Recommendations from TM-44897

From Working Group #1:

WG1 concern: The fundamental objective of the Regulations was established many years ago. The focus on radiation doses is obvious but it does not appear to provide a complete set of objectives. Energy release in other forms than radiation has been considered as a criticality event consequence. It may be a source for damage to package containment and shielding of radioactive material but also to other harmful effects than radiation.

WG1 proposal 1: SSR 6, paras 101-104. Add energy release as an effect (in addition to radiation). The Technical Basis should confirm that a nuclear explosion in transport of radioactive material covered by the Regulations is not credible and capture the improvements in understanding that other potential consequences of a criticality event since the first edition of the Regulations published (1961).

WG1 concern: The fact that criticality may be acceptable under credible but extreme accident conditions should be reflected in the discussion on methods of how to meet the objective in para. 104.

WG1 proposal 2: SSR 6, para. 104. Consider changing “prevention of criticality” to “preservation of criticality safety” in the para. 104 list of methods to meet the objective. This can subsequently be clarified by the statement that criticality safety primarily relies on prevention of criticality.

WG1 concern: Most of the operations in para. 106 are not transport of radioactive material and are not authorized by the Regulations (even though they may be required before transport). Safety during those operations is not assured by the Regulations.

Some of the listed operations can be explained in the Advisory Material as operations required before transport is authorized or as operations required after transport has been completed. The Regulations may require measurement of irradiated fuel but that does not imply that such measurements are authorized and certainly not that compliance with the Regulations assures safety (para. 105). There are many examples of requirements that involve operations not covered by the Regulations. Such operations are not within the scope of the Regulations.

WG1 proposal 3: SSR 6, paras 105-106. Restrict the scope to the operations for which the Regulations provide safety as well as are authorized by the Regulations and by competent authorities.

WG1 concern: The confinement system has several times been recognized as being an incorrect definition, providing incorrect messages, being interpreted very differently than the original intent, containing requirements in the definition that are not consistent with requirements in other sections (leading to neglect of the requirements while applying the definition as a complex set of requirements), etc. The concern has been recognized as legitimate by criticality specialists at various meetings, e.g. IAEA TM-38941 in January 2010.

WG1 proposal 4: Remove the term “confinement system” from Regulations. Return to previous (before 1996) requirement related to subcriticality of containment system. Clarify full intent of containment system. The U.S. national regulations have preserved the pre-1996 interpretation of this requirement. The U.S. has rejected the adoption of the confinement system concept as defined and...
applied in the Regulations. The U.S. discussion and experience may be studied for guidance on new text. The requirements in paras 681 and 682 need clarification.

**WG1 concern:** An improvement of the criticality safety requirements for packages that don’t require competent authority approval (previous 15 g limit, now paras 674 and 675) makes it difficult to ship LSA-I materials that have been packaged during many years for shipment to final disposal sites. The consignors also have to increase the formal hazard level from LSA-I to LSA-II to allow shipment of LWR fuel in IP-II packages. This does not appear to be contributing to a good safety culture.

In both cases the reason is that there is no UN number for material that is both LSA-I and FISSILE. LSA-I material has been informally defined as covering both activity and criticality hazards together. As shown before the SSR 6 2012 Edition, LSA-I material complying with 15 g fissile exception criteria were not demonstrated to provide a higher level of criticality safety (rather the opposite since the provision was removed for safety reasons). The Technical Basis for criticality safety requirements have aimed to result in a consistent safety level (extremely high) for all transport of fissile material.

**WG1 proposal 5:** Modify the definition to express the full purpose of LSA, including reasons for excluding some fissile materials and not others from LSA-I. Alternatively, allow LSA-I to be FISSILE, requiring a new UN number.

**WG1 concern:** The Technical Basis efforts have shown that the “package type” term should be restricted to activity only. This is also clear from the definition of package. Fissile material and uranium hexafluoride require additional considerations. This does not apply to excepted packages since they have requirements both for activity limits and for criticality safety.

**WG1 proposal 6:** Modify the definition of package by removing excepted package from the list of “package types”. Retain a definition of excepted package (but not as a package type) and express its dual purpose. Reasons for excluding some fissile materials and not others should be subsequently documented in the Technical Basis document.

**WG1 concern:** It is not easy to recognize that the RPP also applies to criticality safety measures. This is clear from several documents and paragraphs, in particular para. 576(a) which allows for replacement of CSI with some other control for special use vessels.

**WG1 proposal 7:** Modify the definition to recognize that the RPP accounts for radiation protection and criticality safety measures.

**WG1 concern:** If the activity limit for the definition of radioactive material is high enough to allow criticality of material not defined as radioactive material, under accident and human error conditions, then the fissile material definition and criticality safety requirements in the Regulations will not apply. As long as the title and scope of the Regulations only refer to radioactive material, criticality safety for materials that do not meet the radioactive material definition need to be assured. It has not been obvious from the Technical Basis efforts that such verification has been made. Current activity limits
appear to provide adequate criticality safety and such a purpose needs to be clear and formally
documented.

**WG1 proposal 8:** The definition of radioactive material should refer to a demonstrated “fact” that all
fissile materials of potential criticality safety concern are covered.

**WG1 concern:** Working Group 1 spent considerable time on discussions on mixed packing of LSA
and SCO materials in an IP-II package. The material could also be FISSILE (except for LSA-I). A
single IP-II package can contain multiple materials, each requiring different UN numbers.

It has also been evident from the WG1 discussions as well as from the Technical Basis effort that the
issue of classification versus UN number assignment is confusing to many people. Are both terms
needed in Section IV? Also classification/UN number assignment for materials and for packages can
be confusing. Classification is a common term applied to many areas, also for non-radioactive
material, and it applies both to materials and to packages. Sometimes it is intended to have a precise
meaning (without being defined) and sometimes it is used in a general sense.

**WG1 proposal 9:** Consider removing the classification and classify terms from Section IV. UN
number assignment should be sufficient. Make the need for separation of UN number assignment for
materials and for packages easier to understand. Review this issue with a consideration of the
harmonisation of UN Regulations.

**WG1 concern:** This paragraph covers all fissile materials, both those that have to be assigned a UN
number as FISSILE and those that are excepted from this requirement. It has been evident during the
preparation of SSR 6 that references to the different provisions of para. 417 have often been
incomplete. It would be much easier to avoid mistakes if para. 417 exceptions could be split from the
main requirement for UN number assignment as FISSILE.

**WG1 proposal 10:** Prepare a clearer split of para. 417 into two main subparagraphs. Even clearer
would be to have two separate paragraphs (maybe such a clarification can be made when other
changes to para. numbers are made).

**WG1 proposal 11:** Consider clarifying the text without changing its meaning. Para. 565. A general
structure of the sentence is: “Provided that both condition 1 and condition 2 apply, then operation A
is allowed unconditionally, except when restricted by a certificate.”

It makes no difference if the conditions 1 and 2 are expressed as positive or negative terms (e.g. by
replacing “does not exceed 15 W/m$^2$” with “is less or equal to 15 W/m$^2$”). The paragraph appears to
be correct but complicated.

**WG1 concern:** Paras 656 and 666 appear to be contradictory. Para. 656 was obtained by splitting a
previous multiple requirement paragraph into multiple paragraphs (653-656). Para. 656 is only
intended for parts of paras 653-655 and not to the remaining paras with requirements for type B(U) packages. An effort for simplification may have led to this editorial mistake, possibly causing confusion and even unacceptable designs.

**WG1 proposal 12:** Revise the text in paras 653-656 to assure that the correct intent is covered.

**WG1 concern:** This requirement can be traced back to ancient editions of the Regulations when criticality safety requirements were collected into one Section or subsection. The assessments of package design requirements 680-685 are often completed many years, maybe decades, before the final shipments of radioactive material applying that design are completed. Further, the designer may not be aware of the future uses of the design. This requirement appears more to be guidance for a designer. However, for UN number assignment in Section IV, similar requirements are needed with a general purpose (not only criticality safety).

**WG1 proposal 13:** Consider adding a general requirement in Section IV related to accounting for uncertainties in material, packaging, presence of other materials/packages in the consignment, as well as other specifications. Failure to comply with para. 676 during design does not appear to be a safety concern since it will only limit the type of fissile material that can be shipped in the package (possibly allowing a larger quantity of other types of fissile material). Consider rewriting para. 676 as guidance for inclusion in the Advisory Material document.

**WG1 concern:** The intent of paragraphs 681 and 682 related to reflection of the package and possibly of the containment system should be clarified.

**WG1 proposal 14:** As proposed for para. 209, the confinement system term should be removed from the Regulations. The requirements of paras 681 and 682 should be clarified without reference to a confinement system.

**Concern:** Subpara. 567(a) from 1990 requires subcriticality for undamaged packages under some conditions (5N, stacked in any arrangement, 20 cm water reflection) while allowing some relaxation (no hydrogenous moderation between packages, undamaged packages).

Subpara. 567(b) has a similar requirement for subcriticality of damaged packages with the difference that the allowances (to neglect water between packages and to neglect any damage to packages) is replaced with requirements (hydrogenous moderation between packages and exact package models of the test results).

Para. 684 from SSR 6 – 2012 corresponds to the 1990 subpara. 567(a). The intended allowances (no hydrogenous moderation and no damage) have been replaced with requirements. The original intention of the requirements and allowances appear to be interpreted correctly by the industry and competent authorities. The safety assessment of 684(a) sometimes builds on accident condition packages and with moderation between the packages (same as for para. 685).
The changed meaning of the text is of demonstration interest.

There could be problems with individuals who interpret the Regulations literally. This has occurred with other test requirements (e.g. exactly 30 minute fire being evaluated even when no fire at all caused more “damage”).

**WG1 proposal 15:** Very low priority for revision at this time. If there are other changes to this requirement, more correct text can be provided.

**WG1 concern:** There are many different formats of transport regulations. All those documents may be needed for some consignors and designers.

**WG1 proposal 16:** Consider making an effort to reduce the number of different formats.

**WG1 concern:** There is a lot of text in the Advisory Material (currently still TS-G-1.1 from 2008) that is valuable for various purposes but not to the daily needs of transport staff. The Technical Basis effort allows movement of some of the text and references to such a document. This concern is one of the major reasons for the Technical Basis effort.

**WG1 proposal 17:** Simplify the actual guidance (as opposed to explanatory and historical information) to transport staff in the Advisory Material. Preserve other information in a separate document such as a Technical Basis document.

Working Group #1 recommends uploading the TRANSSC presentation to CSS to the transport page of the IAEA website.

Working Group #1 recommends to consider the Transport Web Portal as “information packs” on transport.

**From Working Group #2:**

- The WG generally did not identify any changes that might be needed to the Transport Regulations as a result of D/DOS issues, recognizing that the current more comprehensive review/revision process currently underway might provide recommendations for change related to D/DOS issue. [Section 4.1] However, it was noted that conflicts between various forms of the regulations can increase likelihood of delay or denial.

- The WG recommends consideration be given to expanding the subsection in Chapter 3 of SSR-6 dealing with “Training” to also address “Education”, ensuring that all those involve in carriage of radioactive material are properly educated, focusing on each functional element in the supply chain; consideration could also be given to expanding the guidance documents to reflect these changes. [Section 4.1]
• The WG recognized that a feedback process is absolutely essential for the Secretariat and TRANSSC; and the basis for the changes caused by delay and denial of shipments must be effectively communicated to the CSS. [Section 4.1]

• The WG recommends that consideration could be given to writing a series of implementing guides and preparing associated training materials, similar to those being developed for security transport, structured around specific types of shipments, focusing in part on how to interact and interface with carriers, customs agencies and other entities that can cause problems with delay and denial. The development of this material should consider and take advantage of the experience and training material already gained in regional training courses (e.g. the course in Panama). [Section 4.1]

• The WG concluded that NST022 could potentially impact delay and denial in a positive, rather than negative fashion; enhancing proper transfer of information, education and understanding. [Section 4.2]

• The WG determined that neither the security of nuclear material in transport document nor the radiological crime scene management document appeared to pose any difficulties with regard to delay or denial of shipments. [Section 4.2]

• The WG recommends that, if the Action Plan is revised, the focus should be on simplification and workability. [Section 4.3.2]

• The WG suggests that implementation of national and regional networks should give priority to the creation and/or implementation of a communication strategy. [Section 4.3.4]

• The WG encourages the establishment of the new inter-UN agency committee for the long term and effective management of DOS issues. [Section 5]

• The WG suggested that the Secretariat investigate whether changes to the radiation protection programme could be implemented to ease delays and denials without sacrificing the adequacy of radiation protection. [Section 5]

• The WG concurred with the current transport safety work plan and recommended that it continue to be applied. [Section 6.1]

• The WG recommended consideration should be given by the Agency to sending a letter directed to all Member States encouraging Member States to become members of TRANSSC and to appoint an NFP if they have not already done so. This is significantly important since about 2/3rd of the Member States are not members of TRANSSC. [Section 6.2]

• The WG recommends that collaborative efforts between safety and security entities within the IAEA and elsewhere should be encouraged. [Section 6.3]

• The WG noted that the new UN inter-agency committee for implementing the DOS Action Plan needs to be properly structured and implemented. [Section 6.4]

• The WG further recognized that it may also be necessary to consider focusing on training of the NFPs and RCs– something that has not been accomplished in the past. [Section 6.4]
• The WG recommends that (a) the ISC review and approve the *Handbook for Addressing Instances of Denial/Delays of Shipment of Radioactive Material*, and then (b) a meeting be convened by the Agency to review and finalize the handbook, and recommending the method and timing of publication and issuance (possibly as a technical report of the IAEA). [Section 6.5]

• The WG supports inviting the ad-hoc expanded inter-agency group and TRANSSC representative to the 8th meeting of the ISC in June 2013. [Section 6.6]

• The WG recommends that the ISC, working with the Agency and other involved agencies, explore who should be the owner of the delay/denial databases and responsible for assessment of the data. [Section 6.7]

• The WG fully supports actions needed to develop guidance for customs officials, which is especially needed in the area of radiation protection, while noting that NSNS has already issued guidance for customs and border officials. [Section 6.8]

• The WG suggests that the Agency should consider convening a technical meeting to collect experience on issues relating to customs operations that have caused delays or denials in shipments. [Section 6.8]

• The WG suggests that TRANSSC take on this task as part of its Terms of Reference such that, when it is reviewing draft security documents, the issue of denial of shipments is addressed. [Section 6.9]

• The WG endorses the recommendation of the ISC with regard to the newly proposed spreadsheet process, recognizing that the process needs to be clarified on how to use the forms. [6.10]

• The WG recommends that the safety and the security staff at the Agency, working together, evaluate existing training materials to ensure the information presented to participants is sufficient to address concerns and actions needed as related to safety and security issues that may accrue from a delay or denial of a shipment. [6.11]

• The WG also recommends that the Secretariat work within the Agency to define the adequacy of training material for national and regional training needs and the ability of Technical Cooperation to support this effort. [Section 6.11]

• The WG recommends that the Secretariat must provide a detailed site map of a country and regional template for the SharePoint site, in order to define a harmonized national and regional network so that the Member States can provide feedback early in the development of the network. [Section 7]

• The WG recommends that the Agency consider enhancing the training course for customs and border officials to include delay and denial of shipments.[Section 8]

**Harmonisation SSR-6, UN and modal regulations**

*WG#3* recommends harmonising the following items:

1. Difference of requirements for UN Packing groups and IAEA types of packages (eg. Industrial Packages)
2. Certification requirements for non-approved package designs
3. Primary and subsidiary risk (technical basis for criteria)
4. Limited quantity, Excepted quantity vs Excepted package
5. Transport of samples (UNOB 2.0.4)
6. Salvage packaging (UNOB 4.1.1.18, 6.1.5.1.11)
7. Expand emergency provisions with general mode-independent requirements (304, 305 and 554 (c) of SSR-6)
8. Assessment of special provisions of UNOB, applicable for radioactive material
9. Segregation requirements and guidance for persons (public and workers), para 562 of SSR-6

Harmonisation between countries

WG#3 recommends examining the following items:

1. Reduce differences between the state regulations and international safety standards (eg. Licence vs certificate, approval)
2. Mutual recognition of approval of package design
3. Consider developing IAEA “package design safety report” guide as a possible standard
4. Support developing the international applicant review guide

WG#3 recommends using the Schedules as a basis to improve Class 7 requirements in the table of Chapter 3.2 in UNOB and the modal agreements/regulations.

WG#3 has an opinion that Schedules are very useful for regulators, shippers and for training purposes for beginners. Therefore, WG#3 recommends posting the E-Schedules on the IAEA website.

Moreover the WG#3 recommends inserting the flow diagram of TS-G-1.6 into SSR-6, Section 4 (Classification) and also into UNOB, Chapter 2.7. Some corrections are needed before inserting of the flow diagram, eg. UN 3507 shall be added.

WG#3 recommends developing a new safety guide at IAEA level with the involvement of all member states to incorporate a methodology for determining cost of safety regulatory changes. Furthermore, WG#3 recommends developing and making available a model of the cost assessment methodology for the transport of radioactive material.

WG#3 recommends

- to use a cost assessment methodology as a tool for this item 6, if applicable
- to change for the next review process for SSR-6 the item 6 in so far, that special costs are to be determined, if applicable
WG#3 recommends considering the following items:

- Clear definitions, no requirements in the definitions
- Consistent use of definition
- One requirement per one paragraph
- Standards for legislation: use of shall, should, must, might
- Use of “and” and “or”
- Not doubling of negative words
- Short, precise and concise sentences
- Clear punctuation
- More visual things, e.g. flow diagrams, tables
- Avoid cross references, if possible (rewrite, if short regs)

Furthermore, WG#3 recommends the following means to improve the clarity of the regulatory language:

- To use the Inter-agency group for concurring the text
- To organise translation conference (for 6 UN-languages)

**From Working Group #4**

1) What regulatory issues cause problems to implementation of the regulations by Member States?
   a. What changes or revisions to the regulations could solve these problems?

   Key recommendations are:

   o Inclusion of large component provisions into SSR-6 would be beneficial for the industry, particularly in respect of increased decommissioning activities. (High priority)
   o Investigate reducing RPP requirements depending on the type of packages handled and the level of risk. Consider removing the requirement for RPP for packages of a low TI in TS-G-1.3.
   o Develop further RPP examples for common radioactive materials within TS-G-1.3 (UO$_2$, natural uranium, UF$_6$, etc.).
   o Add guidance material to TS-G-1.1 to clarify terms and definitions for unirradiated uranium, natural uranium and U-natural.
   o Experts in radiation protection should review and investigate if additional guidance material could be added to TS-G-1.1 (para. 233) in order to improve consistency in measurement methods.
   o Simplification of regulations should be identified as an area for further study.
   o Providing examples of completed transport documents in TS-G-1.1 or TS-G-1.4 for different packages would be beneficial.
   o Testing understanding and interpretation (fissile exceptions and secular equilibrium for example) of the users would help ensure compliance.
2) Examine lessons learned from non-radioactive transport or other incidents where the response system did not work as well as expected.
   a. What applications can be made to transport of radioactive material?
   b. Are changes to the regulations warranted given these “lessons learned”?
   c. What is the nature of these regulatory changes?

Key recommendations are:

- Review human factors and provide more guidance in this area in TS-G-1.1 and TS-G-1.4. *(High priority)*
- Review safety culture implications, including existing accident causation models, in transport of radioactive material and provide more guidance in this area in TS-G-1.1 and TS-G-1.4. *(High priority)*
- Revisions to TS-G-1.2 should provide guidance on the radiological impacts of an event and to recognize that most transport events do not have any radiological impacts.