Comment from Japan on the Additional Justification by Switzerland (CH/2015/02 and CH/2015/03)

Japan requests TRANSSC to handle CH/2015/02 and CH/2015/03 carefully with considerations to their consequences.

1. Evaluation on the Multiplication Factors in TABLE 7

Proposals CH/2015/02 and CH/2015/03 make good point which has been discussed occasionally in previous review/revision cycles of the Regulations.

As stated in para. 523.2 of the Advisory Material SSG-26, the multiplication factors in TABLE 7 were introduced to compensate segregation distances corresponding to the sizes of radiation source. The segregation distances are calculated on the basis of a point source, where the decrease of radiation levels (dose equivalent rate) with distance follows the inverse square law. In the case of a large load, which can be considered as a surface (plane) source or a volume source, the decrease of radiation level with distance does not follow the inverse square law but indicates greater radiation level at the same distance compared with the case of point source. To compensate this, the multiplication factors depend to the size of load were introduced.

The problem identified by Switzerland will be clearly answered by comparison of the manners of decrease of radiation level with distance are calculated using models illustrated in Figure 1.

Even before calculation, one can see the external radiation levels of the container will be similar to those of the large package at the points with the same distance. Hence, from the view point of radiation protection, or to calculate the segregation distances, some compensation due to its size should be applied to large packages. In that case, should the same factors as those for freight container or new factors specifically for the large packages be applied?
Para. 523(b) of SSR-6 may contain a logical question. It says "tanks, freight containers and unpackaged LSA-1 and SCO-I …", then why specifically "tanks?" or "why not packages?", though tanks are always used as packagings.

From the viewpoint of radiation protection, TI is also used as the parameter for the loading limits on or in conveyance, hold, compartment or defined deck area as specified in para. 566 or TABLE 10. Impacts of the introduction of the multiplication factors to packages on the loading limits should be investigated, and appropriateness of the introduction of such factors should be evaluated.

2. Possible consequences of introduction of multiplication factors to packages

For consignors, TI of package is an important element to provide the transport plan. In accordance with para. 526 of SSR-6, consignors shall arrange exclusive use when the TI of package to be shipped exceeds 10. Consignors shall also decide the number of packages to be loaded per single conveyance, hold or compartment in order to comply with TABLE 10.

If the multiplication factors are introduced to packages, TIs of large packages may be doubled or tripled (or even 10 times greater when they are very large). Then, most of large packages have to be transported under exclusive use. Under the current Regulations consignors can load 5 packages per single non-exclusive use conveyance, hold or compartment. If the multiplication factor is introduced, 2 packages can be loaded when the TI is doubled, or single package when tripled. In case of air transport, consignors have to charter whole airplane when exclusive use is required.

Increased number of exclusive use shipments may cause burden to consignors. Decreased payload per conveyance leads to increased number of shipments and consequently the burden to consignors. Hence, aspect of large package transport might change considerably.

For large package designers, following two options seem to be available to determine shielding performance of package:

(a) To maintain external radiation levels less than 100 μSv/h at 1 m from the package external surface to avoid exclusive use (see para. 526), or
(b) To maintain external radiation levels less than 100 μSv/h at 2 m from the package external surface to be transported under exclusive use (see para. 573(c)).

In option (a), however, the radiation level criterion will be reduced to 50 μSv/h when TI is doubled, or to 33μSv/h when tripled commensurate to the size of package. Consequently the radioactive contents to be able to accommodate reduces, then number of transport and burden to consignor will increase.

3. Conclusions

From the viewpoint of radiation protection, the introduction of multiplication factors to packages seems feasible for the calculation of segregation distances, but its
appropriateness for the loading limits is unknown. Meanwhile, from the viewpoint of transport operation practices, its consequences may not be negligible. Having no idea how to balance these issues, Japan just requests TRANSSC careful considerations on the proposals CH/2015/02 and CH/2015/03.