

Paper No. 4058

Proposal of a New Structure for the IAEA Transport Regulations

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Abstract

The IAEA Transport Regulations were issued for the first time in 1961 as “Regulations for the Safe Transport of Radioactive Material”, after more than 50 years it has become one of the most used Safety Standards published by the Agency, and adopted by the UN Model Regulations and all Modal Regulations to regulate the transport of radioactive material.

Although widely used, it has never been user friendly. This is a characteristic that developing countries find difficult to deal with when establishing national regulations for the safe transport of class 7 materials. The IAEA regulations can be challenging to understand, which increases the potential for making mistakes when implementing them at the national level.

Taking into account the popularity and overall good acceptance of the guidance safety standard SSG-33 “Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material, 2012 Edition” and its predecessors, this paper proposes a new structure for transport regulations based on the structure of those schedules. The new structure will greatly simplify the understanding and adoption of the appropriate SSR-6 requirements based upon the characterization of the radioactive material and determination of the proper UN number. The requirements are then identified for each UN number.

Introduction

Regulations for the Safe Transport of Radioactive Material can be easily googled, and Google will return more than 25 pages with links. SS6¹, ST-1², TS-R-1³ and SSR-6⁴ are possible results, all them coming from the same source: the International Atomic Energy Agency, the IAEA. It has been a long journey since 1961, when the first edition was published. The philosophy has been always the same: when transported, the radioactive material is in the public domain; therefore, the safety measures have to be sufficient to minimize, and if possible avoid, radiological consequences to people or the environment due to the movement of the radioactive material on public roads even in the case of accidents.

A brief history

A short assessment of the most known editions of transport regulations will build a basis for later discussions. The review will be based in the editions of 1961, 1964, 1967, 1973, 1985, 1996, 2003, 2005, 2009 and 2012.

Structures

The first edition of IAEA Transport Regulations was in line with the structure of the Agency's standards and presented the following structure with around 180 requirements

- SAFETY SERIES No. 6, REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS, 1961 Edition
 1. DEFINITIONS AND UNITS
 2. SCOPE
 3. GENERAL PRINCIPLES
 4. CONTROL OF EXPOSURE
 5. GENERAL PACKAGING REQUIREMENTS
 6. LIMITATION OF QUANTITY OF RADIOACTIVE MATERIAL IN A PACKAGE
 7. LIMITATION OF EXTERNAL RADIATION DOSE RATE
 8. LABELLING AND MARKING
 9. TRANSPORT DOCUMENTS
 10. LOADING AND STORAGE
 11. RADIOACTIVE CONTAMINATION OF THE CONVEYANCES AND THE EXTERNAL SURFACES OF PACKAGES
 12. CUSTOMS
 13. EXEMPTIONS FROM THE REGULATIONS CONTAINED IN SECTIOND 5 TO 12
 14. TRANSPORT OF RADIOACTIVE MATERIALS OF LOW SPECIFIC ACTIVITY
 15. FISSILE MATERIALS
 16. LARGE RADIOACTIVE SOURCES
 17. SPECIAL ARRANGEMENTS
- ANNEX 1. TABLES
- ANNEX 2. CLASS I FISSILE MATERIAL
- ANNEX 3. CLASS II FISSILE MATERIAL

The 1985 Edition presented a completely different structure and system of numbering paragraphs, close to the current one. A deviation from the structure of IAEA Safety Standards was proposed, accepted by the Agency and maintained until the last edition published in 2012 with internal codification SSR-6. The structure with eight sections similar to the current one appeared with the 1996 Edition, although there were slight differences in the title of some sections. The type C package was introduced in that edition of Regulations.

One important difference between 1996 and previous and post editions is the addition, in that edition and a few subsequent ones, of the SCHEDULES OF REQUIREMENTS FOR THE TRANSPORT

OF SPECIFIED TYPES OF RADIOACTIVE MATERIAL CONSIGNMENTS at the end of the requirements and before the Annexes. Those Schedules had been previously published as Safety Series No. 80, IAEA Safety Guides. As explained in the Preface to the Schedules, they were provided as an aid to the users of the Regulations, as a basic guide to national authorities and international organizations that may wish to adapt the Regulations in schedule form.

And finally, the current structure quite similar to the 1996 Edition in the external format, but incorporating important re-distribution of paragraphs and the topic for “classification” in Section IV to adopt a structure a little more in accordance with the UN Model Regulations, and the addition of a new Annex as well as important modification to the fissile exceptions.

- **SPECIFIC SAFETY REQUIREMENTS No. SSR-6, REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL, 2012 Edition**

SECTION I. INTRODUCTION

SECTION II. DEFINITIONS

SECTION III. GENERAL PROVISIONS

SECTION IV. ACTIVITY LIMITS AND CLASSIFICATION

SECTION V. REQUIREMENTS AND CONTROLS FOR TRANSPORT

SECTION VI. REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES

SECTION VII. TEST PROCEDURES

SECTION VIII. APPROVAL AND ADMINISTRATIVE REQUIREMENTS

ANNEX I: SUMMARY OF APPROVAL AND PRIOR NOTIFICATION REQUIREMENTS

ANNEX II: CONVERSION FACTORS AND PREFIXES

ANNEX III: SUMMARY OF CONSIGNMENTS REQUIRING EXCLUSIVE USE

Comparison with Model and Modal Regulations' structure

United Nations Recommendations on the Transport Of Dangerous Goods⁵, Model Regulations, usually known as Orange Book (UNOB) reproduces the requirements for the safe transport of radioactive material set by the IAEA Regulations, for the transport of class 7, radioactive material.

ICAO, Technical Instructions for the Safe Transport of Dangerous Goods by Air⁶ and IMO, International Maritime Dangerous Goods Code⁷, are the modal regulations governing the transport of dangerous goods by air and sea respectively. The three structures are shown in Table 1.

The need to accommodate the IAEA requirements in the format of the UNOB, made necessary a slight change in the IAEA regulations' structure; but the intricate path forward to include SSR-6 provisions in UNOB would be facilitated by a deeper change.

Here and now

It is easy to identify three different targets in the use of transport regulations:

- ¹ Design/manufacture: there are a complete set of requirements indicating the performance that the final design of materials or packages have to comply with. Essentially they are contained in sections VI and VII, and complemented with section VIII specifying the information to be given in case of application for approval by the competent authority. In addition, the Advisory Material SSG-26 gives advice on the meaning and background of SSR6 paragraphs help with some guidance to fulfil the requirements. This target is represented by a small number of Member States widely recognized as providers of radioactive sources or nuclear material that possess a mature and well developed regulatory infrastructure and deep knowledge based in technical and scientific skills.
- ² Shipment: this must be the most used application of the regulations. A well-known figure commonly uses the number of 20 million shipments by year but the figure is likely to be higher. Nonetheless, based upon the 20 million shipments each year this translates to one shipment every 1,5 seconds anywhere in the world. The sections addressing the needs of operators to transport radioactive material are, essentially, sections IV and V, where the fundamental requirements to the selection of the proper package and operational controls are established in addition to section VIII for administrative controls.
- ³ Regulatory oversight: the competent authorities uses the transport regulations to verify compliance with them and, in this way, assures that the level of safety during the transport of radioactive material achieves that provided by the regulatory requirements in every Member State. As regulatory oversight includes both design/manufacture and shipment operations as well as issuing of approval certificates, there is no distinctive importance of these activities for competent authorities within a mature regulatory infrastructure. The situation is different for competent authorities of developing countries where no design, manufacture and approval of material or packages occurs. There also appears to be areas of the regulations where some Member States have different interpretations.

Current status regarding the adoption of transport regulations

As it is well known, IAEA Safety Standards are recommendations to Member States, but they are not binding unless the Member State adopt them in their national regulatory framework. There are three main formats for the adoption of transport regulations at national level:

- a. Through a regional agreement. That is the case of European countries being contracting parties of the ADR, which takes the format from the United Nations Orange Book.
- b. By adopting literally the text of the IAEA Transport Regulations.
- c. Writing national regulations for Transport of Radioactive Material based on IAEA Transport Regulations.

There is no need for further discussion of (a), the states agree with the ADR, its revision is granted by UN and contracting countries do not need to modify their national regulatory framework each time a new edition is issued because that revision is part of the agreement.

The second format (b) represents the lowest possibility of discrepancies between the IAEA regulations and the national regulations due to the minimal changes in the text. The relevant characteristic to be taken into account is that the IAEA regulations do not assign all responsibilities because that task is the responsibility of each state according to its internal legal organization. National regulations should include that assignation of responsibilities.

The third format (c) historically represents the choice of the majority of Member States, and it is the most difficult. Reproducing the requirements from SSR-6 into national regulations by taking only the activities performed in the country is the biggest potential for making mistakes in the drafting of national regulations.

In recent times through the experience reached after several years working with developing countries involved in the task of building their regulatory infrastructure for transport and, specially, from the Global Meeting on Transport focused on drafting national transport regulations held in Vienna, in 2016, it is clear that most of the Member States now choose the third format (c) to implement their national transport regulations. The results seen in draft texts sent to the Agency for review are problematic with many mistakes, misunderstandings and/or deficiencies found. This is to be expected because a deep knowledge of the regulations and transport operations is needed to determine which requirements are needed to reflect the activities carried out in a Member State. In general, Member States using this format have requested changes to the format of the SSR-6 transport regulations to make it easier to adopt to reflect their particular needs.

Looking at the future

The successful use of the Schedules of Provisions of the IAEA Regulations for the Safer Transport of Radioactive Material (SSG-33) by Member States, demonstrated through the number of downloads registered in the Agency's IT System, and its past inclusion at the end of the transport regulations as an aid to Member States in applying the regulations, led the Secretariat to evaluate the possibility of adopting its format to issue the transport regulations in the future.

There would be a need to distinct the set of requirements specific for design and manufacture of radioactive materials and packages, including testing, maintenance and repair, usually performed by nuclear developed and mature Member States from the group of requirements normally addressed by any country transporting radioactive material which, in most of the cases, come from foreign providers. The breadth of the uses of radioactive materials in each country is in close relation to the types of packages used and, therefore, to the regulatory oversight that is needed to implement.

The fact of having the requirements for the safe transport of radioactive material in a format such of the schedules would allow Member States to select the set of provisions they need to implement in

the country, avoiding misunderstandings in transferring the requirements to a different format and omissions in considering the proper requirements to be addressed in national regulations.

In order to issue the transport regulations in one complete set of requirements, provisions regarding design, manufacture and approval of materials and packages should be grouped, and the rest of requirements dealing with the preparation, consigning, loading, carriage including storage in transit, unloading and receipt at the final destination of radioactive materials could be delivered following the structure of the schedules, keeping together all the provisions for each UN number.

Work is underway in the Agency to prepare a draft SSR-6 based upon the structure of SSG33. Although it is early in the development process the work thus far is indicating a structure as follows:

- PART 1
 - Section I (SSR6)
 - Section II Definitions (SSR6)
 - Section III General Provisions (SSR6)
- PART 2
 - Determination of UN number (SSG33 – refers to Appendix 2)
 - Section IV Activity Limits and Classification (SSR6 – Tables now in Appendix 1)
 - General requirements for all UN numbers (SSG33 + SSR6)
 - Requirements for each UN number (SSG33)
- APPENDICES
 - Tables and figures
 - Classification process (SSG33)
 - Design and testing requirements
 - Fissile material requirements

The text would be taken from SSR6 with no changes. Where a paragraph refers to another paragraph, these paragraphs will be included immediately after so the reader does not have to refer to other parts of the document, therefore some paragraphs will be repeated throughout the document many times. In this way the requirements for each UN number will be complete with references to the Appendices only necessary for the package and materials design and testing requirements.

The electronic version will enable the document to be presented in a variety of ways to suit the readers' needs (operator, regulator, package designer)

Further information will be available towards the end of 2018 following further work and refinement by Consultants meeting over the next 12 months.

Table 1 Structure of UN, IMO and ICAO Regulations

UN - OB	IMO - IMDG	ICAO - TI
Part 1. GENERAL PROVISIONS, DEFINITIONS, TRAINING AND SECURITY	PART 1 GENERAL PROVISIONS, DEFINITIONS AND TRAINING	Part 1. GENERAL
Part 2. CLASSIFICATION	PART 2 CLASSIFICATION	Part 2. CLASSIFICATION OF DANGEROUS GOODS
Part 3. DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND EXCEPTIONS	PART 3 DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND EXCEPTIONS	Part 3. DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND LIMITED AND EXCEPTED QUANTITIES
Part 4. PACKING AND TANK PROVISIONS	PART 4 PACKING AND TANK PROVISIONS	Part 4. PACKING INSTRUCTIONS
Part 5. CONSIGNMENT PROCEDURES	PART 5 CONSIGNMENT PROCEDURES	Part 5. SHIPPER'S RESPONSIBILITIES
Part 6. REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS, INTERMEDIATE BULK CONTAINERS (IBCs), LARGE PACKAGINGS, PORTABLE TANKS, MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs) AND BULK CONTAINERS	PART 6 CONSTRUCTION AND TESTING OF PACKAGINGS, INTERMEDIATE BULK CONTAINERS (IBCs), LARGE PACKAGINGS, PORTABLE TANKS, MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs) AND ROAD TANK VEHICLES	Part 6. PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS
Part 7. PROVISIONS CONCERNING TRANSPORT OPERATIONS	PART 7 PROVISIONS CONCERNING TRANSPORT OPERATIONS	Part 7. OPERATOR'S RESPONSIBILITIES
TABLE OF CORRESPONDENCE between paragraph numbers in the IAEA and the Recommendations on the Transport of Dangerous Goods	APPENDIX A LIST OF GENERIC AND N.O.S. PROPER SHIPPING NAMES	Part 8. PROVISIONS CONCERNING PASSENGERS AND CREW
Appendix A - List of generic and N.O.S. proper shipping names	APPENDIX B GLOSSARY OF TERMS	ATTACHMENT 1. Lists of proper shipping names
Appendix B - Glossary of terms		ATTACHMENT 2. Glossary of terms
		ATTACHMENT 3. Notified variations from the Instructions
		ATTACHMENT 4. Index and list of tables and figures

Conclusions

IAEA Transport Regulations provide a good technical basis for the safe transport of radioactive material worldwide. So far, changes have been incremental over the time according to the progress reached by the industry and new technical possibilities for regulatory control available all over the world.

The use of radioactive material has shown an impressive increase, and this tendency will follow in next years. More and more countries have now access to use radioactive materials in their day to day life. In establishing their regulatory infrastructure for transport of radioactive material these countries are facing difficulties when nationalizing the IAEA transport regulations. Mistakes due to misunderstandings or omissions could lead to a situation where the proposed safety on the transport is not as safe as the IAEA Regulations propose.

The “ideal” recommendation to those Member States is to adopt the IAEA Transport Regulations as they are published by the Agency; but this possibility presents a challenge for many countries where their legal framework does not allow the legislation of activities not performed in the country.

The format of the schedules would allow Member States to choose what schedules they need to incorporate to their national regulations according to the needs of the country.

This is only the kick off for an intention to help Member States in the application of IAEA Safety Standards. A long discussion will be need before a possible new format for the Transport Regulations.

The goal is to keep transport of radioactive material at least as safe as it has been so far.

References

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- ² INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, Safety Standards Series No. ST-1. Vienna, Austria; IAEA (1996)
- ³ INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Materia, 1996 Edition (Revised)l, Safety Standards Series No. TS-R-1. Vienna, Austria; IAEA (2000)
- ⁴ INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, Specific Safety Requirements No. SSR-6. Vienna, Austria; IAEA (2012)
- ⁵ UNITED NATIONS, Recommendations on the Transport of Dangerous Goods, Model Regulations, ST/SG/AC.10/1/Rev.19, UN, New York and Geneva (2015).
- ⁶ INTERNATIONAL CIVIL AVIATION ORGANIZATION, Technical Instructions for the Safe Transport of Dangerous Goods by Air, 2015–2016 Edition, ICAO, Montreal (2014).
- ⁷ INTERNATIONAL MARITIME ORGANIZATION, International Maritime Dangerous Goods (IMDG) Code, IMO, London (2014)