Several changes to SSR-6 and SSG-26 are proposed (see CDN/2015/02 through CDN/2015/16 and CDN/2015/22 through CDN/2015/28) to implement a new SCO-III category to allow the shipment of large surface contaminated objects.

There is an increasing demand in many countries for transporting large radioactive objects, such as equipment from decommissioning or refurbishment activities at nuclear facilities (steam generators, pressurizers, reactor pressure vessels and heads, coolant pumps, etc.). However, many nuclear reactor components are difficult to package because of their large size and weight, making it challenging or impractical to meet standard packaging requirements. This often requires them to be shipped under special arrangement. Over a hundred shipments of these types of components from replacement or dismantlement of nuclear facilities have been conducted under special arrangement around the world. The advisory material from the IAEA Regulations includes specific guidance for the transport of large components under special arrangement. However, as experience with this type of transport has grown and is becoming more routine, specific regulatory requirements are needed to allow the movement of large radioactive objects without the need for special arrangement. A set of standard provisions for transport of large objects as surface contaminated objects (new SCO-III category), based on the IAEA “performance package” concept, have been developed for possible incorporation into the SSR-6 Regulations and Advisory Material as presented here in comments CDN/2015/01 through 16 (all Rev.1). Note that the proposed provisions do not include components such as reactor vessels at this time, due to the more limited experience and greater radioactivity levels. LSA large object provisions may be proposed in the future to cover such components.

Note that the definition from the original large object proposal was removed since it is no longer required: the definition of large object has been rolled into section IV requirements for SCO-III – see CDN/2015/03 Rev.1.

**Comments:***

- Supplementary submission SSG-26:
  - Further justification is needed for the fact that how is it justified that the object cannot be packed into a type of package? This problem is similar to justification of Special Arrangement.
  - The applicant should include the justification for choosing SCO-III in the application.

- Supplementary submission SSG-26:
  - Added 827 bis. A statement of the respects in which, and of the reasons why, the consignment is considered a large object. See CDN/2015/11 Rev.1.

- Comments Extra-ordinary Working Group (EWG):
  - WG1 supports the proposal.
  - WG1 recommends to change the definition “Large Object” to “Large Surface Contaminated Object”.

- Supplementary submission EWG:
  - Definition of Large Object no longer needed as it is has been rolled into section IV requirements for SCO-III – see CDN/2015/03.
  - The large object definition will be removed and replaced with the overall objective of adding large objects as SCO-III to the regulations.
  - The new description of SCO-III in para. 413 (CDN/2015/03 Rev.1) does not include the word...
<table>
<thead>
<tr>
<th>Document</th>
<th>Comment</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDN/2015/02 Rev.1</td>
<td>SSR-6 Table 1</td>
<td>Change UN 2913 PROPER SHIPPING NAME and description to: “RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II or SCO-III), non fissile or fissile-excepted”*</td>
</tr>
<tr>
<td>CDN/2015/03 Rev.1</td>
<td>SSR-6 Para. 413</td>
<td>413. SCO shall be in one of two free groups: (a) SCO-I... (as is) (b) SCO-II... (as is) (c) SCO-III: A large solid object which because of its size cannot be transported in a type of package described in these Regulations and for which: (i) All openings are sealed to prevent release of radioactive material during routine conditions of transport; (ii) The inside of the object is as dry as practicable; (iii) The non-fixed contamination on the external surfaces does not exceed the limits specified in para. 508; (iv) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² does not exceed 8 x 10⁵ Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8 x 10⁴ Bq/cm² for all other alpha emitters, unless it can be demonstrated that, following a transport accident, the activity intake by a person in the vicinity of the accident does not exceed 10⁻⁶ A₂ or a corresponding inhalation dose of 50 mSv.</td>
</tr>
<tr>
<td>CDN/2015/04 Rev.1</td>
<td>SSR-6 Para. 517</td>
<td>517. The quantity of LSA material or SCO in a... See CDN/2015/01 Rev.1 above.</td>
</tr>
</tbody>
</table>
Table 6:

<table>
<thead>
<tr>
<th>SCO-III</th>
<th>10A₁</th>
<th>10A₅</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCO and SCO-III</td>
<td>No limit</td>
<td>No limit</td>
</tr>
</tbody>
</table>

Explanatory note regarding proposed change to Table 6: SCO III no limit because it will be limited by the 10 A₅ intake (413(c)(iv)) and the field requirement of 2 mSv at surface and 0.1 mSv at 2 meters from the conveyance (para. 566(b)).
| CDN/2015/07 | SSR-6, Para. 523 | 523. The TI for a package, overpack or freight container, or for unpackaged LSA-I, SCO-I or SCO-III, shall be the number derived in accordance with the following procedure:

(a) Determine the maximum radiation level in units of millisieverts per hour (mSv/h) at a distance of 1 m from the external surfaces of the package, overpack, freight container or unpackaged LSA-I, SCO-I and SCO-III. The value determined shall be multiplied by 100 and the resulting number is the TI for uranium and thorium ores.

(b) For tanks, freight container (and unpackaged LSA-I, SCO-I and SCO-III), the value determined in step (a) shall be multiplied by the appropriate factor from Table 7. | See CDN/2015/01 Rev.1 above. | Comments EWG: WS1 TRANSSC 30.
The proposed change is appropriate. Comments EWG: WS1 TRANSSC 30.
WG1 supports the proposal. |

| CDN/2015/08 | SSR-6, Table 7 | Modify the title to: Multiplication Factors for Tanks, Freight Containers and Unpackaged LSA-I, SCO-I and SCO-III | See CDN/2015/01 Rev.1 above. | Comments WS1 TRANSSC 30.
The proposed change is appropriate. Comments EWG: WS1 TRANSSC 30.
WG1 supports the proposal. |

| CDN/2015/09 | SSR-6, Para. 540 | 540. Each label conforming to the applicable models in Figs. 2–4 shall be completed with the following information:

(a) Contents:

(i) Except for LSA-I material, the name(s) of the radionuclide(s) as taken from Table 2, using the symbols prescribed therein. For mixtures of radionuclides, the most restrictive nuclides must be listed to the extent the space on the line permits. The group of LSA or SCO shall be shown following the name(s) of the radionuclide(s). The terms “LSA-II”, “LSA-III”, “SCO-I”, “SCO-II” and “SCO-III” shall be used for this purpose. | See CDN/2015/01 Rev.1 above. | Comments WS1 TRANSSC 30.
The proposed change is appropriate. Comments EWG: WS1 TRANSSC 30.
WG1 supports the proposal. |

| CDN/2015/10 | SSR-6, Para. 546 | 546. The consignor shall include in the transport documents with each consignment the identification of the consignor and consignee, including their names | See CDN/2015/01 Rev.1 above. | Comments WS1 TRANSSC 30. |
and addresses, and the following information, as applicable, in the order given:

(n) For LSA-II, LSA-III, SCO-I, and SCO-II and SCO-III, the total activity of the consignment as a multiple of \( A_j \). For radioactive material for which the \( A_j \) value is unlimited, the multiple of \( A_j \) shall be zero.

The proposed change is appropriate.

Comments EWG:
WG1 supports the proposal.

---

SSR-6, Section VIII Approval and Administrative Requirement s, Para. 827 bis.

Add: 827 bis. An application for approval of SCO-III shipments shall include:

(a) A statement of the respects in which, and of the reasons why, the consignment is considered a SCO-III.
(b) Justification for choosing SCO-III by demonstrating that:
   i. no suitable packaging currently exists;
   ii. designing and/or constructing a packaging or segmenting the object is not practically, technically or economically feasible;
   iii. no other viable alternative exists;
   iv. the advantages and level of overall level of safety and security to conducting the transport as SCO-III exceed any possible disadvantages or risks, respectively.
(c) A detailed description of the proposed radioactive contents with reference to their physical and chemical states and the nature of the radiation emitted;
(d) A detailed statement of the design of the SCO-III, including complete engineering drawings and schedules of materials and methods of manufacture;
(e) All information necessary to satisfy the competent authority that the requirements of para. 520(c) and the requirements of paras. 413(c)(iv) and 522, if applicable, are satisfied;
(f) A transport plan covering all activities associated with the shipment, including radiation protection, emergency response, and any special precautions or special administrative or operational controls which are to be employed during transit;
(g) A specification of the applicable management system as required in para. 306.

See CDN/2015/01 Rev.1 above.

Guidance added to SSG-26 for para. 8X2(f) provided in CDN/2015/16.

Comments WG5 TRANSSC 31:
The applicant should include the justification for choosing SCO-III in the application. CS shall discuss where this separate chapter in the regulations should come exactly.

Supplementary submission EWG:
APPROVAL OF SHIPMENTS FOR LARGE OBJECTS (SCO-III)

8X1. Each consignment transported as a large object (SCO-III) shall require multilateral approval.

8X2. An application for approval of shipments for large objects (SCO-III) shall include:

8X2 new (a) A statement of the respects in which, and of the reasons why, the consignment is considered a large object.
8X2 new (b) Justification for choosing SCO-III by demonstrating that:
   i. no suitable packaging currently exists;
   ii. designing and/or constructing a packaging or segmenting the large object is not practically, technically or economically feasible;
   iii. no other viable alternative exists; and
   iv. the advantages and level of overall level of safety and security to conducting the transport as SCO-III exceed any possible disadvantages or risks, respectively.
8X2 (d) A transport plan covering all activities associated with the transport, including radiation protection, emergency response, and any special precautions or special administrative or operational controls which are to be employed during transit;

Comments EWG:
Consideration for TRANSSC 31 to use SCO-III instead of Large Object in Section VIII.
Missing link to SCO-III in para. 825.

Supplementary submission EWG:
• Changed large object to SCO-III throughout.
• Added 8X2(c) for SCO-III to require multilateral approval. See CDN/2015/24.
• This ties in with 802(c) for competent authority approvals for shipments.
• Changed 8X2 to 827 bis. so that it can be captured in shipment section referenced by 802(c).
• Proposals 8X1 and 8X3 are therefore no longer required, as shipment approvals are captured in 802(c) and 825, and can be removed.

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SSR-6, Annex I Summary of Approval and Prior Notification

Add a row to Table, Part 1 of Annex I, as follows; Key paragraphs in the Regulations: 520, 825
Class of package or material: SCO-III
- Shipment

Competent authority approval required – Country of

See CDN/2015/01 Rev.1 above.

Comments EWG:
We agree with the addition but suggest the drafting of the complete table (Annex I part 4) and the verification of the key paragraphs.
Supplementary submission EWG:

Removed changes to Part 4 and added SCO-III to Part 1, where only the shipment requires approval according to 825, where (e) was added to SCO-III to require multi-lateral approval. This ties in with 802(c) for competent authority approvals for shipments.

Full Part 1 Table showing proposed modifications:

<table>
<thead>
<tr>
<th>Key paragraphs in the Regulations</th>
<th>Class of package or material</th>
<th>Competent authority approval required</th>
<th>Consignor required to notify country of origin and countries en route of each shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Country of origin</td>
<td>Countries en route*</td>
</tr>
<tr>
<td>Excepted package*</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>LSA material I*, II* and SCO- I*, II*</td>
<td>Type IP-1, IP-2, IP-3</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
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<td></td>
<td></td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

520, 825

SCO-III

— Shipment

| Yes | Yes | Yes |

Comments EWG:

WG1 felt too many bullets in the table of annex 1 (part 4) and it should be checked again.

Supplementary submission EWG:

Removed changes to Part 4 and added SCO-III to Part 1, where only the shipment requires approval according to 825, where (e) was added to SCO-III to require multi-lateral approval. This ties in with 802(c) for competent authority approvals for shipments.

CDN/2015/13

SSR-6

Annex III

Summary of Consignor ts Requiring Exclusive Use

Modify bullet (a) to “Unpackaged LSA-I material, and SCO- I and SCO-III (see para. 520);”

See CDN/2015/01 Rev.1 above.

Comments EWG:

The proposed change is appropriate.

Comments EWG:

WG1 supports the proposal.

CDN/2015/14

SSG-26

Para. 413.1 and 413.7 bts.

413.1. A differentiation is made between decommissioning of SCO-I and SCO-II in terms of their contamination level...

New paragraphs for guidance on SCO-III:

413.8 For large objects generated from refurbishment or decommissioning of nuclear facilities, over a hundred transports have been conducted under special arrangements in the Member States [VII.1-VII.12]. These objects are quite large and massive, for example, measuring up to 6 m in diameter, up to 20 m in length and weighing over 400 000 kg, and are not readily amenable to transport under the Transport Regulations. While it was apparent that most of the objects transported contained only surface

See CDN/2015/01 Rev.1 above.

Comments WG5 TRANSSC-30:

The proposed change is appropriate. Instead of using “standard provisions” using the terminology “regulatory requirements”.

Supplementary submission WG5 TRANSSC-30:

For large objects generated from refurbishment or decommissioning of nuclear facilities, over a hundred transports have been conducted under special arrangements in the Member States. These objects are quite large and massive, for example, measuring up to 6 m in diameter, up to 20 m in length and weighing over 400 000 kg. As experience with this type of transport has grown and is now more routine, specific regulatory requirements were needed to allow the movement of large objects without the need for special
Appendix VII.19.

Starting with "The major percent
reactor vessels, are outside the
Transport of clearly activated
Regulations or with
levels specified in para. 508 of the Transport
fixed external surface con
intended to
Though a threshold value is not specified, this
resulting from neutron activation of the component.
interior surfaces, rather than on exterior
quantity) should
ensure that the risk from fixed contamination is low.
combined with
conservatively set to that for packages
on the external non
are controlled by other specific requirements.
levels from the contents, and the net radiation levels
similar to packages, the external radiation
movement
radioactivity during routine conditions of
transport. O
machining, sawing, drilling or flame cutting.
413.9 For SCO
III, although typically welded,
openings may be sealed (para. 413(c)(i)) by any
method provided it is justified to prevent release of the
radioactive material during routine conditions of
transport. Openings should be sealed such that they
may only be opened by destructive techniques such as
machining, sawing, drilling or flame cutting.
413.10 Though a threshold value for dryness is not
given (para. 413(c)(ii)), drain out of water, air blow
and air ventilation are procedures employed to dry an
object from the viewpoint of transport. More stringent
dryness specifications may be required for disposal.
413.11 For SCO-III, there is no specific limits for the
levels of fixed contamination on the external surfaces,
since similar to packages, the external radiation
resulting therefrom will combine with the penetrating
radiation from the contents, and the net radiation levels
are controlled by other specific requirements. The limit
on the external non-fixed contamination is
conservatively set to that for packages which,
combined with the controls on radiation levels will
ensure that the risk from fixed contamination is low.
The major percentage of the component’s activity (A
quantity) should be due to surface contamination on
interior surfaces, rather than on exterior surfaces or
resulting from neutron activation of the component.
Though a threshold value is not specified, this is not
intended to allow transport of components with
non-fixed external surface contamination exceeding the
levels specified in para. 508 of the Transport
Regulations or with overt activation of material.
Transport of clearly activated components, such as
reactor vessels, are outside the scope of SCO-III.

Majority taken from old Appendix VII.1-VII.7

413.9 For SCO-III, although typically welded,
openings may be sealed (para. 413(c)(i)) by any
method provided it is justified to prevent release of the
radioactive material during routine conditions of
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resulting from neutron activation of the component.
Though a threshold value is not specified, this is not
intended to allow transport of components with
non-fixed external surface contamination exceeding the
levels specified in para. 508 of the Transport
Regulations or with overt activation of material.
Transport of clearly activated components, such as
reactor vessels, are outside the scope of SCO-III.

Starting with “The major percentage” is taken from old Appendix VII.19.

On the basis of these experiences, a set of standard provisions
regulatory requirements for transport of large objects as surface
contaminated objects (SCO-III category), based on the IAEA
“performance package” concept, have been developed. Note that
these provisions requirements do not include apply to
components such as reactor vessels, due to the more limited
experience and greater radioactivity levels.

Comments FNEG
WG1 supports the TRANSSC 30 revised proposal.
This guidance must be moved to SSG-26 Para. 413, since the
definition of large object was removed.

Other guidance from SSG-26 Appendix VII was also moved to
SSG-26 Para. 413 as it is now applicable to this paragraph.
For SCO-III, contamination on the inaccessible surface may be determined by conservative estimates and/or analysis by methods other than direct contamination measurements. In the Q-system (see Appendix I), five radiation exposure routes, i.e. external photon dose \(Q_A\), external beta dose \(Q_B\), inhalation dose \(Q_C\), skin and ingestion dose due to contamination transfer \(Q_D\) and submersion dose \(Q_E\) are considered. Among these, the inhalation dose \(Q_C\) can be taken as a major exposure route for SCO-III in the event of an accident, since most of the activity that is dispersed is from the surface contamination that comes from the surfaces of the object which may be scratched during an accident. If a SCO-III is involved in an accident, the maximum activity intake for a person in the vicinity of the accident should be approximately of the same level as that from Type A packages (see Appendix VII).

### CDN/2015/15 SSG-26 Para. 310.5

Remove paragraph 310.5. The applicable guidance has been moved to 413.7 bis, removing any references to special arrangement (see CDN/2015/14 proposed wording for 413.8).

### CDN/2015/16 Rev. 1 SSG-26 Appendix VII

Rename to: GUIDANCE FOR CALCULATION OF ACTIVITY INTAKE FOR TRANSPORT OF SCO-III LARGE OBJECTS Moved most the guidance material in Appendix VII to the appropriate paragraphs of SSR-6 (where the guidance has become requirements) and SSG-26 (see CDN/2015/14 Rev. 1, CDN/2015/26 Rev. 1, CDN/2015/27 Rev. 1 and CDN/2015/28 Rev. 1). All that is left is sections VII.11 through to VII.14, which become VII.1 through VII.4, respectively. References VII.11 and VII.12 also remain and are renumbered to VII.1 and VII.2. The new Appendix VII is provided below. Note that “large component” from the original text has been replaced with “SCO-III” throughout.

### Appendix VII

GUIDANCE FOR CALCULATION OF ACTIVITY INTAKE FOR TRANSPORT OF SCO-III

VII.1. In an accident, for SCO-III the maximum activity intake for a person in the vicinity of the accident should be approximately of the same level as the intake from Type A packages, which is considered as a value of \(10^{-6}\) or a corresponding inhalation dose of 50 mSv.

An activity intake for a person in an accident is given by:

\[
Q_{INT} = (Q_{INT, FIX} + Q_{INT, NF})
\]

\(Q_{INT}\) (VII.1)
The intake activity of radionuclides due to the fixed contamination, Q

\text{INT, FIX}

, can be calculated from:

\[ Q_{\text{INT, FIX}} = Q_{\text{IV, FIX}} \times F_{\text{SCRAP}} \times F_{\text{REL, FIX}} \times F_{\text{RSUS}} \times F_{\text{INT}} \]  

(VII.2)

where

\[ Q_{\text{IV, FIX}} \]  is the inventory attributed to fixed contamination in a package or an object (Bq);

\[ F_{\text{SCRAP}} \]  is the fraction of surface area that is scraped in an accident;

\[ F_{\text{REL, FIX}} \]  is the fraction of the activity which is freed from the scraped surfaces and released from the package or the object in an accident;

\[ F_{\text{RSUS}} \]  is the fraction of the released activity which is in a form of respirable aerosol;

\[ F_{\text{INT}} \]  is the fraction of respirable released activity intake for a person in the vicinity of the accident.

In the formula above, for objects with an homogeneous surface contamination, Q

\text{IV, FIX}

, can be determined from:

\[ Q_{\text{IV, FIX}} = C_{\text{FIX}} \times A \times 10^4 \]  

(VII.3)

where

\[ C_{\text{FIX}} \]  is a level of fixed surface contamination (Bq/cm

2

);

\[ A \]  is the surface area of an object (m

2

).

When calculating the intake activity of radionuclides due to the non-fixed contamination, Q

\text{INT, NF}

, 100\% of the non-fixed contamination present on the object should be assumed to be available for release without any scraping of the surfaces required. Therefore, the intake activity of radionuclides due to the non-fixed contamination, Q

\text{INT, NF}

, can be calculated from:

\[ Q_{\text{INT, NF}} = Q_{\text{IV, NF}} \times F_{\text{REL, NF}} \times F_{\text{RSUS}} \times F_{\text{INT}} \]  

(VII.4)

where

\[ Q_{\text{IV, NF}} \]  is the inventory attributed to non-fixed contamination in a package or an object (Bq);

\[ F_{\text{REL, NF}} \]  is the fraction of the activity which is free and released from the package or the object in an accident\(^3\); \n
\[ F_{\text{RSUS}} \]  is the fraction of the released activity which is in respirable aerosol;

\[ F_{\text{INT}} \]  is the fraction of respirable released activity intake for a person in the vicinity of the accident.

\(^3\) \[ F_{\text{REL, NF}} \]  should be taken as unity (100\%) unless the use of a lower release fraction can be justified.

For objects with an homogeneous surface contamination, the inventory, Q

\text{IV, NF}

, is determined as:

\[ Q_{\text{IV}} = C_{\text{NF}} \times A \times 10^4 \]  

(VII.5)

where

\[ C_{\text{NF}} \]  is a level of non-fixed surface contamination (Bq/cm

2

);

\[ A \]  is the surface area of an object (m

2

).

Example calculation: SCO-III

Same figure as on p. 423 of SSG-26, but replace "Large component" with "SCO-III".

Since the internal surface of a SCO-III is considered as an inaccessible surface, the contamination limit can be 8 \times 10^7 Bq/cm

2

for the fixed contamination, plus the non-fixed contamination. In the evaluation below, limits each for the fixed contamination and for the non-fixed contamination are taken, since it gives a slightly conservative result by 1.25\%.

1. Inventory of fixed contamination on an internal surface of a SCO-III:
1. Inventory of fixed contamination scraped from an internal surface:
\[ Q_{\text{SCRAP, FIX}} = Q_{\text{IV, FIX}} \times F_{\text{SCRAP, FIX}} = 80 \text{ GBq} \times 20\% = 16 \text{ GBq} \]

2. Inventory released from scraped fixed contamination:
\[ Q_{\text{REL, FIX}} = Q_{\text{SCRAP, FIX}} \times F_{\text{REL, FIX}} = 16 \text{ GBq} \times 0.01 = 0.16 \text{ GBq} = 160 \text{ MBq} \]

3. Inventory of the released activity from fixed contamination which is in respirable aerosol:
\[ Q_{\text{RSUS, FIX}} = Q_{\text{REL, FIX}} \times F_{\text{RSUS}} = 160 \text{ MBq} \times 100\% = 160 \text{ MBq} \]

4. Intake activity from fixed contamination:
\[ Q_{\text{INT, FIX}} = Q_{\text{RSUS, FIX}} \times F_{\text{INT}} = 160 \text{ MBq} \times (1 \times 10^{-4}) = 16 \text{ kBq} \]

5. Inventory of non-fixed contamination on an internal surface of a SCO-III:
\[ Q_{\text{IV, NF}} = C_{\text{NF}} \times A = 400 \text{ Bq/cm}^2 \times 10 \text{ m}^2 = 4 \times 10^5 \text{ Bq} = 40 \text{ MBq} \]

6. Inventory of non-fixed contamination released from an internal surface:
\[ Q_{\text{SCRAP, NF}} = Q_{\text{IV, NF}} \times F_{\text{SCRAP, NF}} = 40 \text{ MBq} \times 100\% = 40 \text{ MBq} \]

7. Inventory of the released activity from non-fixed contamination which is in respirable aerosol:
\[ Q_{\text{RSUS, NF}} = Q_{\text{REL, NF}} \times F_{\text{RSUS}} = 40 \text{ MBq} \times 1 = 40 \text{ MBq} \]

8. Intake activity from non-fixed contamination:
\[ Q_{\text{INT, NF}} = Q_{\text{RSUS, NF}} \times F_{\text{INT}} = 40 \text{ MBq} \times (1 \times 10^{-4}) = 4 \text{ kBq} \]

9. Total intake activity of radionuclides from an object:
\[ Q_{\text{INT}} = Q_{\text{INT, FIX}} + Q_{\text{INT, NF}} = 16 \text{ kBq} + 4 \text{ kBq} = 20 \text{ kBq} \]

VII.2. In an approval of a SCO-III shipment, every parameter in para. VII.1 should be examined and justified. Parameter A can be calculated from the design drawings of the components. Distributions and radionuclide compositions of parameters C_{\text{FIX}}, C_{\text{NF}} and Q_{\text{IV}} throughout the component can be measured, or properly modelled, for a series of components, together with a verification measurement for representative points on each component. Parameters F_{\text{SCRAP}}, F_{\text{REL}} and F_{\text{INT}} are sensitive and should be demonstrated as being appropriate through the literature, tests or reasoned argument. Parameter F_{\text{INT}} may have a value of $10^{-4} – 10^{-3}$, which is used in para. I.37, relative to the Q system.

VII.3. Care should be taken about the radionuclide composition of the inventory. For example, in the case of β and γ emitting unknown radionuclides, an inventory limit of $10A\gamma$ corresponds to $0.2$ TBq, then to $4 \times 10^{-5}$ Bq/cm², when a surface area of 5000 m² (a typical internal surface area for a steam generator) is assumed. This is two orders of magnitude lower than the contamination level limit on the inaccessible surface of a SCO-III, that is, $8 \times 10^{-5}$ Bq/cm². In contrast, when Co-60 is the only radionuclide present in the inventory, the allowable level of inaccessible surface contamination increases up to 4 TBq and $8 \times 10^{-4}$ Bq/cm².

\[ Q_{\text{INT}} = 20\text{kBq} \times 1 \times 10^{-5}/A_\gamma = 0.02 \text{ TBq} \]

\[ A_\gamma = 0.02 \text{ TBq} (2 \times 10^{-10} \text{ Bq}), \text{then the activity intake is:} \]

\[ Q_{\text{INT}} = 20\text{kBq} \times 1 \times 10^{-5}/A_\gamma = 0.02 \text{ TBq} \]

\[ A_\gamma = 0.02 \text{ TBq} (2 \times 10^{-10} \text{ Bq}), \text{then the activity intake is:} \]

\[ Q_{\text{INT}} = 20\text{kBq} \times 1 \times 10^{-5}/A_\gamma = 0.02 \text{ TBq} \]

\[ A_\gamma = 0.02 \text{ TBq} (2 \times 10^{-10} \text{ Bq}), \text{then the activity intake is:} \]

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\[ A_\gamma = 0.02 \text{ TBq} (2 \times 10^{-10} \text{ Bq}), \text{then the activity intake is:} \]

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\[ A_\gamma = 0.02 \text{ TBq} (2 \times 10^{-10} \text{ Bq}), \text{then the activity intake is:} \]

\[ Q_{\text{INT}} = 20\text{kBq} \times 1 \times 10^{-5}/A_\gamma = 0.02 \text{ TBq} \]
### Transport Regulations (SSR-6 and SSG-26) 2015 Review Cycle

| CDN/2015/22 | SSR-6 | Para. 244 | 244. Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I or SCO-III, shall mean a number that is used to provide control over radiation exposure. | See CDN/2015/01 Rev.1 above. Added from original proposal after review of TRANSSC 30 and Extra-ordinary meeting comments. Missed instance where SCO-III had to be added. |
| CDN/2015/23 | SSR-6 | Para. 572 | 572. Where the consignment is on or on the vehicle is unpackaged LSA-I material or SCO-I or SCO-III, or where a consignment is required to be shipped under exclusive use and is packaged radioactive material with a single UN number, the appropriate UN number (see Table 1) shall also be displayed, in black digits not less than 65 mm high, either…. | See CDN/2015/01 above. Added from original proposal after review of TRANSSC 30 and Extra-ordinary meeting comments. Missed instance where SCO-III had to be added. |
| CDN/2015/24 | SSR-6 | Para. 825 | 825. Multilateral approval shall be required for…. (e) The shipment of SCO-III. | See CDN/2015/01 Rev.1 above. Added from original proposal after review of TRANSSC 30 and Extra-ordinary meeting comments. |
| CDN/2015/25 | SSR-6 | Para. 802 | 802. Competent authority approval shall be required for the following:…. (c) Certain shipments (see paras 825-8249) | See CDN/2015/01 Rev.1 above. Added from original proposal after review of TRANSSC 30 and Extra-ordinary meeting comments. To accommodate addition of SCO-III shipments in 827 bis. (see CDN/2015/11 Rev. 1 ) – paragraph numbering will change. |
| CDN/2015/26 | SSG-26 | Para. 320.1 bis. | 520.2 The basic concept of allowing transport of SCOs unpackaged is that, though unpackaged, the objects should comply with the applicable Type IP package requirements, when the outer envelope (shells, etc.) is considered as packaging. In addition to being allowed to be transported unpackaged, certain requirements for Type IP packages may be excluded, provided that compensatory safety measures in the form of more stringent operational controls are demonstrated in order to ensure the same level of safety. Taken from old Appendix VII.8 and 10. | See CDN/2015/01 Rev.1 above. Added from original proposal after review of TRANSSC 30 and Extra-ordinary meeting comments. Added guidance taken from Appendix VII. |

Note that the above references were mistakenly numbered VI.1 to VI.12 instead of VII.1 to VI.12 in the current revision of SSG-26.
520.4 As addressed in para. 722.6 in this publication, if the conditions in the transport plan effectively prevent the SCO-III from dropping or colliding in certain orientations, then these orientations could be ignored in assessing the maximum damage. Demonstration of compliance may be performed in accordance with any of the methods referred to in para. 701 of the Transport Regulations.

Taken from old Appendix VII.36.

520.5 The SCO-III, including any unpackaged penetrations, openings and crevices, as well as additional shieldings, should meet the Type IP-2 requirements, with the noted exclusions. If a SCO-III is involved in an accident, the maximum activity intake for a person in the vicinity of the accident should be approximately of the same level as that from Type A packages (see Appendix VII).

Taken from old Appendix VII.27.

520.6 The SCO-III, including any unpackaged penetrations, openings and crevices, as well as additional shieldings, should be capable of withstanding the effects of any acceleration, vibration or vibration resonance which may arise under routine conditions of transport. This is set to comply with para. 613 of the Transport Regulations under routine conditions of transport.

Taken from old Appendix VII.26.

522.3 If a SCO-III is involved in an accident, the maximum activity intake for a person in the vicinity of the accident should be approximately of the same level as that from Type A packages (see Appendix VII). See CDN/2015/01 Rev.1 above. Added from original proposal after review of TRANSSC 30 and Extra-ordinary meeting comments. Added guidance taken from Appendix VII.

Taken from old Appendix VII.10.

827 bis.1 A written transport plan is used to govern the transport of SCO-III. The transport plan should contain lines of authority, responsibilities, requirements, precautions, prerequisites, instructions, personnel restrictions, emergency response actions, a radiation protection programme that includes any conveyance transfers, and the sequence of events regarding the transport.

Taken from old Appendix VII.35.

827 bis.2 As part of the transport plan, special attention should be paid to the radiation protection programme since the transport of SCO-III would be conducted in a different manner from the routine transport of ordinary packages and may involve workers not familiar with transport operations. As such, it should take into account all steps and activities of transport and all relevant transport workers and members of the public. Radiation levels of the object, transport and handling methods, including durations and distances of workers from the object in each operation, should be carefully examined and doses to workers should be optimized with the proper dose constraint.

Taken from old Appendix VII.35.