provides recommendations on carrying out compliance assurance, and Section 5 provides recommendations on approvals and approval certificates. Section 6 provides recommendations on cooperation between competent authorities at the international level. The annexes provide examples of procedures and checklists for use by a competent authority in its compliance assurance programme.

2. RESPONSIBILITIES AND FUNCTIONS OF THE COMPETENT AUTHORITY

REGULATORY BASIS

2.1. According to para. 307 of the Transport Regulations [1], “The *competent authority* is responsible for assuring compliance with these Regulations. Means to discharge this responsibility include the establishment and execution of a programme for monitoring the design, manufacture, testing, inspection and maintenance of *packaging, special form radioactive material and low dispersible radioactive material*, and the preparation, documentation, handling and stowage of *packages* by *consignors* and *carriers*, to provide evidence that the provisions of these Regulations are being met in practice.”

2.2. While competent authorities are responsible for ensuring compliance with the Transport Regulations (which includes the oversight and enforcement of all regulations), the prime responsibility for ensuring safety in transport rests with consignors and carriers, which are required to take account of all relevant safety regulations. Thus, consignors, carriers and any other users of the Transport Regulations are required to comply with the actual regulations, and the competent authority is required to ensure compliance with these regulations. The competent authority itself is required to comply with the Transport Regulations, for example, in such matters as the issuing of approvals and the allocation of identification marks.

2.3. A State whose industry for the transport of radioactive material is not yet fully established may develop its compliance assurance programme in stages, depending on the size of the transport industry. For example, initially the competent authority may need to deal only with the movement of packages that were originally assessed and approved by the authorities of other Member States. Later, that competent authority may have to monitor the quality of packages (approved or not) that are designed, built and used within its own jurisdiction. The compliance assurance programme of the competent authority can then be developed accordingly. In an effective programme for compliance assurance, all users of the Transport Regulations should be taken into account; that is, persons who or organizations that, at one time or another, may be subject to the requirements of the Transport Regulations, such as:

- (a) Consignors;
- (b) Carriers;
- (c) Suppliers and/or manufacturers of packagings;
- (d) Regulatory bodies (which may share responsibilities).

2.4. A compliance assurance programme should include two major elements: First, the competent authority should review certain activities for approval before these activities are conducted. Second, the competent authority should ensure, through a programme of inspection and enforcement, that all the regulatory requirements are correctly fulfilled in practice. The competent authority should be provided with adequate resources to perform these activities for review, inspection and enforcement. Compliance assurance should also cover activities relating to emergency response.

2.5. Through the compliance assurance programme, the competent authority should obtain assurance that all transport requirements are being met in practice by the users of the Transport Regulations. Monitoring of the effectiveness of

compliance is generally performed by routine, periodic inspections (announced or unannounced) of the user's activities. For consignors, such inspections are generally examinations of the procedures before, during or after the transport. For carriers, such inspections are generally performed during or after the transport. The frequency of inspection should be established by taking into account the scope and potential importance to safety of the user's activities.

LEGAL BASIS

2.6. The responsibilities and duties of the competent authority (regulatory body) are required to be defined within the national legal framework of a State, in accordance with the requirements established in Ref. [3]. The responsibilities of the competent authority include:

- (a) The establishment, promotion or adoption of regulations for the transport of radioactive material upon which its regulatory actions are based;
- (b) Activities in connection with discharging these responsibilities for the safe transport of radioactive material, such as:
 - (i) Providing guidance for applicants;
 - (ii) Conducting safety reviews and safety assessments;
 - (iii) Issuing approvals;
 - (iv) Carrying out regulatory inspections and taking any necessary enforcement actions;
 - (v) Providing for the reporting of incidents, including accidents;
 - (vi) Making provisions for emergency response;
 - (vii) Coordinating research and development activities;
- (c) The promotion of information exchange by means of activities such as training courses and seminars on the safe transport of radioactive material.

INTERLINKED RESPONSIBILITIES

2.7. More than one organization may be responsible for the regulatory control of the transport of radioactive material in a State, depending on:

- (a) The existing regulations;
- (b) The mode of transport (e.g. for the design of packages that are subject to restrictions on the mode of transport);
- (c) The type of radioactive material (e.g. fissile or non-fissile material).

Usually, at least radiation protection bodies and government transport offices are involved in the control activities. Where there are several responsible authorities, they should cooperate closely and there should be legal or formal agreements between them covering the responsibilities of each authority. Each competent authority is required to communicate with and provide information to other governmental and non-governmental organizations that have related responsibilities (Ref. [3], para. 3.3). The competent authority of a State may also be responsible for security, physical protection and the system for accounting for and control of radioactive material. However, these functions may also be carried out by other authorities, depending on the legal framework of the particular State.

ORGANIZATION AND RESPONSIBILITIES OF THE COMPETENT AUTHORITY

2.8. There is no ideal or universal organizational model for the competent authority. Its organization will depend mainly on its areas of responsibility and on the general organizational approach in the State concerned. However, to avoid conflicts of interest, the competent authority is required to be independent of the activities it regulates. In order to discharge its responsibilities in an efficient and equitable manner, and to perform its many varied regulatory functions, the competent authority is required to establish, implement, assess and continually improve its own management system [2]. Further recommendations on meeting the requirements for the management system are provided in Ref. [4].

INFORMATION, GUIDANCE AND TRAINING

2.9. The competent authority is required to provide information and guidance on the safe transport of radioactive material (Ref. [3], para. 3.3). Specifically, the competent authority should provide the general public and users with adequate information concerning the authority's safety and regulatory approach, organization, procedures and decisions. In particular, specific guidance for users regarding the presentation of applications for approval may be necessary (see paras 5.4–5.7 and Annex II for further information). To achieve the goal of full compliance with the Transport Regulations, provisions should be put in place for the appropriate training of all personnel. The competent authority may need to ensure that adequate training information and programmes are available so that the staff of users can acquire appropriate

levels of knowledge of the regulatory requirements. The competent authority should also promote seminars and conferences for all parties involved in the transport of radioactive material. Further recommendations and information on training are provided in paras 4.103–4.107.

INDEPENDENT ASSESSMENT

2.10. The competent authority should be able to independently assess and verify the technical and test data submitted by an applicant. Such independent assessment may cover nuclear criticality control, heat transfer, radiation protection, structural analysis and risk studies, and all related measures of the management system of the applicant.

2.11. The competent authority need not be entirely self-sufficient in all technical areas of assessment. It may delegate some of its specific activities to organizations having the necessary technical abilities. The competent authority may also engage consultants, as necessary. Such organizations and consultants are required to be independent of the organizations whose work they are to evaluate (Ref. [3], para. 4.3). However, the responsibility for such activities is required to remain with the competent authority (Ref. [3], para. 4.4), which should evaluate the results of any work that is delegated. Suitable subjects for consultancy are, for example, inspections and materials testing, and analysis of safety reports for the purposes of verification.

RESOURCES

2.12. The competent authority is required to be provided with adequate resources for carrying out the activities outlined in para. 2.6 (see Ref. [3], paras 2.1, 2.4). To carry out these activities, the competent authority will need to have access to expertise in many different fields. The resources and the number of staff needed will depend on the nature and extent of the transport operations. Depending on the types of package that exist or that are expected to be developed within a State, the areas of expertise of the competent authority should include some or all of the following:

- (a) Criticality safety;
- (b) Radiation safety;
- (c) Thermal analysis;
- (d) Structural analysis;

- (e) Materials science and mechanical engineering;
- (f) The management system;
- (g) Emergency preparedness;
- (h) Transport operations;
- (i) Inspection and enforcement.

TRAINING OF EMPLOYEES

2.13. The competent authority should establish and maintain a programme for training its own employees. The training provided should be sufficient to ensure consistency in the application of the Transport Regulations. Training should be carried out at an early stage in the development of the industry for the transport of radioactive material. International seminars and conferences are also important for the education and training of employees of the competent authority. Further recommendations and information on training are provided in paras 4.103–4.107.

EMERGENCY RESPONSE

2.14. The competent authority should be provided with adequate resources to respond to transport accidents. This means that the competent authority will need to be provided with sufficient resources to enable it to provide overall direction for response to a transport emergency or, alternatively, will need to act as a coordinator for or to advise other agencies involved in the response to an emergency. Requirements on preparedness for and response to a nuclear or radiological emergency are established in Ref. [5], and recommendations on emergency response to transport accidents are provided in Ref. [6].

LIST OF NATIONAL COMPETENT AUTHORITIES

2.15. A list of National Competent Authorities Responsible for Approvals and Authorizations in Respect of the Transport of Radioactive Material [7] is published annually by the IAEA. Competent authorities should ensure that the information provided in this list is checked annually to verify that it is correct.

LIAISON BY THE COMPETENT AUTHORITY WITH OTHER GOVERNMENT AGENCIES

Liaison concerning the Transport Regulations

2.16. As noted in para. 2.7, more than one organization may be responsible for the regulatory control of transport in a State. For example, the following persons and agencies may be linked directly with the competent authority for the purpose of the safe transport of radioactive material:

- (a) Agencies with responsibilities for transport;
- (b) Agencies with responsibilities for dangerous goods;
- (c) Agencies with responsibilities for health and safety;
- (d) Agencies with responsibilities for radiation protection;
- (e) Legal authorities;
- (f) Police;
- (g) Customs officials;
- (h) Post offices;
- (i) National research institutes and institutes for materials testing;
- (j) Institutions that provide training and education.

2.17. The competent authority should arrange regular meetings for all parties within this complex network of agencies and persons in order to ensure:

- (a) An exchange of information regarding existing regulations for the transport of radioactive material;
- (b) An exchange of information on changes to national laws and regulations as well as changes to the Transport Regulations;
- (c) A complete programme of training for personnel at all levels;
- (d) Consistent application of inspection and enforcement relating to compliance assurance;
- (e) A regular review of all measures for emergency response, including the responsibilities of the competent authority, the industry for the transport of radioactive material and other relevant agencies;
- (f) A suitable forum for the discussion and resolution of issues relating to the Transport Regulations and compliance assurance.

Liaison concerning other regulations

2.18. The competent authority should put in place formal agreements with agencies responsible for national regulations that are only indirectly linked with the Transport Regulations. Examples of such agencies are:

- (a) Other technical regulatory bodies;
- (b) National agencies involved in accounting for and control and physical protection of nuclear material;
- (c) Customs agencies;
- (d) Environmental agencies;
- (e) Agencies with responsibilities for toxic waste;
- (f) Agencies with responsibilities for emergency planning.

2.19. In the case of agencies responsible for security, accounting for and control of nuclear material, and physical protection, the requirements in some States necessitate that the competent authority maintains total control over all transit, import, export and inland shipments relating to nuclear material and other radioactive material. In such cases, some applications in connection with the transfer of such material are required to be checked by the competent authority prior to shipment, to confirm that all proposed shipments and packages are in compliance with the Transport Regulations. Such checks are often required by national regulations irrespective of whether the proposed shipment or package requires approval in accordance with the Transport Regulations. In such cases the liaison between the supervising authorities should be extremely close.

2.20. Liaison between competent authorities and customs agencies can usually be restricted to occasional meetings at which each party is informed of current developments. Particular consideration should be given to the exchange of information when new versions of regulations, including the Transport Regulations, come into force. The competent authority should also be prepared to provide consultation by telephone for customs officers confronted with the complex collection of papers that accompanies shipments of radioactive material at national customs points.

2.21. The liaison with environmental agencies should normally be arranged on demand. The competent authority should keep such agencies generally informed to be able to provide adequate information to the general public, as described in para. 2.9. In practice, the competent authority is most likely to come into contact with environmental agencies when it has to provide written

answers to questions relating to specific shipments or incidents, or when it develops emergency plans.

2.22. The competent authority should liaise very closely with agencies involved in emergency planning. In practice, the plans of such agencies usually concern the response to accidents involving dangerous goods in general or the response to emergencies involving nuclear reactors, or both. The competent authority should agree to an adaptation of the emergency procedures of such agencies to the particular case of accidents in the transport of radioactive material. Although the solution to such problems may be relatively simple, the competent authority should agree to the procedures for emergency response and should initiate a system of periodic review of any such procedures. Further recommendations on planning and preparing for response to an emergency involving radioactive material in transport are provided in Ref. [6].

3. REGULATIONS AND GUIDES

GENERAL

3.1. Regulations for ensuring the protection and safety of people, property and the environment are formulated primarily according to the national legal framework of a State. However, the transport of radioactive material is often international. National regulations as well as international modal regulations, which are based on the Transport Regulations, apply to such transport.

NATIONAL REGULATIONS AND GUIDES

3.2. To meet the requirements of Ref. [3], an authority responsible for promulgating regulations for the transport of radioactive material should be established.

3.3. National documents for regulating the transport of radioactive material can in principle be grouped into three main categories, namely:

- (a) Documents that set out legislation and national regulations;
- (b) Approval certificates issued by the competent authority and other mandatory documents;
- (c) Guides and other advisory documents.

3.4. National regulations drawn up by the government of a State or by a competent authority on behalf of the government are based on the appropriate legislation. Requirements that are not directly covered by the legislation should be set out in the regulations. The regulations should define the procedures for applying for and granting approval, and should establish the mandatory safety requirements.

3.5. National regulations for the transport of radioactive material should be clear in their intent, purpose and prescription, so that they are readily understandable and applicable, and should be sufficiently comprehensive for the size and type of transport industry to which they apply. Their existence, implementation and enforcement should be widely publicized, so that all persons and organizations concerned are aware of them and of the need to comply with the requirements contained therein.

3.6. Guides may be circulated by the competent authority in order to provide specific and detailed information on the acceptable technical and administrative approaches to satisfying the safety requirements. Such guides should be considered non-mandatory documents, except when the competent authority decides to make them mandatory or to make certain aspects of them obligatory.

3.7. In the preparation of national regulations and guides for the transport of radioactive material, all relevant international agreements, regulations and recommendations should be taken into account. The language used in the preparation of such documents should be appropriate to ensure correct and unambiguous understanding by the users of the regulations. If international regulations and/or modal conventions are adopted or used as national regulations, they should be translated into the official national language(s), and the accuracy of the translations should be verified.

INTERNATIONAL REGULATIONS AND GUIDANCE

3.8. The provisions of the IAEA Transport Regulations govern the worldwide transport of radioactive material. Many supporting publications have been

issued by the IAEA. In 2000, the IAEA changed its regulatory review process and moved to a two year review cycle so as to be consistent with the international modal organizations that produce revisions to their regulations on a biennial basis.

3.9. International bodies have issued many general and modal regulations and recommendations on the safe transport of dangerous goods. As far as the transport of radioactive material is concerned, these documents are based on the Transport Regulations [1]. International regulations and recommendations have been issued, for example, by the International Civil Aviation Organization [8], the International Maritime Organization [9] and the Universal Postal Union [10]. These regulations and recommendations are updated periodically.

3.10. There are also regional agreements, conventions and regulations concerning the safe transport of radioactive material, for example:

- (a) The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) [11];
- (b) The Convention Concerning International Carriage by Rail (COTIF) [12];
- (c) The Regulations for the Transport of Dangerous Goods on the Rhine (ADNR) [13];
- (d) The MERCOSUR/MERCOSUL Agreement of Partial Reach to Facilitate the Transport of Dangerous Goods, signed by the Governments of Argentina, Brazil, Paraguay and Uruguay in 1994 [14].

The foregoing agreements and conventions are consistent with the Transport Regulations.

3.11. All international transport operations are required to be conducted in accordance with the same regulations. It follows, therefore, that individual States are required to follow and fully implement the provisions of the Transport Regulations, in the interests of international harmonization and safety. However, a State may need to deviate from, or add to, the provisions of the Transport Regulations or of other international regulations and guidelines. In such cases, the competent authority should communicate such differences to the transport industry for the transport of radioactive material, to other competent authorities as appropriate, to the international modal organizations and to the IAEA. Such communications should be used to assist in the efficient

movement of radioactive material between countries and to minimize any delays or misunderstandings.

3.12. The peaceful use of nuclear material is normally ensured by the application of a system for accounting for and control of nuclear material. An introduction to the IAEA safeguards system, which is based on several international agreements, is provided in Ref. [15].

3.13. The Convention on the Physical Protection of Nuclear Material [16] provides for the protection of nuclear material in transport against sabotage and theft. The convention concerns specifically the international transport of nuclear material and is in conformity with the provisions of Ref. [15].

3.14. Security provisions for the transport of radioactive material are provided for in the modal regulations and the IAEA Nuclear Security Series.

3.15. International cooperation may be required when States are affected by transport accidents. Transport incidents, including accidents, that occur in international waters or air space will normally attract international interest and debate, but incidents, including accidents, that occur within a national boundary may also have implications for a neighbouring State or States, and close cooperation between States and authorities is invaluable in such circumstances. Certain transport accidents are covered by the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency [17].

4. COMPLIANCE ASSURANCE

GENERAL

4.1. The following recommendations will be of assistance specifically to competent authorities that are in the process of developing a compliance assurance programme; however, competent authorities that have established a compliance assurance programme may also benefit from these recommendations. The recommendations will also assist in the uniform application and interpretation of international regulations and guidance on the safe transport of radioactive material.

4.2. The competent authority should put in place a programme for compliance assurance for examining and reviewing all aspects of the transport of radioactive material within its jurisdiction or area of influence with regard to safety and the provisions of the Transport Regulations. In determining the national programme for compliance assurance, the competent authority should take into account not only the quantities and types of packages being transported, but also the size and complexity of the industry for which it has responsibility, as well as its own resources. In all circumstances, compliance assurance should include, as a minimum, the following three fundamental activities:

- (a) Activities relating to review and assessment, including the issuing of approval certificates;
- (b) Activities relating to inspection and enforcement;
- (c) Activities relating to emergency response.

PROVIDING FOR COMPLIANCE ASSURANCE

4.3. Before a compliance assurance programme can be considered to operate and, consequently, reasonable assurance (and evidence) of compliance can be provided, there are a number of actions that need to be taken. In order for a competent authority to obtain assurance of compliance with the Transport Regulations, it should:

- (a) Create and maintain a legal environment in which the competent authority can function effectively;
- (b) Organize itself so as to be independent;
- (c) Be of an appropriate size and have access to the appropriate expertise for the activities relating to the transport of radioactive material for which it is responsible;
- (d) Issue and/or revise regulations and guidelines appropriate to the activities for which it is responsible, with account taken of international regulations and conventions and any changes to these.

4.4. Even after a compliance assurance programme has been developed and introduced, it should not be considered to be complete. Rather, the compliance assurance programme should be reviewed periodically by the competent authority in the light of regulatory changes and with account taken of the experience with its performance of users of the Transport Regulations since the establishment of the compliance assurance programme. The compliance

assurance programme should be updated in a timely fashion when there is any specific change to the Transport Regulations, and should also be reviewed periodically to ensure that it continues to achieve the goals that it was designed to achieve. In some cases such reviews may be performed by external groups.

4.5. As discussed in Section 2, the competent authority should have adequate resources to carry out its functions, which include the operation of its own compliance assurance programme.

4.6. Compliance assurance programmes may be relatively simple and straightforward or may be complex and wide ranging, depending on the size and variety of the industry for which the competent authority has responsibility. For a simple compliance assurance programme, for example, for a State whose industry for the transport of radioactive material is involved only in activities relating to the transport of medical isotopes, account should be taken of, as a minimum:

- (a) Material classification;
- (b) Import and export operations;
- (c) All relevant modes of transport;
- (d) All package types and associated certificates;
- (e) The low volume of transport movements;
- (f) End disposal of packaging.

4.7. A more complex compliance assurance programme will be needed for a State whose industry for the transport of radioactive material is involved in all types of movement of radioactive material. For such a programme, account should additionally be taken of:

- (a) Package design, manufacture and maintenance;
- (b) The high volume of transport movements.

4.8. Irrespective of the size or complexity of the competent authority or its industry, the three fundamental activities stated in para. 4.2 should be addressed in the compliance assurance programme, in a manner that is graded according to the complexity and variety of the particular responsibilities of the competent authority.

METHODS OF ASSURANCE AND INSPECTION

4.9. Assurance of compliance with the Transport Regulations and the associated inspections can be obtained in various ways. Examples of activities that may be carried out in obtaining assurance of compliance are:

- (a) Issuing of approvals by the competent authority;
- (b) Assessment of designs;
- (c) Assessment and approval of the management systems of users of the Transport Regulations;
- (d) Witnessing or inspection of test arrangements;
- (e) Inspection or observation of manufacturing;
- (f) Inspection or observation of maintenance and servicing arrangements;
- (g) Inspection or observation of transport operations;
- (h) Inspection or observation of emergency preparedness arrangements;
- (i) Distribution of information (communication with the industry for the transport of radioactive material);
- (j) Application of enforcement measures, such as:
 - (i) Written notices;
 - (ii) Suspensions;
 - (iii) Prosecutions;
- (k) Interdepartmental liaison and cooperation;
- (l) Review of national and international regulations;
- (m) Review of the compliance assurance programme of the competent authority.

An example of how a complete compliance assurance programme can be organized is provided in Annex I.

ISSUING OF APPROVALS BY THE COMPETENT AUTHORITY

4.10. The Transport Regulations distinguish between cases in which radioactive material can be transported without approval by the competent authority and cases in which some kind of approval is required. In all cases, the Transport Regulations place the primary responsibility for compliance on the consignor. In cases requiring some kind of approval, an independent assessment by the competent authority is required, as appropriate, in respect of the following (Ref. [1], para. 802):

- (a) Designs for:
 - (i) Special form radioactive material;
 - (ii) Low dispersible radioactive material;
 - (iii) Packages containing 0.1 kg or more of uranium hexafluoride;
 - (iv) Packages containing fissile material;
 - (v) Type B(U) packages and Type B(M) packages;
 - (vi) Type C packages;
- (b) Special arrangements;
- (c) Certain shipments;
- (d) Radiation protection programmes for special use vessels;
- (e) The calculation of radionuclide values that are not listed in Table 1 of the Transport Regulations.

As described in Section VIII of the Transport Regulations, some of the items listed above may be subject to the approval of several competent authorities.

4.11. Within the provisions of the national legislation or regulations, approval for the transport of radioactive material should be sought directly from the competent authority in the cases referred to in para. 4.10.

4.12. The respective responsibilities of and the relationship between the competent authority and the applicant or licensee should be clearly understood by all parties. It is the responsibility of the applicant or licensee to demonstrate compliance with the Transport Regulations, and it is the responsibility of the competent authority to review and assess compliance. This should not discourage or prohibit the competent authority from giving informal advice, without commitment, on what is likely to be an acceptable way of demonstrating compliance.

4.13. Upon receipt of an application for approval, the competent authority should evaluate whether or not all relevant regulatory requirements are fulfilled. A competent authority may also be interested in the safety of a shipment within or through the State, for which its approval is not required by the Transport Regulations. If this is the case, all necessary documents should be made available to the competent authority of the State concerned.

4.14. When an approval by the competent authority is required for a design or a shipment, approval should be considered on the basis of the assessment that was made of the application that was sent to the competent authority. A list of items that may be submitted to the competent authority is provided in Annex II.

4.15. For each application for approval, the competent authority should evaluate compliance with the Transport Regulations. The application should be accepted or rejected on the basis of the results of this evaluation. If the application is successful, the competent authority should provide the applicant with an approval certificate (see Section VIII of the Transport Regulations and Annex III of this Safety Guide).

4.16. To meet the requirements of the Transport Regulations and of Ref. [2], an integrated management system is required for all transport related activities. The competent authority should verify that the management system of the applicant provides for compliance with the Transport Regulations and that it is consistent with the number, complexity and radiological significance of the transport movements that are carried out.

4.17. The competent authority should verify that the applicant and subsequently consignors and carriers have in place adequate provisions for preparedness for and response to an emergency in the transport of radioactive material.

4.18. When considering applications for approval of shipments under special arrangement, the competent authority should assess the demonstration by the applicant that the overall level of safety provided by the design of the package and the supplementary operational controls during transport is at least equivalent to that which would be achieved if all applicable regulatory requirements were met. Possible additional operational controls that may be employed are discussed in Ref. [18] (para. 825.1), for example.

4.19. The different types of approval certificate are discussed in greater detail in Section 5 of this Safety Guide, and details of specific information that may be included in applications for approval are provided in Annex II. The competent authority is required to comply with the Transport Regulations when it considers applications for approval, and to issue the appropriate certificates of approval containing all the required information. Appropriate records should be maintained by the competent authority to demonstrate that proper and due consideration was given to each application before the necessary approval was issued.

4.20. Consistent with the national practice and with due regard for any legitimate commercial considerations, the competent authority should be prepared to supply copies of its approvals to other users of the Transport Regulations (other than the original applicant) in order to facilitate their compliance with any specific requirements or conditions.

SPECIAL FORM RADIOACTIVE MATERIAL AND LOW DISPERSIBLE RADIOACTIVE MATERIAL

4.21. The Transport Regulations require unilateral approval for the design for special form radioactive material and multilateral approval for the design for low dispersible radioactive material to be issued prior to transport.

4.22. The competent authority should satisfy itself that the arrangements of the management system for the design for and testing and manufacture of special form radioactive material or low dispersible radioactive material are appropriate and adequate, with due regard for the nature of the material and the amounts that are likely to be produced.

4.23. Before the commencement of tests by the applicant, the competent authority should inspect the test facilities and arrangements, especially the specimens, the target for drop tests, and the measuring and recording systems. The competent authority may also witness the tests. The applicant should inform the competent authority of any deviation from the test plan and should present the results of testing — for example, evidence of leakage, distortion or other damage — to the competent authority.

4.24. The final application for approval of the design for special form radioactive material or low dispersible radioactive material should be sent to the competent authority. The application should include, among other information as described in Annex II, the final test programme and the test results, which need to be evaluated by the applicant. The application should specify the requirements for the individual special form radioactive material or low dispersible radioactive material and should demonstrate that the regulatory requirements have been met.

4.25. The competent authority should give consideration to the design life, the operating lifetime and the necessary identification of special form radioactive material or low dispersible radioactive material, as well as to the in-service inspections and safety checks to be made in order to ensure the continued integrity of the special form radioactive material or low dispersible radioactive material.

4.26. When the competent authority has verified that the design for special form radioactive material or low dispersible radioactive material meets all the valid regulations, it should issue an approval certificate. Examples of templates for approval certificates are given in Annex III.

4.27. During the manufacture of special form radioactive material or low dispersible radioactive material, the competent authority should carry out random inspections and/or reviews of the management system of the manufacturer to ensure that all the requirements have been correctly implemented.

PACKAGES REQUIRING COMPETENT AUTHORITY APPROVAL AND PACKAGE DESIGN ASSESSMENT

4.28. The competent authority may discuss the development and the proposed tests of a package with the applicant on the basis of the preliminary information provided. The preliminary information may cover the topics described in Annex II. Specifically, it may include the test plan for the package, with a clear statement of the scale of the model, the requirements and specifications of the model, the number of tests proposed, the drop attitudes for packages, the essential measuring and recording equipment to be used, and the nature of the target for drop tests. The preliminary information may also cover the requirements of the management system for design and testing.

4.29. The competent authority should give particular consideration to special features of the package design, as well as to the test plan. If it is proposed by the applicant to use a scale model specimen, it should be ensured that all relevant features of the original are adequately scaled and represented, including materials, contents and internal structures. The adequacy of the means proposed to establish compliance with the Transport Regulations should be reviewed. Account should be taken of instrumentation to be used for the measurement of physical quantities such as local accelerations, strains and internal pressure transients.

4.30. The competent authority should verify that the manufacture of models or prototypes is carried out in a controlled manner that complies with the management system of the manufacturer so that the models or prototypes are representative of the proposed package design. Particular consideration should be given to materials, welding and inspections, as well as to the results of quality control tests. Any deviations from the requirements and specifications should be declared, justified and recorded by the applicant, and presented to the competent authority for agreement.

4.31. Before the commencement of tests by the applicant, the competent authority should inspect the test arrangements, especially the specimen, the

target for drop tests, and the measuring and recording systems. The competent authority may also witness the tests. The applicant should inform the competent authority of any deviations from the test plan and should present the results of testing — for example, evidence of leakage, distortion or damage — to the competent authority.

4.32. The final application for approval of the package design should be sent to the competent authority. The final application for approval should include, among other information as described in Annex II, the final test programme, the results of testing and the evaluation report. The application should describe the management system of the applicant and should state in particular the requirements for the series production of packagings and their proper maintenance and use. Specifically, the applicant should demonstrate that the requirements for the package type in question have been met. The following aspects should be included, if appropriate, and should be verified by analyses (for routine, normal and accident conditions of transport):

- (a) Criticality safety;
- (b) Heat transfer;
- (c) Radiation safety (including shielding);
- (d) Structural integrity.

According to the Transport Regulations, compliance with the specific test requirements may also be demonstrated by means of analyses if suitable criteria or established comparative data are available.

4.33. When assessing safety, the competent authority should, as appropriate, make independent assessments to verify the results presented in the application for approval of the package design. In making such assessments, the competent authority should ensure that proper computer codes and models have been used, that they have been validated and that all input data have been correctly and, if appropriate, conservatively defined. Depending on the package type, expertise in different areas will be needed by the competent authority. The evaluation by the competent authority should also specifically cover the provisions made by the applicant or designer for the manufacture, servicing, maintenance and use of the package.

4.34. When assessing applications for approval of package design, the competent authority should ensure that full and proper provision has been made for the application, legibility and durability of identification marks and serial numbers, as well as for the proper notification to the competent authority

of the serial numbers of packages. This is particularly important in cases where multiple or interchangeable packaging components are used.

4.35. In the case of applications for full approval in respect of the current edition of the Transport Regulations [1] concerning designs previously approved under the 1973, 1973 (As Amended), 1985 or 1985 (As Amended 1990) editions of the Transport Regulations, the competent authority should evaluate the design fully against all appropriate aspects of the current Transport Regulations. This may involve an in-depth ‘design review’ of the materials and manufacturing methods, as well as of the testing and the programme of quality assurance applied to the original design of packagings. Similarly, when changes are made in the design of the packaging or in the nature or quantity of the authorized radioactive contents that would significantly affect safety, as described in paras 816 and 817 of the Transport Regulations, the competent authority should ensure that all appropriate aspects of the design and of the manufactured packaging are evaluated against the requirements of the current edition of the Transport Regulations [1].

4.36. The design of the package in question should be accepted or rejected on the basis of the evaluation results. In the case of acceptance, an approval certificate should be issued by the competent authority. More detailed recommendations on approval certificates are provided in Section 5, and an example of a template for approval certificates is provided in Annex III.

APPROVAL OF SHIPMENTS UNDER SPECIAL ARRANGEMENT

4.37. The Transport Regulations permit a consignment that is known beforehand not to satisfy the applicable requirements to be transported under special arrangement. Upon approval of such a shipment under special arrangement, the competent authority issues an approval certificate, as required in para. 826 of the Transport Regulations. Moreover, for international shipments of this type, multilateral approval is required.

4.38. For a shipment under special arrangement, the applicant is required to demonstrate to the competent authority that the overall level of safety is at least equivalent to that which would be provided if the applicable requirements of the Transport Regulations had been met. The competent authority should give consideration to the reasons why the shipment cannot be made in full accordance with applicable requirements.

4.39. The competent authority should carefully evaluate the provisions for control of design and operation submitted to it by the applicant for approval. To maintain its objectivity, the competent authority should not take part in activities relating to the control of design and operation.

4.40. The information submitted by the applicant for approval of a shipment under special arrangement is required to include, as appropriate:

- (a) The necessary information relating to the particular package design;
- (b) The applicable requirements of the Transport Regulations with which the shipment is not in compliance;
- (c) The design, operational, administrative or special provisions that will be employed during transport and storage in transit to compensate for the inability to meet the applicable requirements of the Transport Regulations.

PACKAGES NOT REQUIRING APPROVAL BY THE COMPETENT AUTHORITY

4.41. The compliance assurance programme of the competent authority should also cover the design, manufacture and use of packages and the maintenance of packagings that do not require approval by the competent authority.

4.42. Experience with the certification and use of package designs that do not require approval by the competent authority has shown that particular consideration should be given by the competent authority to ensuring that there is full compliance with the applicable requirements (paras 306 and 801 of the Transport Regulations). In particular, the following subjects for inspection by the competent authority should be addressed:

- (a) The management system within which the package is designed, manufactured and transported;
- (b) The design process and the internal process for granting approvals;
- (c) Control of manufacturing;
- (d) The programme for maintenance of packagings (in the case of reusable packagings).

IDENTIFICATION OF PACKAGES AND SERIAL NUMBERS OF PACKAGINGS

4.43. For the safe transport of radioactive material, once packagings have been correctly designed, assessed and manufactured, it is required that they be correctly identified throughout their lifetime. The Transport Regulations specify the identification marks assigned by the competent authority, the serial numbers of packagings and the markings of the package types that are required to be present during transport; Ref. [18] provides further recommendations on the legibility, durability and positioning of such markings. In its activities relating to compliance assurance, the competent authority should take every opportunity to verify that all required markings, serial numbers and identification marks are correctly, durably and appropriately applied to packages.

4.44. The scheduled inspection and maintenance programme of the user should include provisions for inspecting and, if necessary, correcting all permanent markings and for repairing any damage or defects. Such inspections by the user will show whether markings are indeed durable.

4.45. The competent authority should control the allocation of the required identification marks and should advise applicants of the allocation process. Identification marks can be assigned readily by the competent authority during the preliminary design assessment or evaluation phase. The arrangements for the allocation of the required identification marks should be such as to prevent two or more different designs of packages entering service with the same identification marks. The competent authority should also communicate to the transport industry recommendations on the self-allocation or determination of identification and design numbers for package designs that are not subject to approval by the competent authority, to avoid confusion in transport and in the event of an emergency.

4.46. The serial number on the packaging is required to uniquely identify each packaging manufactured. For packagings manufactured to an approved Type B(U), Type B(M) or Type C package design, and for packagings designed to contain fissile material, it is required that the appropriate competent authority be informed of the serial number (Ref. [1], para. 819). In this case, the term ‘appropriate’ has a broad interpretation and could pertain to any or all of the following:

- (a) The competent authority of the State in which the design of the packaging originated;

- (b) The competent authority of the State in which the packaging was manufactured;
- (c) The competent authority of the State or States in which the packaging is used.

In the case of packagings approved for continued use under paras 816 and 817 of the Transport Regulations, all competent authorities involved in the multilateral approval process should be provided with and should retain information on the serial numbers of the packagings.

4.47. An approved package design may be such that different internal components are used with a single outermost component, or that the internal components of a packaging are interchangeable between more than one outermost component. In such cases, each outermost component of the packaging with a unique serial number will identify the packaging as an assembly of components; this will satisfy the requirements of para. 539(b) of the Transport Regulations, provided that the assembly of components is in accordance with the design approved by the competent authorities. In such cases, the correct identification and use of the components should be ensured through the management system established by the consignor.

RADIATION PROTECTION

4.48. Paragraphs 301–303 of the Transport Regulations establish the general requirements for radiation protection and the requirements for radiation protection programmes in the transport of radioactive material. Through its compliance assurance programme, the competent authority should ensure that the requirements have been met, for example, by requesting information on and inspecting the radiation protection programmes in use in the industry. Specific recommendations on Radiation Protection Programmes for the Safe Transport of Radioactive Material are provided in Ref. [19].

4.49. Appropriate radiation monitoring equipment should be used, as well as appropriate equipment and containers for samples of radioactive material to be analysed. The equipment should be calibrated and maintained, and the staff using it should be adequately trained and qualified. Where necessary, the competent authority should require the inclusion of information on radiation protection programmes in applications for approval. Further, the places where radioactive material is handled and stored are required to be segregated sufficiently from places occupied by transport workers and members of the