



**WORKING PAPER**

**DANGEROUS GOODS PANEL (DGP)  
WORKING GROUP MEETING (DGP-WG/24)**

**Montreal, 21 to 25 October 2024**

**Agenda Item 3: Facilitating safe transport of dangerous goods by air (Ref: REC-A-DGS-2027)**

**PRESSURE DIFFERENTIAL REQUIREMENTS APPLICABLE TO PACKAGINGS  
CONTAINING RADIOACTIVE MATERIAL**

(Presented by S. Bitossi)

**SUMMARY**

This working paper proposes amendments to the Technical Instructions and its Supplement based on guidance material that was discussed at the 2017 DGP Working Group Meeting (DGP-WG/17, 24 to 28 April 2017) (see paragraph 3.2.6.2 of the DGP-WG/17 Report). The guidance material was subsequently presented to the 34<sup>th</sup> meeting of the International Atomic Energy Agency (IAEA) Transport Safety Standards Committee (TRANSSC) (see page 18 of the [TRANSSC 34 Meeting Report \(Draft 5\)](#))<sup>1</sup> for consideration. TRANSSC-34 did not object to the material developed by DGP.

The amendments in this working paper pertain to Part 6;7.2.3 of the Technical Instructions which requires that all packages containing radioactive material must evidence differential pressure testing of not less than maximum normal operating pressure plus 95kPa. This applies to all forms of radioactive material within the packages and does not allow for demonstrated compliance by means other than differential pressure testing for packages containing solid radioactive material, as provided for in IAEA publications.

Action by the DGP-WG is in paragraph 2.

<sup>1</sup> Note: Only the 5th edition of the report of 34th Meeting of the IAEA TRANSSC has been published online, with the final report not available in this forum.

## 1. INTRODUCTION

### 1.1 The current regulations

#### 1.1.1 Part 6;7.2.3 of the Technical Instructions states that:

7.2.3 Packages containing radioactive material must be capable of withstanding, without loss or dispersal of radioactive contents from the containment system, an internal pressure that produces a pressure differential of not less than maximum normal operating pressure plus 95 kPa.

#### 1.1.2 The corresponding requirement in paragraph 621 of the [International Atomic Energy Agency \(IAEA\) Regulations for the Safe Transport of Radioactive Material, \(2018 Edition\), Safety Standards Series No. SSR-6 \(IAEA SSR-6\)](#) also states the same wording:

Packages containing radioactive material must be capable of withstanding, without loss or dispersal of radioactive contents from the containment system, an internal pressure that produces a pressure differential of not less than maximum normal operating pressure plus 95 kPa.

#### 1.1.3 The IAEA published [Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material \(2018 Edition\) Specific Safety Guide No. SSG-26 \(Rev. 1\)](#) where explanatory text in para 621.2 states that:

In the case of solid material, to comply with para. 621 of the Transport Regulations, means other than pressure resistance may be used to demonstrate compliance. If it can be demonstrated that there is no loss or dispersal of the radioactive contents from the containment system when the package is exposed to the pressure differential expected during flight, the package design can be considered to meet the requirement even if the internal pressure is not maintained.

### 1.2 The pressure differential issue

#### 1.2.1 Shippers have reported that some radioactive packages (designed for solid radioactive material) do not evidence differential pressure testing to maximum normal operating pressure (MNOP) plus 95kPa in line with Part 6;7.2.3, and are at risk of non-compliance with the regulations.

#### 1.2.2 Shippers have also reported that these same radioactive packages (designed for solid radioactive material) evidence other means of compliance to demonstrate that there is no loss or dispersal of the radioactive contents from the containment system in line with IAEA SSR-6 and corresponding IAEA SSG-26 (current editions).

#### 1.2.3 The Technical Instructions do not provide explanatory text or provide for other means of demonstrating compliance with Part 6;7.2.3 for solid radioactive material packages.

### 1.3 Historical work by the DGP

#### 1.3.1 Optimization of the requirement for packages containing radioactive material to be subject to a pressure differential test for transport by air had been a topic of discussion at meetings of the IAEA Transport Safety Standards Committee, where it had been decided that input from appropriate aviation organizations was needed. Accordingly, members of the DGP with appropriate expertise were invited to join an expert group at the 2016 DGP Working Group Meeting (see paragraph 3.2.6.1 of the

DGP-WG/16 Report). A joint DGP/IAEA Working Group on Pressure Differential Requirements Applicable to Packagings Containing Radioactive Material was subsequently formed.

1.3.2 The joint working group was convened from 21 to 22 April 2017 at ICAO Headquarters, and its conclusions were presented to the 2017 DGP Working Group Meeting that followed (DGP-WG/17, 24 to 28 April 2017) (see paragraph 3.2.6.2 of the DGP-WG/17 Report). The joint working group concluded that a package design would meet the requirement of Part 6;7.2.3 if the pressure differential was not maintained due to leakage of air, provided there was no loss or dispersal of radioactive material. It also concluded that additional guidance on the existing regulatory requirements would provide clarification and presented draft material. DGP-WG/17 had no objections to the conclusions and agreed that draft guidance material should be submitted to the 34th meeting of the IAEA TRANSSEC for consideration.

1.3.3 In July 2017, ICAO attended the 34<sup>th</sup> Meeting of the IAEA TRANSSEC and provided the findings from the DGP/IAEA Working Group where the question was asked if there was any objection from the TRANSSEC that the next ICAO DGP would determine the best location for the guidance material. It was recorded in the [meeting report](#)<sup>1</sup> that the TRANSSEC had no objection for ICAO to process with the addition of the proposed wording.

1.3.4 There is no record of any subsequent mention of this topic, or related to this matter, and the draft guidance text that was proposed at TRANSSEC does not appear to have been presented to the panel in subsequent meetings.

## 2. ACTION BY THE DGP-WG

2.1 The DGP-WG is invited to:

- a) review and consider the two options for amending the Technical Instructions presented in Appendix A to this working paper:
  - 1) Option A was presented at DGP-WG/17 (see paragraph 3.2.6.2 of the DGP-WG/17 Report); and
  - 2) Option B is wording of para 621.2 of the IAEA Advisory Guidance (limiting the note to solid material only);
- b) review and consider the proposed guidance material in Appendix B to this working paper, originally presented to DGP-WG/17 (see paragraph 3.2.6.2 of the DGP-WG/17 Report), for incorporation into the Supplement to the Technical Instructions.

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## APPENDIX A

### PROPOSED AMENDMENT TO PART 6 OF THE TECHNICAL INSTRUCTIONS

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## Part 6

### PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

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## Chapter 7

### REQUIREMENTS FOR THE CONSTRUCTION, TESTING AND APPROVAL OF PACKAGES FOR RADIOACTIVE MATERIAL AND FOR THE APPROVAL OF SUCH MATERIAL

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#### 7.2 ADDITIONAL REQUIREMENTS FOR PACKAGES TRANSPORTED BY AIR

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7.2.3 Packages containing radioactive material must be capable of withstanding, without loss or dispersal of radioactive contents from the containment system, an internal pressure that produces a pressure differential of not less than maximum normal operating pressure plus 95 kPa.

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#### Option A:

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Note.— The intent of this requirement is to avoid loss or dispersal of radioactive material out of the package during its carriage in an aircraft taking into account of the pressure variation that can be encountered in in the cargo hold of an aircraft (see xxx of the Supplement to these Instructions for further guidance).

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#### Option B:

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Note.— In the case of solid material, to comply with 7.2.3, means other than pressure resistance may be used to demonstrate compliance. If it can be demonstrated that there is no loss or dispersal of the radioactive contents from the containment system when the package is exposed to the pressure differential expected during flight, the package design can be considered to meet the requirement even if the internal pressure is not maintained (see xxx of the Supplement to these Instructions for further guidance).

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## APPENDIX B

### PROPOSED AMENDMENT TO PART S-6 OF THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS

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## Part S-6

### PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

#### (ADDITIONAL INFORMATION FOR PART 6 OF THE TECHNICAL INSTRUCTIONS)

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### Chapter 7

#### ADDITIONAL GUIDANCE FOR PACKAGES OF RADIOACTIVE MATERIAL TRANSPORTED BY AIR

##### 7.1 GUIDANCE TO STATES ON NORMAL AND EMERGENCY FLIGHT CONDITIONS WITH RESPECT TO DIFFERENTIAL PRESSURE

7.1.1 The normal conditions of flight and the emergency flight conditions are defined in ISO Standard 11242 as follows:

- a) **Normal flight conditions:** Flight conditions with cabin/cargo compartment pressure decreasing from standard sea level 100 kPa to minimum cruise flight cabin altitude pressure 75 kPa (8000 ft) during climb at minimum rate of 150 Pa/s (2500 ft/min), and increasing back to standard sea level during descent, at minimum rate of 90 Pa/s (1500 ft/mn). Some cargo-only aircraft are designed and operated such that the cargo compartment is not pressurized during flight. For these type of aircraft the normal rate of pressure change experienced by the cargo is the actual rate of aircraft climb and descent which is expected to be greater than the "normal" pressure change provided in the ISO standard 11242.
- b) **Emergency (rapid decompression) flight conditions:** Cabin/cargo compartment atmosphere dropping linearly from a minimum normal equivalent altitude of 6000 ft, i.e. a maximum normal pressure of 81 kPa in cruise flight, to the standard ambient pressure of 15 kPa at 45000 ft altitude in a duration of 1 s.

7.1.2 The maximum normal operating pressure (MNOP) is at least the gauge pressure developed in the containment system of the package at 55°C (primary receptacle, or intermediate packaging or outer packaging), i.e. the absolute pressure developed in the package at 55°C less 100 kPa.

7.1.3 The differential pressure of MNOP + 95 kPa results from a consideration of aircraft depressurization at a maximum civil aviation flight altitude together with any pressure already inside the package, plus a safety margin.

7.1.4 In the particular case of solid material, in order to comply with Part 6, 7.2.3 other means of demonstration than pressure resistance may be used by the designer of a package design.

7.1.5 If “no loss or dispersal” can be justified when the package is exposed to pressure differential the package design is considered to meet the requirement even if the internal pressure is not maintained.

7.1.6 *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2018 edition)*, Safety Standard Series No. SSG-26 (Rev.1), IAEA, Vienna (2019), paragraph 621.3 states:

If, within the definition of MNOP, the phrase “conditions of temperature and solar radiation corresponding to environmental conditions” is interpreted to include consideration of conditions specific to air transport (para. 620), then the MNOP does provide a suitable basis for specifying this requirement. If the temperature range given in para. 620 (–40°C to 55°C) is used, self-heating of the package contents is taken into account and the solar radiation input is considered to be zero, as the package is inside an aircraft, and hence the MNOP is consistent with the ICAO approach.

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