

**3042 Impact of “transport security threshold”
on the practical transport operation**

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Abstract

IAEA security implementing guides, “Security in the Transport of Radioactive Material”, was published as NSS No.9 in 2008, and it is currently under revision as NST044. In this document, “transport security threshold” was defined as “ten times of D value for specific 25 radionuclides, and 3000 times of A_2 value for the other nuclides”, and it was introduced into UNOB Rev.17 in 2011, then IMDG code and ICAO TI. However it has not been introduced into Japanese transport regulations at present, since IMDG code and ICAO TI maintains these provision recommendatory. And the following questions could still be raised about 10 D transport security threshold in practical operation.

- 1) NSS No.9 says the 25 radionuclides are chosen as those included in the “Code of Conduct on the Safety and Security of Radioactive Sources (2004)”. In the same time, the code says “the 25 radionuclides are listed for illustrative purpose only, and D values for the other nuclides may be found in TECDOC-1344”. And now D values for 373 nuclides may be found in “Dangerous quantities of radioactive material (D-values)”, EPR-D-VALUES 2006, published in 2006. So, why 25 nuclides and why two different definitions are needed?
- 2) The transport security threshold is not restricted to sources. Should 10 D thresholds be applied to all kind of radioactive material, such as nuclear fuels or radioactive waste, other than sources?
- 3) Eleven nuclides of the 25 radionuclides have the lower transport security thresholds than their A_1 values, and 3 nuclides have the lower thresholds than their A_2 values. Does it mean some radioactive materials, even in type A package, could be categorized as high consequence dangerous goods and required the additional security measures?

Regarding 3), we carried out a survey on the transport of radioactive sources to examine an impact, supposing that the 10 D threshold is introduced into the transport regulations in Japan. As a result, we found that there were at least 4 transports of Co-60 sources as type A package with greater radioactivity than 10 D in past 4 years. We also reviewed the past discussion on the introduction of the security provision into UNOB rev.13 (2003) and IMDG code Amdt. 32-4, and looked at the background the security provision remains as a recommendatory in the modal regulations.

1. Introduction

International standards on the safety requirements for transport of radioactive material are prescribed in IAEA Regulations for the Safe Transport of Radioactive Material, SSR-6 [1] and the requirements are incorporated into United Nations Recommendations on the transport of dangerous goods - Model Regulations (UN Orange book, UNOB). On the other hand, the security recommendations during transport of radioactive materials are written in NSS No.9 [2] and partially introduced in UNOB. However the security provision maintains recommendatory in IMDG code and ICAO TI. In this paper, it will be reviewed the transition of the security provision in the safety regulation and considered the reason why the provision is remained as recommendatory in IMDG code.

2. Introduction of security provisions to safety regulation

2.1 Introduction of security provisions into UN orange book Rev.13

September 11 attacks of 2001 in USA triggered that each government or international organization started to discuss about the necessity of measurement and prevention for counter-terrorism in public transportation. Especially it was indicated the threat of theft or sabotage using dangerous goods or Conveyance. Inland Transport Committee (ITC) initiated the discussion on the issues on the security in transportation in January 2002 [3]. The document was introduced to 20th session of UN Sub-Committee of Experts on the Transport of Dangerous Goods (UNSCETDG) in March 2002 [4] and USA and UK submitted the proposals to introduce security provisions into UNOB on 21st UNSCETDG in July 2002 [5], [6]. USA explained their experience to consolidate the security provision and safety requirement by including development of security plan, training, security enhancement of transport route. UK presented EC recommendation of possible action for security developed by the working group. The draft security provision was developed, modified, and submitted by Namibia, EC and AISE to 22nd UNSCETDG in December 2002 [7]. The final draft of the security provision was developed by consolidating the comments from IAEA[8], Canada[9], Germany[10], USA[11], Japan[12] and the chair of the working group [13]. It was adopted and introduced into UNOB Rev.13 as chapter 1.4 “security provisions” and paragraph 7.2.4 “Security provisions for transport by road, rail and inland waterway”. Chapter 1.4 defined “high consequence dangerous goods” as those which have the potential for misuse in a terrorist incident and which may, as a result, produce serious consequences such as mass casualties or mass destruction. For Class 7 radioactive materials, high consequence dangerous goods was defined as “radioactive material in quantities greater than 3000 A₁ (special form) or 3000 A₂, as applicable, in Type B or Type C packages” [14].

2.2 Introduction of security provisions into IMDG code Amdt. 32-4 [15],[16]

International Maritime Organization (IMO) also started to discuss how to enhance the maritime security. It was decided the Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC) would deal with maritime security matters, as part of the Maritime Safety Committee, the

Legal Committee and the Facilitation Committee to respond to the requests of the Assembly, as specified in resolution A.924 on “Review of measures and procedures to prevent acts of terrorism which threaten the security of passengers and crews and the safety of ships”. The most recent effort was made by the MSC Intersessional Working Group on Maritime Security which had met from 9 to 13 September 2002 to prepare for a SOLAS Conference to take place in December to adopt a new SOLAS Chapter XI-2 and an associated new International Ship and Port Facility Security Code to contain important mandatory and recommendatory requirements to strengthen security on board ships and in ship/port interface areas.

Measures to Enhance Maritime Security were discussed as agenda item 11 at DSC 7 in September 2002. DSC 7 reviewed the Recommendations on the safe transport of dangerous cargoes and related activities in port areas (MSC/Circ.675); and the IMO/ILO/UN ECE Guidelines for packing of CTUs (MSC/Circ.787); and the related model course (IMO Model course 3.18) in light of security measures to be included with a target completion date of 2004. It was noted that UNSCETDG 21 in July 2002 agreed to discuss, at its December 2002 meeting, the security of the transport of dangerous goods for inclusion in the UNOB. It was agreed to establish a drafting group to look at the way forward taking into account that relevant instruments, like the ISPS Code, had not yet been finalized and the outcome of other international bodies, like WCO, ILO and UNECE, was not yet available.

Then a drafting group was established for the following purposes:

- To advise the Sub-Committee on how to proceed with the subject, taking into account activities in other organizations such as WCO and the UN Committee of Experts on the Transport of Dangerous Goods and propose a relevant work plan;
- To identify areas in three IMO instruments:
 - (1) the Recommendations on the safe transport of dangerous cargoes and related activities in port areas (MSC/Circ.675);
 - (2) the IMO/ILO/UN ECE Guidelines for packing of CTUs (MSC/Circ.787);
 - (3) the IMO model course on safe packing of cargo transport units (CTUs) (Model Course 3.18), which might need to be amended, in light of security measures to be included; and
- To prepare, if appropriate, terms of reference for a correspondence group to consider the matter intersessionally with a view to prepare initial draft amendments to the three instruments.

It was also recognized that there was not sufficient time to consider the three rather voluminous documents mentioned above, also taking into account that the aforementioned ISPS Code, which might form the basis for this work, would only be available in its final form after adoption by the Diplomatic Conference in December 2002. Then it was invited to Member Governments and international organizations to submit to DSC 8 documents/proposals on the three IMO instruments, which might need to be amended, in light of security measures to be included.

However, there was not such proposals had been submitted to DSC 8 in 2003. It was noted the 2002 SOLAS Conference on Maritime Security adopted amendments to SOLAS and the International Ship and Port Facility Security (ISPS) Code and a number of resolutions. During the session a drafting

group was established for the following purposes:

- To identify areas within the three instruments, namely, Recommendations on the safe transport of dangerous cargoes and related activities in port areas (MSC/Circ.675), and IMO/ILO/UNECE Guidelines for packing of CTUs (MSC/Circ.787) and model course on safe packing of CTUs (3.18), which need to be amended in light of security measures to be included;
- To identify other IMO instruments, which may need to be amended, in light of security measures regarding cargoes and suggest an order of priority in which these need to be amended; and
- To prepare, if appropriate, terms of reference for a correspondence group to consider the matter intersessionally.

It was noted as an important issues that the definition of “High Consequence Dangerous Cargoes” to be included in MSC/Circ.675; and some definitions in MSC/Circ.675 and MSC/Circ.787 which are different from those in the ISPS Code (i.e. Port Area vs Port Facility). It was agreed to bring the following list of the other cargo-related IMO instruments for the review:

Priority 1 - ISPS Code;

- CSC Convention;
- STCW Convention, Section B;

Priority 2 - INF Code;

- BC Code;
- IBC Code;
- IGC Code;

Priority 3 - IMO Model course 1.10 on dangerous, hazardous and harmful cargoes; and

Priority 4 - FAL Convention

A correspondence group was established, under the co-ordination of the United Kingdom, with the following terms of reference:

- (1) To continue the reviewing of the Recommendations on the safe transport of dangerous cargoes and related activities in port areas (MSC/Circ.675); the IMO/ILO/UN ECE Guidelines for packing of CTUs (MSC/Circ.787); and the IMO model course on safe packing of CTUs (3.18), in light of security measures to be included;
- (2) To prepare draft amendments to the above-mentioned instruments, taking into account the relevant work within the Organization and other international bodies, if necessary; and
- (3) To submit its report to DSC 9.

On the same time, E&T group of DSC was requested to advise the group, based on the legal advice by the Secretariat, on the incorporation of the proposed new chapter 1.4, dealing with security provisions, in the next amendment to the Code. It was decided that the provisions which concern training and shore-side operations should be reflected as recommendatory whilst others mandatory. Then E&T group finalized the chapter 1.4 of the amendment to the IMDG code taking into account the comments

Because ships personnel are mandatorily required to comply with chapter XI-2 on Special Measures

to enhance maritime security of International Convention for the Safety of Life at Sea (SOLAS Convention) and The International Ship and Port Facility Security (ISPS) code by the convention, Some countries proposed that the security provision shall not be include to IMDG code [17],[18][19]. Many countries showed the position the provision should not be mandatory and more stringent than those of the SOLAS convention.

3. Introduction of D values as the threshold for High consequence dangerous goods

In the biennial for UNOB Rev.17, at 35st meeting of UNSCETDG in June 2009, the representative of IAEA explained that they would consider submitting the proposal of harmonization of the security provisions between UNOB and this guidance and request the experts to provide comments [20]. Certain experts drew attention to the fact that the basic security provisions and those concerning high consequence radioactive material contained in this guidance document were significantly more stringent than those contained in the Model Regulations. The representative of IMO underlined also that the security provisions contained in the IMDG Code should not go beyond the mandatory provisions of Part A of the International Ship and Port Facility Security (ISPS) Code [21].

At 37st meeting of UNSCETDG in July 2010, IAEA submitted the proposal to apply the provisions of NSS No.9 to all dangerous goods [22], and it was agreed in part. The changes of threshold for high consequence dangerous goods harmonizing with NSS No.9 was agreed, but the proposal to apply to all dangerous goods certain security provisions taken from IAEA NSS No.9 did not receive support. Industry expressed their concern [23], and it was concluded that the general aspects of transport security were governed by other legal instruments such as the ISPS Code of IMO, and the procedures proposed by IAEA for notification between the consignors and the consignees were unrealistic and the existing procedures were apparently already sufficient [24].

IAEA submitted the proposal to apply some of the provisions only to radioactive material [25] at 38st session of UNSCEDG in December 2011. Most experts considered that it was not realistic to expect implementation of most of such provisions in international transport. It was agreed to refer the examination of the IAEA proposal to a lunchtime working group that would consider whether new specific provisions could be introduced for radioactive material. On the basis of the report of the working group [26], it was agreed to add a new 1.4.1.4 exempting excepted packages of UN Nos. 2908 and 2909, excepted packages of UN Nos. 2910 and 2911 with an activity level not exceeding the A₂ value, and LSA-I and SCO-I radioactive material from the application of security provisions of Chapter 1.4 [27].

Then the threshold for high consequence dangerous goods was changed in UNOB rev.17 in 2011. The values of the threshold were suggested based on NSS No.9, which is published in 2008.

Although the security provisions are required only to Type B(U), B(M) and C packages in UNOB Rev.13, this restriction was deleted in UNOB Rev.17. On the other hand, it was specified that the following radioactive materials are not applied to the Chapter 1.4 security provision.

- (a) UN 2908 and UN 2909 excepted packages

(b) UN 2910 and UN 2911 excepted packages with an activity level not exceeding the A₂ value

(c) UN 2912 LSA-I and UN 2913 SCO-I

These revisions were introduced to IMDG code amdt. 36-12 but they were remained recommendatory.

4. Transition of the thresholds for high consequence dangerous goods in UNOB

The transition of the definition for high consequence dangerous goods of Class 7 and the correspondence between UNOB and IMDG code are shown in Table 1. The security provision and the definition of high consequence dangerous goods were introduced into UNOB Rev.13 and IMDG code amdt. 32-4, and changed in UNOB Rev.17 and IMDG code amdt. 36-12. The provisions remain recommendatory in IMDG code from the beginning of the introduction.

Table 1 Definition of High consequence radioactive material in UNOB and IMDG code

UNOB	IMDG code	Activity threshold for high consequence dangerous of Class 7
Rev. 13	Amdt. 32-4	radioactive material in quantities greater than 3000 A ₁ (special form) or 3000 A ₂ , as applicable, in Type B or Type C packages
Rev. 14	Amdt. 33-6	radioactive material in quantities greater than 3000 A ₁ (special form) or 3000 A ₂ , as applicable, in Type B(U) or Type B(M) or Type C packages
Rev. 17	Amdt. 36-12	For dangerous goods of Class 7, high consequence radioactive material is that with an activity equal to or greater than a transport security threshold of 3000 A ₂ per single package (see also 2.7.2.2.1) except for the following radionuclides where the transport security threshold is given in Table 1.4.2 below.

Table 1.4.2: Transport security thresholds for specific radionuclides

Element	Radionuclide	Transport security threshold (TBq)
Americium	Am-241	0.6
Gold	Au-198	2
Cadmium	Cd-109	200
Californium	Cf-252	0.2
Curium	Cm-244	0.5
Cobalt	Co-57	7
Cobalt	Co-60	0.3
Cesium	Cs-137	1
Iron	Fe-55	8000
Germanium	Ge-68	7
Gadolinium	Gd-153	10
Iridium	Ir-192	0.8
Nickel	Ni-63	600
Paladium	Pd-103	900
Promethium	Pm-147	400
Polonium	Po-210	0.6
Plutonium	Pu-238	0.6
Plutonium	Pu-239	0.6
Radium	Ra-226	0.4
Ruthenium	Ru-106	3
Selenium	Se-75	2
Strontium	Sr-90	10
Thallium	Tl-204	200
Thulium	Tm-170	200
Yterbium	Yb-169	3

5. Fact-finding survey in Maritime transport of radioactive sources

Since the security provision in IMDG code is not mandatory, the Japanese regulation for maritime transport of dangerous goods, “Regulations for the Carriage and Storage of Dangerous Goods in Ships”, does not contain the provision. On the other hand, there is a discussion to introduce D values to the regulation for transport of radioactive source. With such a background, the survey was carried out with the following conditions.

Survey conditions:

- Maritime transport of radioactive sources related to Japan excluding transit
- Four years from 1 January 2011 to 31 December 2014
- 23 nuclides excluding plutonium from the 25 nuclides shown in Table 2

Table 2 Comparison of Transport Security Threshold and A1/A2 values for 25 nuclides

Radionuclide	Transport security threshold (TST) (TBq)	A1 (TBq)	A2 (TBq)	10D<A1	10D<A2
Am-241	0.6	10	0.001	Yes	x
Au-198	2	1	0.6	x	x
Cd-109	200	30	2	x	x
Cf-252	0.2	0.1	0.001	x	x
Cm-244	0.5	20	0.002	Yes	x
Co-57	7	10	10	Yes	Yes
Co-60	0.3	0.4	0.4	Yes	Yes
Cs-137	1	2	0.6	Yes	x
Fe-55	8000	40	40	x	x
Gd-153	10	10	9	x	x
Ge-68	7	0.5	0.5	x	x
Ir-192	0.8	1	0.6	Yes	x
Ni-63	600	40	30	x	x
Pd-103	900	40	40	x	x
Pm-147	400	40	2	x	x
Po-210	0.6	40	0.02	Yes	x
Pu-238	0.6	10	0.001	Yes	x
Pu-239	0.6	10	0.001	Yes	x
Ra-226	0.4	0.2	0.003	x	x
Ru-106	3	0.2	0.2	x	x
Se-75	2	3	3	Yes	Yes
Sr-90	10	0.3	0.3	x	x
Tl-204	200	10	0.7	x	x
Tm-170	200	3	0.6	x	x
Yb-169	3	4	1	Yes	x
Number of nuclides TST greater than A/A2				11	3

The purpose of the survey is to identify the transport of high consequence dangerous goods for radioactive materials, and to examine the impact of the introduction of the security provision into the domestic regulations. Almost all of the logistics of radioactive sources have been historically controlled by Japan Radioisotope Association (JRIA). So this survey was carried out with the

cooperation of them. Plutonium was excluded from the target of this survey since transport of the following three nuclides, Uranium, Plutonium and Thorium, are regulated in Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors and the logistics are not controlled by JRIA. Then, target of the survey was limited to 23 nuclides, which are regulated in Act on Prevention of Radiation Hazards due to Radioisotopes, etc.

The survey found that there were total 52 of maritime transports of radioactive sources over 10 D for 4 years in Japan. These were all Co-60 or Cs-137 sources and the details were 27 imports, 11 exports and 14 domestic transports; and 48 transports of Type B package and 4 transport of Type A package. Since it is not required package design approval for Type A package, the result shows there are 4 maritime transports in recent 4 years which affect if administrative procedure is required. The 4 transports were Co-60 sources and transported in only domestic, from island to island.

Conclusions

This paper reviewed the introduction and transition of security provision in UNOB and IMDG code. The security provision remained recommendatory in IMDG code from the beginning of the introduction since it was considered the provisions were covered by the other instruments such as ISPS code. The threshold for high consequent radioactive material was changed to 10 times D values in UNOB Rev.17 and IMDG code amdt. 36-12 to harmonize with NSS No.9, and some radionuclides in Type A packages to be categorized as high consequent radioactive material. With such background, the survey was carried out for four recent years in maritime transport of radioactive material in Japan to examine the impact of introducing transport security threshold in the regulation. There were 52 transports of high consequent radioactive material, of which 48 transports were Type B packages and 4 transports were Type A packages. The 4 transport was Type A package of Co-60. It indicates there is a certain impact for maritime transport of Type A package, if Japanese transport regulation introduce such a threshold. In addition, it should be noted that the number of maritime transport of Type A package is relatively smaller than that of air transport in Japan. There are more than thousands of air transports of radioactive material in Type A packages per year. The impact for air and land transport may larger than that of maritime transport. Therefore, when the introduction of the threshold of 10 D is discussed, the careful consideration may be needed to avoid the confusion.

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References

- [1] IAEA SAFETY STANDARDS SERIES No.SSR-6, "Regulations for the Safe Transport of Radioactive Material 2012 Edition", International Atomic Energy Agency, Vienna, 2012.
- [2] IAEA NUCLEAR SECURITY SERIES No. 9, "Security in the Transport of Radioactive

Material Implementing Guide”, International Atomic Energy Agency, Vienna, 2008.

- [3] United Nations, TRANS/2002/15, “Note by the secretariat”, 2002.
- [4] United Nations, ST/SG/AC.10/C.3/2002/56 “Transport and security”, Note by the secretariat, (2002).
- [5] United Nations, UN/SCETDG/21/INF.19 “Transport Security”, 2002.
- [6] United Nations, UN/SCETDG/21/INF.53, “Transport and Security” 2002.
- [7] United Nations, ST/SG/AC.10/C.3/2002/65, “new proposals, outstanding issues, Transport and Security”, 2002.
- [8] United Nations, UN/SCETDG/22/INF.16, “Comments on ST/SG/AC.10/C.3/2002/65”, 2002.
- [9] United Nations, UN/SCETDG/22/INF.19, “Comments on ST/SG/AC.10/C.3/2002/65”, 2002.
- [10] United Nations, UN/SCETDG/22/INF.28, “Comments on ST/SG/AC.10/C.3/2002/65”, 2002.
- [11] United Nations, UN/SCETDG/22/INF.35, “Comments on ST/SG/AC.10/C.3/2002/65”, 2002.
- [12] United Nations, UN/SCETDG/22/INF.48, “Comments on ST/SG/AC.10/C.3/2002/65”, 2002.
- [13] United Nations, UN/SCETDG/22/INF.51, “Committee on ST/SG/AC.10/C.3/2002/65”, 2002.
- [14] United Nations, ST/SG/AC.10/C.3/44, “Report of the Sub-Committee of Experts on its 22nd session”, 2003.
- [15] IMO, DSC 7/15, “Report to the Maritime Safety Committee”, 2002.
- [16] IMO, DSC 8/15, “Report to the Maritime Safety Committee”, 2003.
- [17] IMO, DSC/8/3/1, “Security provisions”, 2003.
- [18] IMO, DSC/8/3/10, “Security provisions”, 2003.
- [19] IMO, DSC/8/3/12, “Incorporation of security provisions (new chapter 1.4) into the IMDG Code”, 2003.
- [20] United Nations, UN/SCETDG/35/INF.9, “Guidance for the Security in Transport of Radioactive Material”, 2009.
- [21] United Nations, ST/SG/AC.10/C.3/70, “Report of the Sub-Committee of Experts on the Transport of Dangerous Goods on its 35th session”, 2009
- [22] United Nations, ST/SG/AC.10/C.3/2010/3, “Guidance for the security in transport of radioactive material”, 2010.
- [23] United Nations, UN/SCETDG/37/INF.10, “Comments on document ST/SG/AC.10/C.3/2010/3”, 2010
- [24] United Nations, ST/SG/AC.10/C.3/74, “Report of the Sub-Committee of Experts on the Transport of Dangerous Goods on its 37th session”, 2010.
- [25] United Nations, ST/SG/AC.10/C.3/2010/77, “Guidance for the security in transport of radioactive material”, 2010.
- [26] United Nations, UN/SCETDG/38/INF.58, “Amendments to Chapter 1.4”, 2010.
- [27] United Nations, ST/SG/AC.10/C.3/76, “Report of the Sub-Committee of Experts on the Transport of Dangerous Goods on its 38th session”, 2011