

 Office for Nuclear Regulation	ONR Transport Assessment
Radiation Protection	21/08/2015
Andy Smith	Page 1 of 4
IAEA Review Cycle – Consideration of French/USA proposals on amendment of the Normal Conditions of Transport 20% Surface Dose Rate Increase (SSR-6 para. 624b)	

Summary

The current regulation requiring duty holders to demonstrate not more than a 20% increase in surface dose rate in NCT compared to RCT (*SSR-6 624b*) is not well understood by GB design authorities. It is also often difficult to demonstrate at the design stage, and requires the same level of compliance for packages from very low to high external dose rates. The lack of guidance on how the regulation should be met, and the original intention behind the regulation is not well understood. It is often therefore difficult in practice to regulate for this requirement.

France and the US have both put forward proposals to change this regulation. This paper sets out the GB Competent Authority position in respect to these proposals.

In summary, GB supports the US proposal and France’s proposal in part including;

- The introduction of an absolute dose rate increase for low dose rate packages, and
- Improvement of the guidance material to better explain assessment methodology

For future review cycles, GB supports the formation of a working group to identify further improvements such as inclusion of ALARA, package type, probability of accident, operational information etc.

Introduction

Safety documentation for Type IP-2, IP-3, A, B, & C packages must demonstrate compliance with the Normal Conditions for Transport (NCT) dose rate criterion. The criterion is introduced in para. 624 (for IP-2 packages) and is repeated for other packages (with more restrictive conditions) throughout SSR-6. The applicable NCT testing is stipulated in paras. 721 – 724. Of the 4 tests (water spray, free drop, stacking, penetration), the free drop test usually has the largest impact on external dose rates, although all 4 tests can impact the integrity of the package depending on build / quality. Internal movement of the package contents following drop testing usually has the most significant effect on external dose rates, but other factors including damage to the source/packaging, increased neutron multiplication, movement of shielding etc. can also challenge the criteria.

Compliance can be demonstrated by visual inspection (and reasoned argument), calculation or measurement.

 Office for Nuclear Regulation	ONR Transport Assessment
Radiation Protection	21/08/2015
Andy Smith	Page 2 of 4
IAEA Review Cycle – Consideration of French/USA proposals on amendment of the Normal Conditions of Transport 20% Surface Dose Rate Increase (SSR-6 para. 624b)	

SSR-6 Regulation

624. A package to be qualified as Type IP-2 *shall be designed* to meet the requirements for Type IP-1 as specified in para. 623 *and, in addition, if it were subjected to the tests specified in paras 722 and 723, it would prevent:*

- (b) *More than a 20% increase in the maximum radiation level at any external surface of the package.*

NB. Only 2 of the NCT tests apply to IP-2, paras. 722 & 723

SSG-26 Guidance

There is some guidance in the advisory material concerning this regulation that covers:

- If there is little external deformation / internal movement, visual inspection may suffice
- If it is expected that the dose rate has increased, monitoring should be undertaken
- Advice on where / how to take measurements
- Warning to allow for internal movement (contents / shielding displacement)
- Advice on test methods to satisfy all disciplines / criteria (qualitative approach)

Issue

The regulations state that the dose rates following NCT testing should not increase by >20%. There is no information in SSR-6 advisory material (SSG26) or the IAEA Technical Basis Document ‘*Technical Basis for the IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6)*’ (June 2015 draft) that suggests why the 20% value was chosen. It can be assumed that the restriction helps to ensure that annual dose to radiation workers remains below 20mSv (1mSv for members of the public). However, the requirement is part of the package design, and with no operational information available for the package, the number is rather arbitrary.

For example, if surface dose rates are already significant then the surface dose rate increase may also be significant (e.g. a package with a surface dose rate of 1.5mSv/h can increase up to 1.8mSv/h, an increase of 300uSv/h). Following NCT damage, this could have a significant impact on annual dose and put more restrictive requirements on package movements (i.e. fewer movements) or transport workers (e.g. dose sharing).

On the contrary, a package with a low surface dose rate (say 10uSv/h), will increase by just 2uSv/h to 12uSv/h following NCT damage. It is unlikely that this will have a significant effect on dose uptake, unless the package was handled intensely over a year (i.e. assuming the same number of minor NCT-type damage, this would require x150 higher operator exposure than the scenario above in order to have the same impact on dose). There is no saying, however, that a

 Office for Nuclear Regulation	ONR Transport Assessment
Radiation Protection	21/08/2015
Andy Smith	Page 3 of 4
IAEA Review Cycle – Consideration of French/USA proposals on amendment of the Normal Conditions of Transport 20% Surface Dose Rate Increase (SSR-6 para. 624b)	

low dose rate package would not be handled intensely over a year, leading to significant dose uptake whereby the 20% increase could challenge the annual dose uptake limit.

We could also consider the likelihood of an accident. For example, it could be considered that a Type B flask containing fresh fuel is far less likely to be dropped than, say, a lightweight (manually handled) Type IP-2 package. It would be incorrect to assume that the 20% increase should be applied to the total annual dose, as following the shipment, the problem would be rectified and dose rates for future shipments would return to RCT levels. This is not accounted for in the regulations, but again, is linked to the calculations involving the intensity of use, which could not be controlled by the design.

The main issues experienced in GB regarding NCT dose rates are not necessarily with the limitations set by the IAEA (dose rate criterion and conditions of transport), but rather concern over GB duty holder's knowledge and understanding of the regulation (whereby demonstration of compliance is either not adequate or not included in the safety documentation). The ONR are actively engaging with industry to improve the safety case standard, whilst not being over penalising for current applications that are not at the level required in SSR-6. However, for low dose rate (usually self-certified) packages, relaxation of this regulation in some way will be advantageous to industry with negligible or no effect on safety. (One of the main issues is duty holders not accounting for internal movement and/or damage to the source material, and not accounting for source geometry during NCT testing where the radioactive contents cannot be properly identified (e.g. obsolete sources or waste material).

Competent Authority Proposals

US / French Proposals

There can be an obvious absolute dose rate limit whereby the 20% restriction need not apply, as dose rate increases beyond this will not challenge the annual limit. The USA have proposed a value of 10uSv/h, with a maximum increase below this being 2uSv/h irrespective of the RCT surface dose rate.

French Proposal

The French proposal is to establish a working group in order to understand the various challenges that this regulation causes to industry and examine the improvement possibilities (i.e. causes, assessment method, safety issue, consequences on RPP / labelling / separation). Suggestions are; to put in place an absolute value for NCT (in particular for low dose rate packages), use of ALARA, relaxation for I-WHITE or II-YELLOW. A further suggestion is to allow for operational methods (i.e. frequency of use, contour maps). The main issue caused to the French is the transportation of bulk waste, where high activity material shielded by lower activity material may become unshielded following NCT testing.

 Office for Nuclear Regulation	ONR Transport Assessment
Radiation Protection	21/08/2015
Andy Smith	Page 4 of 4
IAEA Review Cycle – Consideration of French/USA proposals on amendment of the Normal Conditions of Transport 20% Surface Dose Rate Increase (SSR-6 para. 624b)	

GB Contribution

The ONR believe that the US proposal of introducing an absolute dose rate increase limit of 2uSv/h on packages with a surface dose rate of <10uSv/h is acceptable and that this will not challenge dose uptake requirements even for frequently used packages (note that the 2uSv/h increase is not EXPECTED to happen, it is a consequence of an NCT accident). It will be prudent, therefore, to introduce this absolute limit for packages designed to have a surface dose rate of <10uSv/h. For packages with surface dose rates higher than this, it is difficult to assess what the impact on dose uptake will be unless operational usage restrictions are placed into the design.

This is supported by ONR as a modification in the current review cycle.

The French propose to introduce an absolute criterion for I-YELLOW and II-YELLOW (up to 500uSv/h) and relax the regulation for III-YELLOW (up to 2mSv/h), make use of operational information (which may be difficult to implement in to the safety case and could require restrictions on frequency of use) and implement ALARA (which is difficult for unilateral approvals). Notwithstanding, these should be considered in the working group. **The development of a working group is supported by ONR.**

The ONR position on this is that an absolute value should be determined for lower dose rate packages (i.e. in support of the US proposal, potentially increasing the dose rate whereby the criterion changes from an absolute value to a relative value). However, introducing absolute values up to II-YELLOW limits and relaxing the criterion of 20% for dose rates up to III-YELLOW limits could potentially have a significant detrimental impact on dose uptake and these limits should be discussed at an international working group. Furthermore, account could be taken of both the likelihood of NCT actually occurring between different packages (i.e. a Type B fuel flask is less likely to be dropped than a Type IP-II manually handled package) and some probabilistic analysis of what the impact on dose uptake would be, depending on how often the NCT accident occurs in comparison with the number of transportations per year (i.e. the 20% increase may only be on one of 100 transportations per year). The ONR also believe that the guidance could be clearer on the methods of assessment and when to use them (inspection, calculation, measurement) and what to account for during NCT testing.

Conclusion

For the next amendment:

- Propose an absolute dose rate increase for low dose rate packages
- Improve the IAEA advisory material

For future review cycle:

- Develop a working group to discuss issues and further improvements