TRANSSC established working group on the rule of the 20 % increase in radiation levels during NCT

Workshop for TRANSSC Members and experts

Monday 26 November 2018
Background

• **SSR-6 requirement**: after NCT tests, the maximum dose rate at any external surface of the package shall not increase by more than 20% for Types IP-2, IP-3, A, B and C packages.

• **Benefits of this requirement:**
  – The requirement ensures the workers protection by guaranteeing adequacy (at +/- 20 %) of the dose assessment in the radiation protection programme and of the labelling of the package, even if an undetected incident has occurred during transport.
  – The requirement also ensures that the shielding of the package stays effective after NCT test.
Difficulties with the rule of the 20 %

• The following difficulties have been reported:
  – Difficulties to demonstrate compliance with this requirement, for packages with a heterogeneous content (bulk waste, non-certified packages with a content that is not exactly known at the design stage), mainly because of the internal movement of the content;
  – As the criteria is proportional to the dose rate, increasing the shielding makes the requirement more difficult to comply with. In general, the lower the dose rate, the more difficult it is to comply.

• Even in routine conditions of transport, the dose rate can increase by more than 20 %, for example in case of precipitation of radionuclides in a liquid.
Proposal to change the current SSG-26

The proposed changes do not represent any deviation from the original intent of the text provided by the March 2018 Consultancy Meeting; they mainly present clarification and editorial changes of the originally proposed text and the SSG-26 /10 October 2018 version.
Proposal to change the current SSG-26

• “624.4. The 20% limit on dose rate increase under normal conditions of transport is a design requirement to verify appropriateness of the shielding design. Depending on the intended use of the package, compliance with this requirement could be demonstrated by shielding analysis, including simulating deformation of the package and, as appropriate, movement of the radioactive contents and change in the state of the contents, such as segregation and/or precipitation of the radionuclides due to normal conditions of transport. Dose rate increase due to a change in the state of the contents and/or movement of the contents under routine conditions of transport should be considered in the design of the package and or in the preparation of the package for shipment, and Consequently, dose rate increase due to the causes may be excluded from the demonstration of the dose rate increase under normal conditions of transport. (See paras 527.1, 528.1 and 573).”
Proposal to change the current SSG-26

• “516.5. The maximum dose rate should be determined taking into account potentially significant amplifying phenomena such as movement of the radioactive contents, or, in the case of packages containing liquids, change in the state of the contents, including segregation and/or precipitation of the radionuclides. These phenomena should be taken into account by applying a correction factor to the maximum dose rate measured at the external surface of the package or by using a maximum value instead. This correction factor or a maximum value should be provided in the package instructions for use. In any case, a dose rate measurement should be performed before shipment, and the maximum potential dose rate should be determined by the radiation protection programme should then taking into account any such the corrected factors dose rates or the maximum value.”
Proposal to change the current SSG-26

• “527.1. The maximum dose rate should be determined taking into account potential significant amplifying phenomena, such as movement of the radioactive contents, or, in the case of packages containing liquids, change in the state of the contents, including segregation and/or precipitation of the radionuclides. These phenomena should be taken into account by applying a correction factor to the maximum dose rate measured at the external surface of the package or by using a maximum value instead. This correction factor or the maximum value should be provided in the package instructions for use. In any case, a dose rate measurement should be performed before shipment, and the maximum potential dose rate should be determined by The radiation protection programme should then taking into account any such the corrected factors dose rates or the maximum value. See also paras 526.1 and 528.1.”
Proposal to change the current SSG-26

• "523.7. The maximum dose rate should be determined taking into account potential amplifying phenomena such as the movement of the radioactive contents, or, in the case of packages containing liquids, change in the state of the contents, including segregation and/or precipitation of the radionuclides. These phenomena should be taken into account by applying a correction factor to the maximum dose rate measured at 1 m from the external surface of the package (leading to the TI) or by using a maximum value instead. This correction factor or the maximum value should be provided in the package instructions for use. In any case, a dose rate measurement should be performed before shipment, and the maximum potential dose rate should be determined by taking into account any such factors. The radiation protection programme should then take into account the corrected TI."
Proposal to change the current SSG-26

- “573.1. In applying para 573 (a), the maximum dose rate should be determined taking into account potential amplifying phenomena such as internal movement of the radioactive contents, or, in the case of packages containing liquids, change in the state of the contents, including segregation and/or precipitation of the radionuclides. These phenomena may should be taken into account by applying a correction factor to the maximum dose rate measured at the external surface of the package or overpack and at the surface and at 2 m from the vehicle or by using a maximum value instead. This correction factor or the maximum value should be provided in the package instructions for use. In any case, a dose rate measurement should be performed before shipment, and the maximum potential dose rate should be determined by taking into account any such factors. The radiation protection programme should then take into account the corrected dose rates or the maximum value. See paras 221.1–221.6 on exclusive use.”
The WG has reviewed the corresponding SSR-6 (2018 Edition) paragraphs and agreed upon the following change recommendations to be considered by TRANSSC in the next SSR-6 review cycle:

➢ to modify paras 624, 626, 627, 628, 629, 630 and 648 as followed:

“[…] if [the package] were subjected to the [NCT tests], it would prevent:

(a) Loss or dispersal of the radioactive contents;

(b) More than a 10 µSv/h increase in the maximum dose rate at any external surface of the package if the maximum dose rate is lower than 50 µSv/h;

(c) More than a 20% increase in the maximum dose rate at any external surface of the package if the maximum dose rate is greater than or equal to 50 µSv/h.”
Dose rate limits

In additional discussions, the WG proposed:

• to close the WG;
• to review the dose rate limits in SSR-6;
  and to focus on the applicable justifications to determine their validity and agreed that the topic should reside within the Radiation Protection TTEG.
• to document in the TBD the validity and justification of the value 20% and the value of 50 µSv/h and corresponding 10 µSv/h prior to their incorporation in the SSR-6.
Thank you for your attention