Document Preparation Profile (DPP)
Version 3 dated 18 August 2016

1. IDENTIFICATION

Document Category	**Safety Guide**
Working ID:	**DS500**
Proposed Title:	**Implementation of the Clearance Concept**
Proposed Action:	**New Document replacing the Safety Guide RS-G-1.7**
Review Committees:	**WASSC, RASSC, TRANSSC**
Technical Officer:	**V. Ljubenov, NSRW**

2. BACKGROUND

Notification and authorization are fundamental requirements in GSR Part 3 for the control of planned exposure situations. Provision however has been made for the clearance of material from authorised practices from further regulatory control. Numerical values for clearance of material are provided in Schedule 1 of GSR Part 3, in Table I.2 and I.3.

These numerical clearance values were taken from the existing Safety Guide RS-G-1.7 "Application of the Concepts of Exclusion, Exemption and Clearance" that was issued by the IAEA in 2004. This Safety Guide was based on the 1996 version of the Basic Safety Standards and issued prior to the publication of the Fundamental Safety Principles (SF-1). Although some terminology has changed since then, the concepts of exemption and clearance remain in GSR Part 3. Hence, the guidance on the application of the clearance levels that is given in the Safety Guide is still valid even though it would require updating to the new GSR Part 3 terminology.

GSR Part 3 does not expand upon the application of the concepts of exemption and clearance, but assumed that further guidance would be provided in two IAEA Safety Guides: a Safety Guide on the Implementation of the Clearance Concept, and another Safety Guide on the Application of the Concept of Exemption and Criteria for Trade in Contaminated Commodities. This document preparation profile addresses the Safety Guide on the Implementation of the Clearance Concept.

The original Safety Guide RS-G-1.7 contains much information that can be used directly in the new Safety Guide on the Implementation of the Clearance Concept. Parts that contain useful text are:

- Paragraphs 1.8 and 1.9 listing the substances/situations that the clearance values do not apply to;
- Paragraph 3.1 describing the basis of the derivation of the values, noting that the concept of exclusion is no longer applied to naturally occurring radionuclides but that the concept of existing exposure applies instead;
- Paragraphs 3.4 to 3.7 describing the dose criteria and calculation procedures and models;
- Paragraph 4.5 describing the values to be used for noble gases;
- Section 5 describing the application of the values.

The original Safety Guide RS-G-1.7 did not address all the aspects of the clearance process, for example it did not discuss conditional (specific) clearance and the use of surface contamination levels, nor did it address the management and organisational aspects of the clearance process. These aspects will be addressed in the new Safety Guide. A detailed description of the calculations used to derive the clearance levels is provided in Safety Report 44 and therefore it does not need to be included within the new Safety Guide.

The new Safety Guide therefore needs to provide guidance on the clearance process and on the application of the clearance levels, in particular on the organisation and regulation of the process, and its verification. It also needs to address conditional clearance and the use of surface contamination levels.

3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

The original version of Safety Guide RS-G-1.7 was based on an older version of the BSS. With the incorporation of the basic information from the Safety Guide RS-G-1.7 into the new BSS (GSR Part 3), much of the information in Safety Guide RS-G-1.7 is redundant. Although the information in Safety Guide RS-G-1.7 regarding the application of the clearance principle is still relevant, it has been noted by Member States that it

should be expanded to provide more detailed guidance on the clearance process; establishment of national regulations; planning, organization and implementation, technical and safety implications and resources needed to implement the clearance process. The process of clearance is a regulated process and, hence, the procedures and processes leading to the act of clearance need to be well defined. As noted above, the original Safety Guide RS-G-1.7 also contains no guidance on the clearance of building and equipment based on surface contamination measurements and, hence, there is a need for this to be included in a new Safety Guide. The new Safety Guide should also address the concept of clearance for liquids and gases, and the boundary between clearance and discharge should be established. The Safety Guide will also investigate whether the existing clearance levels for solids could be relevant to liquids and gases.

Based on discussions among the IAEA staff and on the revision of basic documents pertaining to the clearance concept, it was suggested that a new document be prepared to expand on the application of this concept as defined in the BSS (GSR Part 3) to address the issues identified above. This DPP is developed based on these recommendations. As a result of the development of this new Safety Guide on the Implementation of the Clearance Concept, the Safety Guide RS-G-1.7 would be superseded.

4. OBJECTIVE AND SCOPE

The objective of the Safety Guide is to provide detailed guidance on the application of the clearance concept for materials and buildings that are to be released from regulatory control. It will be especially applicable during decommissioning to assist in the minimization of waste that will require disposal as radioactive waste. However, the guidance will also be applicable for releasing material for unconditional reuse or for non-radiological disposal during the normal operation of a facility, and may be applicable to other situations. The Safety Guide will also provide guidance on the development of conditional clearance values for the reuse of material through recycling or other reuses. It will not address exclusion as it is no longer defined in the BSS (GSR Part 3), and it will not address exemption as this will be addressed in another Safety Guide.

The information presented in this new Safety Guide is applicable to facilities that use, manufacture, process or store radioactive material. The types of facilities that may be included under this category are nuclear power plants, research reactors, other nuclear fuel cycle facilities, industrial plants, medical facilities, research facilities and accelerators. It also applies to industries processing naturally occurring radioactive material (NORM).

The scope of this new Safety Guide is to describe the process of clearance from regulatory control. It will include the following aspects:

- Clarification on the use of terminology, especially the use of terms clearance and release;
- Responsibilities of the operator and the regulatory body;
- All relevant steps of the clearance process including characterization, determination of the nuclide vector, measurement techniques, sampling, management of the clearance process;
- Volumetric and surface specific clearance criteria for unconditional clearance;
- Volumetric and surface specific clearance criteria for conditional clearance;
- Case by case approach which can be used for small quantities of material, or for other situations where the assumptions for the generic derivation of clearance levels do not apply (e.g. where the water pathway is not relevant), or for radionuclides for which clearance values have not been given in GSR Part 3, or e.g. for cases where it is proposed that the rounding procedure or other features from the model in Safety Report 44 are not applied or are modified;
- Considerations of clearance of liquids;
- Consideration of clearance of gases;
- Additional requirements for building materials containing naturally occurring radionuclides;
- Considerations of averaging masses and averaging areas;
- Discussion of the degree of homogeneity that was assumed in the calculation of the clearance levels and the implications for application of the clearance levels to non-homogenous material;
- Discussion of the derivation of unconditional clearance levels for radionuclides for which there are no values in Table I.2 of GSR Part 3, noting the methodology described in Safety Report 44 and the relevance of any values for exemption of moderate amounts that are already listed in Table I.1;
- Discussion of the independence of exemption levels and conditional clearance levels, noting that conditional clearance levels can be above the values given in Tables I.1 and I.2 in GSR Part 3 since the destination and final fate of the material is known;
- Consideration should be given of whether the clearance levels given in GSR Part 3 are reproduced in the Safety Guide;

- Consideration should be given of whether clearance values for other radionuclides, that have already been calculated using the same methodology described in Safety Report 44, are also presented in the Safety Guide.

This new Safety Guide will differentiate between:

- Clearance and exemption, describing the concepts and the scope of this document and of the separate document on exemption and reference levels for commodities;
- Clearance and discharges for gaseous and liquid releases;
- Material that is eligible for clearance and material that is considered as part of existing exposure situations (commodities);
- Clearance of materials and release of contaminated sites;
- (Conditional) clearance and transport.

5. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

The proposed Safety Guide will be a new document that will provide Member States with complementary information necessary when implementing the existing Safety Standards. In particular, the following documents have identified the importance of establishing clearance criteria and its application:

1. Decommissioning of Facilities, General Safety Requirements Part 6 (GSR Part 6)
2. Radiation Protection and Safety of Radiation Sources: International Safety Standards, General Safety Requirements Part 3 (GSR Part 3)
3. Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, Draft IAEA Safety Guide DS452
4. Decommissioning of Medical, Industrial and Research Facilities, Draft IAEA Safety Guide DS403

The following documents are relevant to the context of the new Safety Guide:

1. IAEA Safety Report 44 on Derivation of activity concentration values for exclusion, exemption and clearance;
2. IAEA Safety Report 67 on Monitoring for compliance with exemption and clearance levels;
3. The new Safety Guide planned to be developed in parallel that will address Application of the Concept of Exemption and Criteria for Trade in Contaminated Commodities;
4. IAEA TECDOC on Clearance levels for landfill disposal;
5. Draft IAEA Safety Guide DS442 on Regulatory control of radioactive discharges to the environment.

6. OVERVIEW

The following is the proposed content of the Safety Guide.

1. Introduction
   - 1.1 Background
   - 1.2 Objective
   - 1.3 Scope
   - 1.4 Structure

2. Regulatory framework for clearance
   - 2.1 General
   - 2.2 Responsibilities
   - 2.3 Organization
   - 2.4 Graded approach

3. Clearance of solid material
   - 3.1 General
   - 3.2 Characterisation of the material to be cleared
   - 3.3 Volumetric criteria for unconditional release
   - 3.4 Surface criteria for unconditional release
   - 3.5 Volumetric criteria for conditional release
   - 3.6 Surface criteria for conditional release

3.7 Graded approach
3.8 Case by case approach.
3.9 Monitoring programme
3.10 Dilution

4. Clearance of liquid material
4.1 General
4.2 Application of concept

5. Clearance of gaseous material
5.1 General
5.2 Application of concept

References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2014).
[2] EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).
[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Derivation of Activity Concentration Values for Exclusion, Exemption and Clearance, Safety Reports Series No. 44, IAEA, Vienna (2005).
[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Monitoring for Compliance with Exemption and Clearance Levels, Safety Reports Series No. 67, IAEA, Vienna (2012).
[5] New Safety Guide on Application of the Concept of Exemption and Criteria for Trade in Contaminated Commodities (to be developed in parallel to this document).
[6] Draft IAEA TECDOC on clearance levels for landfill disposal (in preparation).
[7] Regulatory Control of Radioactive Discharges to the Environment, Draft IAEA Safety Guide DS442 (in preparation).
[8] Set of guidance documents issued by European Commission, in particular RP 89/101/113/114/122-I/122-II

7. PRODUCTION SCHEDULE

Provisional schedule for preparation of the document, outlining realistic expected dates for *(fill the column corresponding to your proposed document and delete the other columns)*:

	A*
STEP 1: Preparing a DPP	August 2016
STEP 2: Approval of DPP by the Coordination Committee	September 2016
STEP 3: Approval of DPP by the relevant review Committees	November 2016
STEP 4: Approval of DPP by the CSS	May 2017
STEP 5: Preparing the draft	June 2017 - June 2019
STEP 6: Approval of draft by the Coordination Committee	August 2019
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	November 2019
STEP 8: Soliciting comments by Member States	December 2019 – March 2020
STEP 9: Addressing comments by Member States	April 2020
STEP 10: Approval of the revised draft by the Coordination Committee Review in NS-SSCS	May 2020

STEP 11: Approval by the relevant review Committees	June 2020
STEP 12: Endorsement by the CSS	November 2020
STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	March 2021
STEP 14: Target publication date	August 2021

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- *Column A for Safety Fundamentals, Safety Requirements and Safety Guides.*
- *Column B for Nuclear Security Series publications noting that for Technical Guides a fast track may be proposed and justified for approval by the NSGC at step 3. If approved, the draft will not be subject to the steps 4 to 10 and, be provided at step 11 to the NSGC to take note of it before its publication*
- *Column C for TECDOCs, safety reports and other publications*

8. RESOURCES

Estimated resources involved by the Secretariat (person-weeks) and the Member States (number and type of meetings)

- 6 CS meetings (4 consultants x 5 days for each CS meeting)
- 1 TM meeting (20 participants x 3 days)
- IAEA staff:
    - 1 Scientific Secretary – 14 weeks
    - 1 administrative assistant – 7 weeks

Supplementary information: Details of the proposed content
(this is not a part of the DPP)

1. Introduction

1.1. Background

Regulatory systems protect people from radiation. Some situations do not warrant regulatory control. BSS defines concept of clearance from regulated practices and provides clearance levels for solids.

1.2. Objective

To provide guidance on application of the concept of clearance from regulatory control for solids, liquids and gases.

1.3. Scope

Clearance and exemption are related concepts. This document relates to clearance only. Commodities contaminated as a result of residual radioactivity and exemption are considered in a separate document. Unconditional and specific clearance are both addressed here.

1.4. Structure

2. Regulatory framework for clearance

2.1 General

Safety Report 89 (1988) described the original basis for exemption and the derivation of the 10 microSv/y dose criterion, and a description of the collective dose criterion of 1 man Sv per year of operation. The collective dose criterion is no longer explicitly considered as part of the clearance and exemption concepts.

GSR Part 3 describes the concept of clearance from regulatory control in Paras I.10 to I.12. The process of clearance is a regulated process. Once cleared the material is no longer subject to regulatory control. Hence, the procedures and processes leading to the act of clearance need to be well defined.

Note for building construction materials or for drinking water supplies BSS requires natural radionuclides to meet 1 mSv/y dose criterion. This means that the values in table I.3 are not relevant in these cases, and the regulatory authority will therefore need to stipulate some relevant values. Examples for building materials are provided in the EC BSS and EC RP112; for drinking water this pathway is addressed in EC RP122 Part 2. These values are derived on the basis of 1 mSv/y so are directly relevant. Before these are adopted by a country the underlying assumptions should be reviewed by the regulatory authority to ensure they are relevant to the country etc.

Specific situations may also have clearance levels derived by the regulatory authority, e.g. metals recycling, building rubble, landfill disposal, buildings for reuse and buildings for demolition. These should be derived on the basis of the same 10 microSv/y dose criterion. Examples can be found in EC documents RP89/113/101/114. Again, the assumptions are to be reviewed before adopting these in a country, especially those outside Europe.

Clearance levels are values used to define the category that the material/waste is assigned to. The activity levels in the material that is cleared will depend on the radionuclide vector so not every radionuclide in cleared material will be at the clearance level.

2.2. Responsibilities

Operator and regulator responsibilities are addressed. Regulator accepts the Table 1.2 values, and defines other requirements eg averaging masses.

Operator is responsible for setting up the clearance process, making the measurements, verifying compliance with the clearance criteria, documentation. Interface with the regulator.

In the case of conditional clearance (specific clearance) there must be a method to demonstrate compliance with the conditions attached to the process e.g. that the metal will only go to a recycling facility and will be melted rather than reused directly. This can be verified by the operator, by the authority or by the recipient, and the process should be well defined.

2.3. Organization

Organisation of the entire clearance process, structured approach required, examples are the application in some countries for a licence for clearance and this application includes details of how the measurements are made and how decisions on waste 'sentencing' (classification) are made. The application includes proposals on averaging quantities, quality assurance of the measurement process, and verification. Note that arrangements should be put in place for discussions with regulator and operator since these are an important part of the clearance process.

Clearance occurs at the point at which regulatory control for radioactivity is removed and this will occur at a location within the authorised practice.

2.4. Graded Approach

Procedure adopted depends on the likelihood of contamination being present (operating history) and on the level of contamination.

Provenance is a very important factor in determining the level of detail required. If the material is not from a radiation controlled area then the measurement requirements can be relaxed. If it comes from an area for which there is no history of radioactive contamination then only a very few measurements are required to confirm the absence of contamination and to confirm that the understanding of the use of the building is correct.

Also, if the material has a uniform radionuclide vector or a uniform level of contamination then fewer measurements are required to characterise the waste.

Averaging masses should reflect the level of homogeneity in the material to be cleared, taking into account the volume of material and degree of homogeneity that were assumed in the derivation of the clearance levels. No need for very small averaging masses or averaging areas.

3. Clearance of solid material

3.1. General

General requirements for clearance already stated above. The process of clearance of material is a regulated process. It occurs at a location within the authorised practice.

Dealing with mixtures of radionuclides: summation rule, characterisation in terms of vector, mixtures of naturals and artificial radionuclides.

3.2. Characterisation of the material to be cleared

- Establishing the nuclide vector is of great importance;
- Ensure all radionuclides present have been identified;
- Presence of hot spots, distribution of activity with depth and area and how to address this.
- Sampling strategies. Refer to SRS 67 for details of monitoring (measurement and sampling) approaches.
- Averaging masses and areas. Give examples of values used in EC RP113, RP122, practical examples are 'drum' or 'excavator bucket', few hundred cm2for surface contamination measurements.

3.3. Volumetric criteria for unconditional release

Values are in table I.2 and I.3. Refer to SR44 for the derivation of these values. Values for other radionuclides can be derived using the same models and approach (note that the SR 44 models are not really applicable to short lived radionuclides so may need to refer to values in Table I.1 if they already exist).

3.4. Surface criteria for unconditional release

No values in GSR Part 3. Values can be derived on basis of 10 microsv/y. EC RP101 gives values for reuse and recycling of metals that can be used as general surface specific clearance values for any materials with a hard and measurable surface e.g. metals, wood, plastic, composite materials. EC RP113 gives values for release of buildings for reuse or recycling: these values assume that all contamination is on the surface (meaning activity is projected onto the surface even though in reality it may have penetrated below the surface). ANSI standard ANSI/HPS N13.12-201 also gives relevant surface contamination values. Guidance to be provided on the applicability of the values given in these documents to different situations, with examples.

3.5. Volumetric criteria for conditional release

No values in GSR Part 3. Values can be derived on basis of 10 microSv/y. Specific situations have already been addressed in published documents eg metals for recycling see EC RP89, building rubble for recycling in EC RP113. Other situations, e.g. landfill disposal have been addressed by country specific approaches.

3.6. Surface criteria for conditional release

No values in BSS. For demolition of a building, RP113 values for demolition of a building exist and could be used. For recycling of metal scrap, values in RP101 for recycling only could be used.

3.7. Graded approach

Optimisation requires a graded approach. Reference SR67 section 2.2.3 or reproduce it here.

3.8. Case by case approach.

This could be used for small quantities of material, also for other situations where the assumptions used for the generic derivation of the clearance levels do not apply. Examples are situations where certain exposure pathways can be excluded: building demolition in an enclosed space where the airborne release and water pathways are not relevant; or the use of building rubble for filling voids or excavation pits, road construction, dams, sea walls.

Small quantities can be treated on a case by case basis since, for example, the exposure times that are relevant will be lower than those used to derive the generic values; or the quantity released to groundwater would be negligible etc.

3.9. Monitoring programme

Monitoring for clearance, bulk monitoring, surface monitoring, sampling and laboratory analysis. Reference to SR 67 for measurement techniques. National guidance may also be developed: an example is the UK code of practice, also German DIN 25457.

Development of waste sentencing criteria in cps or similar for a particular measurement geometry (derived on the basis of clearance levels, nuclide vector, detection efficiency etc).

3.10. Dilution

RSG1.7 para 5.19 stipulates that deliberate dilution is not permitted without prior permission. Dilution that occurs as part of the physical process of decommissioning/dismantling/separation and would occur without consideration of the radioactive content is allowed. Dilution of NORM with other material or with other NORM may be allowed by prior permission by the authorities, either through a general regulation that specifies that dilution is allowed, or by a specific agreement for that specific case.

4. Clearance of liquid material

4.1 General

Liquids usually treated as discharges. Possible to use the concept of clearance under certain circumstances. Release of liquids can be considered in 3 categories:

- Discharges at higher activity concentrations: use of site specific limits derived from dose criteria e.g. 300 microSv/y. Discharges are addressed in WSG2.3.
- Discharges at lower activity concentrations: as above, or use of generic activity concentrations (coupled with a limit on the quantity released over a given time period) based on models that may be similar in approach to SR44 models.
- Clearance of liquids: fundamentally different to discharges. For discharges, once released to the environment, the activity cannot be concentrated again by compression, evaporation etc. Partition into other environmental media is considered in the environmental modelling used to derive the release values. For clearance, however, such processes (concentration etc) need to be considered in the modelling.
- Generic clearance levels may be derived for some liquids for recycling and reuse, eg acids and oil, cooling fluids, and non-aqueous liquids that cannot be discharged to water bodies. The applicability of the models in SR44 for the derivation of clearance levels for liquids can be considered and the values used if considered appropriate.

4.2 Application of concept

Country may decide what facilities this applies to. Discuss application of clearance concept for facilities that are subject to registration, but not authorisation, see WSG2.3 for discussion. If a facility subject to registration (and not authorisation) can demonstrate that discharges are always at very low levels, meeting the 10 microSv/y dose criterion then this discharge could possibly be considered as exempt, rather than cleared? The overlap between this Safety guide and the Safety guide on exemption and commodities is to be discussed here.

5. Clearance of gaseous material

5.1. General

For gases discharge is the relevant concept, clearance is unlikely to be relevant. Similar considerations apply as for liquids: two categories of discharge.

5.2. Application of concept

If a discharge is constantly below discharge limits that give rise to not more than 10 microSv/y, then this discharge can be exempted, particularly if the facility is subject to registration but not to authorisation? To be discussed.