# Restructuring the IAEA Transport Regulations

*I.L.S. Gray*
*UK Nirex Ltd.*

*I.F. White*
*IFW Technical Services*

## THE PRESENT REGULATIONS

The present IAEA Transport Regulations (1985, as amended 1990) total four separate documents. Only the first of these contains the actual Regulations: IAEA Safety Series 6, *Regulations for the Safe Transport of Radioactive Material* (IAEA 1990a). A further three documents are then required to provide *Explanatory Material* (IAEA 1990b), *Advisory Material* (IAEA 1990c), and a *Schedule of Requirements* (IAEA 1990d).

More recently these four documents have been supplemented by Safety Guides and Safety Practices on emergency planning, compliance assurance, and quality assurance; however, the above four documents form the core of the Transport Regulations.

The graded approach to contents limits for packages and conveyances contained within the Transport Regulations has provided an excellent world-wide safety record for radioactive materials transport. But the organisation and presentation of the Regulations cause problems to users. These uncertainties in understanding and implementing the Regulations are increasing with each revision; ultimately, this could have an adverse impact on safety.

Without wishing to make any changes to the technical content of the existing Regulations, this paper proposes a strategy for change to a more understandable form of presentation.

Since the current round of revisions is almost complete and new regulations will be released in 1996, now is an ideal time to be considering changes aimed at the next revision appearing in 2005-06.

## PROBLEMS WITH THE PRESENT REGULATIONS

### Unplanned Growth and Its Effect on Safety

The present Regulations are the result of years of unplanned growth. Each revision has added new regulations and amendments on to previous versions. The whole combination is now so badly structured that users often find great difficulty in deciding how to comply with the Regulations. Indeed, a minor industry has grown around the needs of everyday transport users for specialised advice and interpretation.

A sound set of regulations is an important foundation for the safe transport of radioactive materials but, of themselves, regulations do not provide safety. Safety can only be achieved by everyday users implementing the Regulations accurately and intelligently. Uncertainty among the users of the Regulations can lead to mistakes, and hence to hazards. For example, a user might begin by consulting Safety Series 80 (IAEA 1990d) to find which of the Regulations apply to a proposed transport activity. But SS80 is almost meaningless without frequent cross-reference to SS6 (IAEA 1990a), and then the background information in SS7 and SS37 (IAEA 1990b, c). To reach an accurate answer to a particular practical question, the user must find all this scattered information and integrate it without any errors or omissions. Such a confusing presentation detracts from the safety that the Regulations seek to promote.

For 1996, IAEA proposes to absorb the Schedules from SS80 (IAEA 1990d) into SS6 (IAEA 1990a), and to absorb the Advisory Material from SS37 (IAEA 1990c) into an expanded and unified SS7 (IAEA 1990b). These proposals are helpful, but they do not tackle the underlying structural problems in the Regulations themselves.

### Quality Assurance

Although calling for Quality Assurance in the transport of radioactive material, the Regulations themselves would not survive a QA audit. There is no explicit trail of accountability linking individual regulations back to basic safety standards, although it is understood that the 1996 revision will make reference to Safety Fundamentals. This is a welcome step, but it will also accentuate the lack of a clear 'audit trail' from basic standards to the final regulations.

### Reason for the Problems

The problem for everyday users is that the Regulations do not explain themselves, and the root of this problem is the structure of the documentation. When a new edition of Regulations is published, the supporting documents are all organised as if the Regulations had been written first. This of course is untrue – each new edition is the product of a mass of background material and studies – but the user has to unravel the trail of inference for himself, instead of being presented with a detailed rationale for each paragraph.

The regulatory process is also weak in dealing with new situations, which arise continually. Since the rationale underlying the current Regulations is often not clear, even to experts, it is difficult for users to forecast the nature and impact of future changes. Such uncertainty can create major financial risks for organisations that are trying to develop long-term plans involving a huge scale of expenditure.

## TOWARDS RATIONAL REGULATIONS

All of the IAEA Transport Regulations should be derived from basic safety standards in a clear, explicit and accountable way.

The earliest Regulations were essentially arbitrary, based heavily on experience and expert judgement, but with relatively little scientific justification. Over many years there has been a progressive change towards regulations based on modern concepts of risk assessment, and on explicit limits on risk and/or radiation dose. Old Regulations have been progressively replaced by newer ones, with their scientific bases much better documented in SS7 and SS37 (IAEA 1990b, c).

Current international safety standards have bridged the conceptual gap between the risks from routine radiation exposure and the risks arising from much less probable events, which would lead to much higher exposures if ever they did occur. Clearly, the transport of radioactive materials falls within the scope of this unified risk-based approach. Normal conditions of transport give rise to routine radiation exposures, while there are also risks of larger doses in very low probability accident conditions.

It would now be of great benefit to embody basic safety standards of dose and risk into the IAEA Transport Regulations themselves, and then to derive each individual Regulation in an explicit manner. The current body of Regulations is sufficiently mature and well-founded to support this restructuring, without a significant need for change in the detailed Regulations themselves.

## PROPOSAL FOR REVISION

It is therefore proposed that the IAEA Transport Regulations be reorganised into a logical system based on a four-level structure:

1. **Transport Safety Fundamentals**
2. **The Justified Regulations**
3. **The Regulations**
4. **Guidance and Codes of Practice.**

The contents of these four parts will now be explained in more detail, using the current regulations (IAEA 1990a,b,c) to demonstrate how the reorganisation can be achieved.

## PART 1: TRANSPORT SAFETY FUNDAMENTALS

The purpose of the *Transport Safety Fundamentals* document is to state the primary safety objectives, and if necessary to derive more specific safety objectives that apply to transport. The exact content will depend on the IAEA safety standards available at the time.

The *Transport Safety Fundamentals* document should outline how the standards will be applied through a system of package specifications. In other words, the proposed restructuring will be based primarily on the major package types; this concept then provides a unified structure for all the lower-level documents.

The contents of the *Transport Safety Fundamentals* document are further outlined below.

- **Purpose** – In essence the purpose of the IAEA Transport Regulations has always been the same, and should not change.
- **Primary safety objectives** – Quoted from IAEA Basic Safety Standards or other appropriate IAEA document.
- **Transport safety objectives** – More detailed objectives relevant to radioactive materials transport, and justified by reference to primary objectives.
- **Scope and exclusions** – Very similar to paragraphs 102-109 of SS6 (IAEA 1990a).
- **The system of package specifications** – Most of the Regulations should be organised according to the types of packages concerned.

  The section numbers shown below were derived by taking a detailed 'inventory' of the existing Regulations (IAEA 1990a) and reallocating them as shown. This numbering scheme finds a place for everything in the present Regulations, but it transforms the structure into one that is primarily based on package types. It thus provides a complete main structure for all the lower-level documents.

1. **Excepted Packages**
   - 1.1 Limited quantities of radioactive material
   - 1.2 Instruments and articles
   - 1.3 Articles manufactured from natural uranium, etc.
   - 1.4 Empty packagings of other types
2. **Industrial Packages**
   - 2.1 LSA-I
   - 2.2 LSA-II
   - 2.3 LSA-III
   - 2.4 SCO-I
   - 2.5 SCO-II
3. **Type A Packages**
4. **Type B Packages**
   - 4.1 Type B(U)
   - 4.2 Type B(M)

5. **Type C Packages** (probably, from 1996)

Further chapters will be required for:

6. **Packages containing Fissile Material**
7. **Material Transported under Special Arrangement**
8. **Shipment and Storage in Transit**

## PART 2: THE JUSTIFIED REGULATIONS

This major document is the core of the proposed new structure. It forms the link between the *Safety Fundamentals* statement and the detailed regulations. Note that the Regulations are the **product** at the end of the chains of reasoning and justification given in this document. This is a crucial difference between the proposed structure and the present one.

The main features of the *Justified Regulations* document are listed below.

- **Organisation and presentation** – The *Justified Regulations* document will be organised according to the numbering scheme shown above.

  Regulations should be referred to by section and sub-section number, abandoning the old scheme of numbering individual paragraphs (which always becomes confused when new paragraphs are introduced).

- **Justification** – Each Regulation or group of Regulations within the overall section numbering scheme will be preceded by its own Justification. The Justification of each Regulation must always start from the Primary and Transport safety objectives. The Justifications are to be presented as derivations of suitable Regulations to implement these objectives in the context of the particular package type. The Regulation thus emerges at the **end** of the Justification - it is **not** to be stated first.

  Considerable technical background material already exists to justify most of the existing Regulations. However, in every case the actual wording of a Regulation must be the product of expert judgement, often balancing technical rigour against practicability of implementation. Such judgements are both necessary and legitimate, since the aim is to find the most effective **practical** way to achieve the primary safety objectives. In the case of the Transport Regulations, these judgements can often be supported by a long record of favourable experience.

- **Regulations** – As stated above, each section of Justification will **end** with the Regulation or sub-group of Regulations thus derived.

- **Avoidance of cross-referencing** – There should be a minimum of cross-referencing to other Regulations. This policy is in sharp contrast to the existing documentation. It aims to ensure that every Regulation and every section of the Justified Regulations document is as complete and self-contained as possible, even at the expense of repetition. (It is false economy to save paper and space by making the Regulations harder to read and interpret.)

Certain large sections that are referenced by several different Regulations – for example, the Definitions of Terms, and the derivation and tables of $A_1$ and $A_2$ values – should be moved to an Annex; but these should be rare exceptions to a general rule of 'no cross-referencing'.

**PART 3: THE REGULATIONS**

Under these proposals, the Regulations will simply be extracted from the *Justified Regulations*, and presented in the format required to provide a model for national legislation. This document will be completely dependent on the *Justified Regulations*. It would never be revised independently.

**PART 4: GUIDANCE DOCUMENTS**

The first three levels of documents described above will explain and justify how the Regulations are derived, and state the Regulations themselves. However, this still leaves the end user with the task of implementing the Regulations in practice. A further level of interpretation is therefore required to give clear practical guidance.

The difference from the present IAEA Guidance material would be that the Regulations themselves would be far more self-explanatory. Therefore the new Guidance documents would not (and should not) introduce any new explanation of the purpose or contents of the Regulations. All they will need to do is explain the practical implications and recommend good practice.

**DISCUSSION**

There must be a strict hierarchy of dependence from one level of document to the next higher, as shown in Table 1 (at end of paper).

Day-to-day users of the Regulations – the transporters of radioactive material – will mainly need the Regulations themselves, and the Guidance material. The higher levels of documentation will be mainly used by specialists.

**MAKING THE CHANGE**

**Compatibility**

There are no major incompatibilities between the proposed new structure and the old. A detailed inventory of the existing Regulations has shown that everything finds a place in the proposed new structure.

There is already enough background material and knowledge to write the Justifications for most of the current Regulations under the proposed new structure. Most of the technical information is already present in SS7 and SS37 (IAEA 1990b,c ).

**Programme for Changeover**

It is not practicable to combine the revision of the structure of the regulations with the ongoing task of revising their technical content. The work should be separated into two distinct projects, running in parallel for several years and with a carefully planned changeover date.

The first restructuring should be applied retrospectively to the an existing set of Regulations. After developing the new structure in detail, the new draft must be carefully audited to ensure that it covers the original Regulations point-for-point and contains no unintended changes.

## CONCLUSIONS

1. The graded approach to contents limits for packages and conveyances contained within the Transport Regulations has provided an excellent world-wide safety record for radioactive materials transport. But the organisation and presentation of the Regulations does cause problems to users.
2. Without wishing to make any changes to the technical content of the existing Regulations, this paper has proposed a detailed strategy to enhance the user-friendliness of the Regulations.
3. Since the current round of revisions is almost complete and new regulations will be released in 1996, now is an ideal time to be considering changes aimed at the next revision appearing in 2005-06.
4. It is proposed that the IAEA Transport Regulations be reorganised into a logical system based on a four-level hierarchy:

    **1. Transport Safety Fundamentals**

    **2. The Justified Regulations** – documenting the essential links between the Safety Fundamentals and the Regulations derived from them

    **3. The Regulations** – copied from the Justified Regulations

    **4. Guidance.**

5. These documents should have a unified structure, based primarily on the types of package concerned.
6. It is not practicable to combine the revision of the structure of the regulations with the ongoing task of revising their technical content. The first restructuring should be applied retrospectively to an existing set of Regulations. After developing the new structure in detail, the new draft must be carefully audited against the old Regulations.
7. If the present situation were allowed to continue into the indefinite future, the Regulations would become ever more difficult to interpret and enforce, creating increasing problems both for users and for the Competent Authorities of Member States. Most seriously of all, this could eventually have an impact upon safety.

## REFERENCES

IAEA Safety Series 6, *Regulations for the Safe Transport of Radioactive Material, 1985 Edition (as amended 1990)*. Vienna, IAEA (1990a).

IAEA Safety Series 7, *Explanatory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (1985 Edition). Second Edition (as amended 1990)*. Vienna, IAEA (1990b).

IAEA Safety Series 37, *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, 1985 Edition (as amended 1990)*. Vienna, IAEA (1990c).

IAEA Safety Series 80, *Schedule of Requirements for the Transport of Specified Types of Radioactive Material Consignments (as amended 1990)*. Vienna, IAEA (1990d).

**Table 1. Hierarchy of Proposed Documents**

| Document Level; IAEA Category | Short Working Title | Notes | Main Users |
|---|---|---|---|
| 1<br>IAEA Safety Standard | **Safety Fundamentals** | IAEA Safety Fundamental, interpreted and expanded if necessary to be more relevant to transport. Provides all the fundamental safety criteria required for the Justified Regulations. | Transport experts and IAEA Revision Panels |
| 2<br>IAEA Safety Standard | **Justified Regulations** | Provides the 'audit trail' from Safety Fundamentals to the detailed Regulations. Could include its own Safety Fundamentals if free-standing Regulations are required. Structured primarily according to major package types. | Transport experts and IAEA Revision Panels |
| 3<br>IAEA Safety Standard | **Regulations** | Quoted directly from the Justified Regulations. Follows the above structure, organised primarily according to major package types. | End users – transporters of radioactive material. |
| 4<br>IAEA Safety Guide | **Guidance** | Practical implications of the Justified Regulations. Follows the above structure, organised primarily according to major package types. | End users – transporters of radioactive material. |