



# AzSPU Procedure for Transportation of Radioactive Materials

## AzSPU-HSSE-DOC-00115-2

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<b>Scope:</b>	AzSPU	<b>Document Administrator:</b>	AzSPU HSSE MS Document Coordinator
<b>Issue Date:</b>	7 <sup>th</sup> October, 2009	<b>Issuing Dept:</b>	AzSPU HSSE
<b>Revision Date:</b>	1 <sup>st</sup> July, 2010	<b>Control Tier:</b>	2
<b>Next Review Date:</b>	7 <sup>th</sup> October, 2010		

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## 1. PURPOSE/SCOPE

The intent of this procedure is to ensure a systematic approach to the transportation of radioactive material (to and from onshore and offshore AzSPU facilities) and to provide requirements for permitting, packaging, labeling, documentation, and chain of custody.

Radioactive material encompasses radioactive sources, NORM contaminated equipment, NORM waste (e.g. LSA scale), and NORM samples.

This controlled procedure applies to AzSPU Operations PUs and Projects engaged in the drilling, production, and/or transportation of oil and gas (including support activities), and construction activities when working with radioactive materials in Azerbaijan. Contractors working on AzSPU owned or operated sites/installations are also required to align with this procedure.

This procedure does not replace, nor should it conflict with, the AzSPU Procedure for Management of Radioactive Materials and Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#)).

Any form of deviation from this procedure, including but not limited to site-specific instructions, shall be requested and authorised in accordance with the AzSPU Deviations Procedure ([AZSPU-HSSE-DOC-00011-2](#)).

Revision of this procedure and the operational controls detailed therein will be in accordance with the AzSPU HSSE Document Management Procedure ([AzSPU-HSSE-DOC-00025-2](#)).

## 2. DEFINITIONS

A full glossary of terms related to radiation and radioactive materials is provided in Appendix A of the AzSPU Procedure for Management of Radioactive Materials and Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#)).

Additional definitions specific to this procedure are included here:

Consignee	A person or organisation that receives a consignment.
Consignor	A person or organisation that prepares a consignment for transport.
Fixed Contamination	Contamination other than 'non-fixed contamination' (see definition below).
Low toxicity alpha emitters	Natural uranium; depleted uranium; natural thorium; uranium-235 or uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical and chemical concentrates; or alpha emitters with a half-life of less than 10 days.
Non-fixed contamination	Contamination that can be removed from a surface during routine conditions of transport.

Overpack	An enclosure such as a box or bag which is used by a single consignor to facilitate as a handling unit a consignment of one or more packages for convenience of handling, stowage and carriage.
Package	The packaging with its radioactive contents as presented for transport.
Packaging	The assembly of components necessary to enclose the radioactive contents completely, which may consist of one or more receptacles, absorbent materials, spacing structures, radiation shielding etc. The packaging may be a box, drum or similar receptacle, or may also be a freight container, tank or intermediate bulk container.
Radioactive material	Any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed specified values (see Table 1).
Special form radioactive material	Either an indispersible solid radioactive material, or a sealed capsule containing radioactive material.
Specific activity	The specific activity of a radionuclide shall mean the activity per unit mass of that nuclide. The specific activity of a material shall mean the activity per unit mass of the material in which the radionuclides are essentially uniformly distributed.
Transport Index	The Transport Index assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I, shall mean a number that is used to provide control over radiation exposure. The number has no units and is derived by dividing the dose rate, measured in $\mu\text{Sv/h}$ , at 1 m from a package by 10.

### 3. GENERAL REQUIREMENTS

General requirements pertaining to radiation safety are detailed in Section 3.1 of the AzSPU Procedure for Management of Radioactive Materials and Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#)).

In addition the following legislation is also considered applicable to this procedure:

International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material, IAEA Safety Standards Series No. TS-R-1.

**Road transport:** Decree of the Cabinet of Ministers of the Azerbaijan Republic No. 10, 27 January 2007, On Approval of the Rules for Carriage of Dangerous Goods by Road. The decree implements most of the provisions of the European Agreement on the Carriage of Dangerous Goods by Road (ADR).

**Sea transport:** Current edition of the International Maritime Dangerous Goods Code (IMDG Code).

**Air transport:** Current edition of the International Air Transport Association Technical Instructions for the Transport of Dangerous Goods by Air (IATA).

## Radioactive Material & Exemptions:

The transport legislation defines radioactive material as that which exceeds a specified activity concentration and total activity. Examples of exemption levels for some commonly encountered radioactive materials are provided in Table 1.

**Table 1: Radionuclide Exemption Levels**

Radionuclide	Activity concentration for an exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Americium-241	1	10,000
Bromine-82	10	1,000,000
Caesium-137	10	10,000
Carbon-14	10,000	10,000,000
Cobalt-60	10	100,000
Hydrogen-3	1,000,000	1,000,000,000
Iridium-192	10	10,000
Lead-210	10	10,000
Polonium-210	10	10,000
Radium-226	10	10,000
Radium-228	10	100,000

**Material that does not exceed the activity concentrations in Table 1 can be classed as Exempt and can be transported in accordance with AzSPU's existing transportation practices.**

NB: NORM materials encountered in the oil and gas industry are frequently found to be Exempt from the transport legislation. However, the activity concentration of a radioactive material can only be determined by analysis of the material at a suitable laboratory.

## 4. KEY RESPONSIBILITIES

A full description of the responsibilities with regard to radiation protection is provided in Section 4 of the AzSPU Procedure for Management of Radioactive Materials and Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#)). A summary of key responsibilities directly applicable to this procedure are provided below:

### Site Manager / OIM

The Site Manager / OIM is accountable for providing authorization for dispatch of radioactive sources to their site / facility.

**Supply Base / HSE Personnel**

Responsible for ensuring that:

- Trucks and drivers arriving at the Supply Base are in compliance with legislative requirements, prior to allowing entry.
- Shipping containers are intact and fit for purpose, and that labeling, placarding, and documentation are in accordance with applicable legislation (see Appendix A).
- Radioactive sources are transported together with all accompanying documentation and monitoring equipment (i.e. the load must not be split between vessels).

**Deck Forman**

Responsible for ensuring the safe lifting of radioactive sources onboard the Installation and informing / consulting with contractor, or site RPS, about the placement and location of the sources.

**Site Radiation Protection Supervisor (RPS)**

With respect to the transportation of contractor owned radioactive sources the RPS is responsible for:

- Inspecting packages or containers containing radioactive sources, ensuring that they are undamaged, and that the surface dose rate and Transport Index are correct (in collaboration with the contractor RPO).
- For identifying designated storage areas for radioactive sources and establishing controlled / supervised areas (if required).
- Maintaining Site Radiation Records (completing Contractor Checklist, Site Mobile Register, Critical Examination Checklist, etc).
- Reviewing contractor's arrangements for accounting for radioactive sources.

With respect to the transportation of AzSPU owned NORM contaminated equipment / waste the RPS is responsible for:

- Ensuring that the contaminated equipment / waste is categorized, packed, marked and labeled appropriately (see Appendix A), and that the Dangerous Goods Declaration is completed (see Appendix B).
- For collecting samples of NORM, monitoring their contamination levels, preparing them for transportation, and arranging for them to be couriered to the Tracerco laboratory.
- Contacting the AzSPU RP SPA for advice on cleaning / disposal of contaminated equipment / waste, prior to it being shipped from the facility.

**AzSPU Radiation Protection Single Point Accountability (AzSPU RP SPA)**

Responsible for maintaining a proper communication flow between the AzSPU RPA (UK based) and the Site Radiation Protection Supervisors (RPSs).



## **AzSPU Radiation Protection Advisor (RPA)**

AzSPU retains by contract and appointment a RPA to provide the AzSPU with expert advice on radiation safety and compliance matters. The RPA reports to the AzSPU Safety & Compliance Manager and works directly with the AzSPU RP SPA.

In terms of this procedure, the RPA will be consulted with respect to the following:

- Cleaning / disposal options for NORM contaminated equipment / waste, based on the results of sampling and analysis.
- Provision of instructions to drivers regarding accidents and emergencies (where AzSPU is the consigner).

## **Contractors**

All third party contractors transporting radioactive materials to / from AzSPU sites are required to work in accordance with this procedure, and in compliance with applicable national and international legislation.

## **5. PROCEDURE / PROCESS**

### **5.1 TRANSPORTATION OF RADIOACTIVE SOURCES**

#### **5.1.1 Transportation of Radioactive Sources to / from Offshore Facilities**

Before a Contractor brings a radioactive source onto an offshore facility, he will notify the OIM, the site RPS, the Supply Base, and the sponsoring department representative at least 24 hours prior to dispatch. The following information will be provided:

- Number, type and size of sources.
- Name of vessel/transport company.
- Dispatch date and time and estimated time of arrival.
- Type and ID number of transport container.
- Transport Index.

The OIM is responsible for providing authorization for dispatch.

The contractor will ensure that the radioactive substances are categorized, packed, marked and labeled appropriately (see Appendix A). The contractor will also complete and sign a Dangerous Goods Declaration.

The contractor will also provide test certificates for packages used for shipping of radioactive materials when requested by a site RPS.

Once authorization has been obtained from the OIM the contractor delivers the radioactive source to the Supply Base.

Supply Base Operations/HSE personnel will check that the transport arrangements are in compliance with applicable legislation for transportation of radioactive sources (see Section 5.5). Trucks or drivers not in compliance with legislative requirements will not be allowed to enter the site.

Once sources are accepted onto the site Ops/HSE personnel will check if the shipping container is intact and fit for purpose, and that labeling, placarding, and documentation are in accordance with applicable legislation (see Appendix A).

Any shipping containers carrying radioactive source(s) will be loaded to the Supply Vessel as a last item before dispatch and secured with deck straps for transit. The shipping manifest is completed by the Supply Base Materials / Logistics Coordinator.

It should be noted that radioactive source(s) must always be transported offshore together with all accompanying documentation and monitoring equipment. Splitting of equipment onto different vessels has the potential to result in business value loss (as the work cannot be carried out on the facility until all equipment and documentation received) and unsafe operations (e.g. lack of radiation monitoring equipment in case of incident with radioactive source on vessel).

Upon arrival offshore, the Deck Foreman will place the radioactive source container into a designated storage area previously agreed between the site RPS and contractor RPO. Where such arrangements have not been previously agreed, the Deck Foreman will contact the site RPS or contractor RPO before unloading the source container from the vessel.

The site RPS and contractor RPO will inspect packages or containers containing radioactive material and ensure they are undamaged, and that the surface dose rate and Transport Index are correct, i.e. as described on the transport documents and the package labels. Any anomalies will be addressed by the contractor RPO. A controlled area / supervised area will be set up around the source, if required (see Section 5.1.1 of the AzSPU Procedure for Management of Radioactive Materials and Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#))).

Where a contractor does not accompany his radioactive source to site, the contractor will endeavour to have an RPO on the site prior to the source arriving. By prior arrangement and agreement, the site RPS may receive sources on behalf of the contractor. The site RPS will then carry out the checks described above.

The site RPS will complete the Contractor Checklist (Appendix M of the AzSPU Procedure for Management of Radioactive Materials & Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#))) prior to starting any on-site work with the radioactive source.

The site RPS will also update and maintain the Site Mobile Source Register (Appendix N of the AzSPU Procedure for Management of Radioactive Materials & Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#))) in order to record radioactive sources arriving on site and those leaving.

Contractors must carry out and record an accounting check for radioactive materials on a daily basis. The contractor is responsible for ensuring that these checks are carried out and the

results recorded. The site RPS will review the contractor's arrangements for accounting for radioactive substances on a regular basis, although the results of the RPS's checks do not need to be recorded.

If the radioactive source is installed on the facility (e.g. installation of a nucleonic device) a Critical Examination Checklist (Appendix H of the AzSPU Procedure for Management of Radioactive Materials & Radiation Generators ([AzSPU-HSSE-DOC-00058-2](#))) will be completed by the site RPS prior to AzSPU accepting responsibility for the device.

On completion of the scope of work, and prior to leaving the site, the contractor will ensure that his sources are categorized, packed, marked and labeled appropriately (see Appendix A) and that a Dangerous Goods Declaration has been completed. The Platform Materials / Logistics Coordinator will complete the shipping manifest, using the contractor's Dangerous Goods Declaration and with the assistance of the contractor RPO (if required).

In the event that the contractor leaves the site prior to dispatch of their radioactive source there must be a formal handover of responsibility for the source between the contractor and the site RPS and the contractor must present their completed documentation for transport. The site RPS is then responsible for the security and accounting of the source. Radioactive sources must not be left on site unless these, or suitable alternative arrangements have been made.

Prior to shipping the radioactive source the Platform Materials / Logistics Coordinator will ensure that 24 hours notification has been sent to Supply Base and to the contractor.

The Supply Base liaises with the contractor to enable the contractor to have transport available to collect the source at an appropriate time. The source is then transported on to the contractor's premises.

As a general rule, sources used offshore will normally be back loaded if they will be redundant for 7 days or more.

**NB:** Sources can be transported between offshore facilities but the same documentation that would be required to send the sources onshore must be completed.

### **5.1.2 Transportation of Radioactive Sources to / from Onshore Facilities**

The requirements outlined above for offshore transportation of radioactive sources also apply to transportation of radioactive sources to AzSPU's onshore facilities. In this case, however, radioactive sources are delivered directly from contractor owned storage facilities to AzSPU facilities (without passing through the Supply Base). The contractor will notify the Site Manager, site RPS, and the sponsoring department representative at least 24 hours prior to dispatch. The Site Manager is responsible for providing authorization for dispatch.

The contractor will ensure that the radioactive substances are categorized, packed, marked and labeled appropriately (see Appendix A). The contractor will also complete and sign a Dangerous Goods Declaration.

The contractor will also provide test certificates for packages used for shipping of radioactive materials when requested by a site RPS.

On arrival at the facility, the radioactive source container will be placed in a designated area previously agreed between the site RPS and contractor RPO. The site RPS and contractor RPO will then inspect the packages, or containers containing radioactive material, and ensure they are undamaged, and that the surface dose rate and Transport Index are correct, i.e. as described on the transport documents and the package labels. Any anomalies will be addressed by the contractor RPO.

Sources that are used onshore may be stored onsite temporarily, without being placed in a store area, provided they are accompanied at all times.

The site RPS will be responsible for completing the Contractor Checklist prior to work with the radioactive source, for updating and maintaining the Site Mobile Register, and for completing the Critical Examination Checklist if radioactive sources are installed on the facility.

Contractors must carry out and record an accounting check for radioactive materials on a daily basis. The contractor is responsible for ensuring that these checks are carried out and the results recorded. The Site RPS should review the contractor's arrangements for accounting for radioactive substances on a regular basis, although the results of the RPS's checks do not need to be recorded.

On completion of the scope of work, and prior to leaving the site, the contractor will ensure that his sources are categorized, packed, marked and labeled appropriately (see Appendix A) and that a Dangerous Goods Declaration is completed.

As a general rule, mobile sources are not stored at AzSPU onshore facilities. They are returned to the contractor's storage facilities at the end of the work day.

## **5.2 TRANSPORTATION OF NORM CONTAMINATED EQUIPMENT / WASTE**

In terms of NORM contaminated equipment and waste it is the site RPS's responsibility to ensure that the radioactive substances are categorized, packed, marked and labeled appropriately (see Appendix A). The site RPS will also complete and sign a Dangerous Goods Declaration (Appendix B contains a Dangerous Goods Declaration Form already completed with the correct UN number, proper shipping name, radionuclide information, activity, form, hazard category and package classification for NORM contaminated equipment / waste – see red text).

Generally, NORM contaminated equipment will not be transported from site until sampling and analysis has been carried out and advice received from the RPA. An exception to this would be contaminated equipment impeding operations due to lack of deck space, etc.

The IMDG Code and ADR allow surface contaminated objects to be transported unpackaged under the following conditions:

- If under routine conditions of transport there will be no escape of radioactive contents or loss of shielding – this can be achieved by fitting end caps to tubulars / drill pipe; sealing open ends of valves, pumps, etc with flange protectors or heavy duty polythene; or wrapping the entire item in heavy-duty polythene, as appropriate. Any externally contaminated items must be wrapped in heavy-duty polythene.
- For accessible surfaces the non-fixed contamination must not exceed 4 Bq/cm<sup>2</sup> and the fixed contamination 40 k Bq/cm<sup>2</sup>.
- For inaccessible surfaces the non-fixed plus the fixed contamination must not exceed 40 k Bq/cm<sup>2</sup>. Measures must be taken to ensure that the radioactive material from inaccessible surfaces is not released into the conveyance or vehicle, again this can be achieved through the use of end caps, flange protectors, polythene wrapping, etc.

Prior to contaminated equipment / waste being shipped from the site, the RPS should contact the AzSPU Radiation Protection SPA in order to determine the facility to be used for cleaning / disposal; the SPA will liaise with the RPA. For offshore facilities, the Platform Materials / Logistics Coordinator will ensure that 24 hours notification has been sent to the Supply Base prior to shipping.

Further instructions for the storage and handling of NORM contaminated equipment and wastes are provided in the AzSPU Procedure for Management of NORM ([AzSPU-HSSE-DOC-00097-2](#)).

### 5.3 TRANSPORTATION OF NORM CONTAMINATED SAMPLES

The activity concentration of radioactive material can only be determined by analysis at a suitable laboratory. NORM samples may be in the form of solids such as sand, sludge, scale and wax, liquids such as produced water, and samples of gas.

Due to the nature of NORM it is not always possible to know the type or quantity of radioactive material that is present in a sample, however, certain assumptions can be made based on past experience.

Solid samples can be transported as Exempt (i.e. not radioactive) provided the sample weights do not exceed those stated below:

- 1-4 samples – maximum weight per sample 50g.
- 5-8 samples – maximum weight per sample 25g.

The values above are based on a conservative assumption that the specific activity could be up to 50 Bq/g. The RPS must monitor the samples to ensure that this specific activity is not exceeded. Provided the contamination level of the material does not exceed 30 counts per second, the above conditions apply.

Exempt samples can be couriered to the Tracerco Laboratory in Billingham (address in Appendix C) in the same way as any other parcel, as long as there is nothing else in the sample that would require it to be transported in accordance with the dangerous goods legislation.

If the contamination level is exceeded, the samples should be sent as Excepted Packages (see Appendix A).

NB: In the case of produced water NORM samples and radon-in-gas samples, the activity concentration will always be low enough for the sample to be classed as Exempt.

## **5.4 TRAINING**

All persons involved in the transport of dangerous goods must have received appropriate training.

Contractors must provide evidence, when requested, that personnel have received training in the transport of Class 7 (i.e. Radioactive) dangerous goods.

For transport operations by sea and road the RPSs require only basic awareness level of training. Materials Coordinators must have passed a suitable training course that includes Class 7 dangerous goods, i.e. radioactive material.

Persons involved in transport operations by air must have completed a course approved by the Civil Aviation Authority (CAA) that satisfies the IATA Dangerous Goods Regulations.

## **5.5 PERMITTING / LICENSING REQUIREMENTS**

The following permits must be obtained for transportation of radioactive materials:

- A special permit (license) from the State Committee for Supervision of Safe Industrial and Mining Practices (SCSSIMP) of the Ministry of Emergency Situations (MES).
- A “radiological-hygienic” passport from the State Sanitary-Epidemiological Service of the Ministry of Health.

In addition prior to transporting radioactive substances by road approval must be obtained from the State Road Police (within the Ministry of Internal Affairs) and MES.

It is the responsibility of AzSPU’s transportation contractors to obtain the permits listed above and will be a requirement of their contracts.

Drivers of vehicles transporting radioactive substances have to pass a training course approved by the State Road Police and MES.

The consignor will provide instructions to the driver regarding accidents and emergencies. In cases where AzSPU is the consigner then instructions will be supplied by the RPA.

## **6. KEY DOCUMENTS/TOOLS/REFERENCES**

This document shall, where appropriate, be used in conjunction with of the following procedures and plans:

<b>Document Number</b>	<b>Title of Procedure</b>
<a href="#"><u>AzSPU-HSSE-DOC-00058-2</u></a>	AzSPU Procedure for Management of Radioactive Materials and Radiation Generators
<a href="#"><u>AzSPU-HSSE-DOC-00097-2</u></a>	AzSPU Procedure for the Management of NORM
<a href="#"><u>AzSPU-HSSE-DOC-00086-2</u></a>	AzSPU Radiation Contingency Plan
<a href="#"><u>AzSPU-HSSE-DOC-00083-2</u></a>	AzSPU Procedure for The Import / Export of Radioactive Materials and Sources of Ionising Radiation
<a href="#"><u>AzSPU-HSSE-DOC-00011-2</u></a>	AzSPU Procedure for Deviations
<a href="#"><u>AzSPU-HSSE-DOC-00025-2</u></a>	AzSPU Document Management Procedure

### Revision/Review Log

<b>Revision Date</b>	<b>Authority</b>	<b>Custodian</b>	<b>Revision Details</b>
7 October, 2009	Yuliy Zaytsev (Safety & Compliance Manager)	Idrak Nazarov (HSE MS Team Leader)	<p>This procedure replaces the Offshore Operations radioactive Source Management Chain of Custody Procedure (AzSPU-HSSE-DOC-00033-3).</p> <p>The original procedure has been expanded to encompass both offshore and onshore operations (and hence moved to Tier 2 level). It has also been expanded to include transportation requirements for NORM contaminated equipment / waste and NORM samples.</p> <p>More detailed information on categorizing, packing, marking, labeling and providing documentation for the transportation of radioactive materials has been added to the procedure (see Appendices A and B).</p>
1 <sup>st</sup> July, 2010	Yuliy Zaytsev (Offshore Health & Safety Manager)	Rebecca Heath (AzSPU HSE MS Senior Advisor)	Document revised to include requirement for transporting radioactive sources, together with all accompanying documentation and monitoring equipment, on the same vessel (based on LL on WA).

## APPENDIX A – REQUIREMENTS FOR CATEGORISING, PACKING, MARKING, AND LABELLING RADIOACTIVE MATERIALS FOR TRANSPORTATION

In the transport of all classes of dangerous goods, primary reliance for safety is on the package design. As the hazard associated with the radioactive material increases, so to does the packaging requirement.

The package types most likely to be encountered in the oil and gas industry are listed below in order of increasing robustness:

- **Excepted package** – those in which the allowed radioactive content is restricted to such low levels that the potential hazards are insignificant and therefore no testing is required with regard to containment or shielding integrity. There is a requirement that the radiation level at the surface of an excepted package must not exceed 5  $\mu\text{Sv/h}$ . This is in order to ensure that sensitive photographic material adjacent to the package will not be damaged and that any radiation dose to members of the public will be insignificant.
- **Industrial package** - may be either Type IP-1, IP2 or IP3. Type IP-1 packages must be able to contain their radioactive contents under routine transport conditions i.e. incident free. In the event of an incident the release of the radioactive contents would not present a significant hazard.
- **Type A package** – used for the transport of relatively small, but significant, quantities of radioactive material. Because it is assumed that this type of package theoretically could be damaged in a severe accident and that a portion of their contents may be released, the amount of radionuclides they can contain is limited. In the event of a release, these limits ensure that the risks from external radiation or contamination are very low.

**Table 1: Summary of Requirements for Categorising, Packing, Marking & Labelling Radioactive Materials for Transportation**

	Radioactive sources		NORM contaminated / LSA
	Activity Limits in accordance with Table 3	Activity Limits in accordance with Table 2	
Package Type	Excepted	Type A (A <sub>1</sub> or A <sub>2</sub> )	Industrial (IP-1 or IP-2, see Table 4)
Category of Package	NA	I-WHITE, II-YELLOW or III-YELLOW (see Table 5)	I-WHITE, II-YELLOW or III-YELLOW (see Table 5)
Marking (packages & overpacks)	Consignor and consignee. UN number.	Consignor and consignee. UN number. Proper Shipping Name Type A	Consignor and consignee. UN number. Proper Shipping Name Type IP-1 or IP-2.
Labelling (packages, overpacks & freight containers)	NA	I-WHITE + Contents + Activity <u>OR</u> II & III-YELLOW + Contents + Activity + Transport index	I-WHITE + Contents + Activity <u>OR</u> II & III-YELLOW + Contents + Activity + Transport index
Placarding (large freight containers)	NA	Placards required	Placards required

Documentation	Dangerous goods transport document to be completed	Dangerous goods transport document to be completed	Dangerous goods transport document to be completed
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## PACKAGE TYPE

### Type A Packages

Limits are placed on the total activity of radioactive material that can be transported in each type of package. The limits are based on the relative hazard associated with each radionuclide and how easily it is dispersed in the event of an accident.

Package limits are expressed as A1 and A2 values (see Table 2). A1 is either an indispersible solid material, or a sealed capsule containing radioactive material that has been designed to withstand a transportation accident. A2 relates to radioactive material in other forms.

**Table 2: Activity Limits for Type A Packages**

Radionuclide	A <sub>1</sub> (TBq) <sup>1</sup>	A <sub>2</sub> (TBq)
Americium-241	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>
Bromine-82	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>
Caesium-137	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>
Carbon-14	4 x 10 <sup>1</sup>	3 x 10 <sup>0</sup>
Cobalt-60	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>
Hydrogen-3	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>
Iridium-192	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>
Lead-210	1 x 10 <sup>0</sup>	5 x 10 <sup>-2</sup>
Polonium-210	4 x 10 <sup>1</sup>	2 x 10 <sup>-2</sup>
Radium-226	2 x 10 <sup>-1</sup>	3 x 10 <sup>-3</sup>
Radium-228	6 x 10 <sup>-1</sup>	2 x 10 <sup>-2</sup>

### Excepted Packages

For radioactive materials where the quantity of material is significantly below the limits of a Type A Package, it is possible to transport those materials in Excepted Packages. The content limits for Excepted Packages are based on fractions of the A1 and A2 values, see Table 3.

**Table 3: Activity Limits for Excepted Packages**

Physical state of contents	Instrument or article		Materials
	Item limits	Package limits	Package limits

<sup>1</sup> 1 TBq = 1000000000 Bq, or 1000 GBq.

Solids:			
Special form	$10^{-2} A_1$	$A_1$	$10^{-3} A_1$
Other forms	$10^{-2} A_2$	$A_2$	$10^{-3} A_2$
Liquids	$10^{-3} A_2$	$10^{-1} A_2$	$10^{-4} A_2$
Gases			
Special form	$10^{-3} A_1$	$10^{-2} A_1$	$10^{-3} A_1$
Other forms	$10^{-3} A_2$	$10^{-2} A_2$	$10^{-3} A_2$

### Industrial Packages

NORM contaminated equipment and items are transported as Surface Contaminated Objects (SCO-1).

Contaminated sand, sludge, pig wax, scale, etc are transported as low specific activity (LSA) material.

Both surface contaminated objects and LSA must be transported in Industrial Packages, the type of which is determined with reference to Table 4.

Under certain conditions (see Section 5.2) it is possible to transport these objects ‘unpackaged’ although controls over the spread of contamination are still required.

**Table 4: Industrial Package Requirements for SCO and LSA**

Radioactive Contents	Industrial package Type	
	Exclusive Use <sup>2</sup>	Not Under Exclusive Use
LSA-I		
<i>Solid</i>	Type IP-1	Type IP-1
<i>Liquid</i>	Type IP-1	Type IP-2
SCO-I	Type IP-1	Type IP-1

### CATEGORY OF PACKAGE

Type A and Industrial Packages must be assigned to a specific category for transport depending on the level of radiation hazard, as shown in Table 5.

The Transport Index is calculated by dividing the dose rate, measured in  $\mu\text{Sv/h}$  at 1m from the package, by 10.

<sup>2</sup> ‘Exclusive use means the sole use, by a single consignor, of a conveyance or of a large freight container, in respect of which all initial, intermediate and final loading and unloading is carried out in accordance with the directions of the consignor or consignee.’

**Table 5: Categories of Packages**

Conditions		Category
Transport Index	Maximum radiation level at any point on external surface	
0 <sup>a</sup>	Not more than 5 $\mu\text{Sv/h}$	I-WHITE
More than 0 but not more than 1	More than 5 $\mu\text{Sv/h}$ but not more than 500 $\mu\text{Sv/h}$	II-YELLOW
More than 1 but not more than 10	More than 500 $\mu\text{Sv/h}$ but not more than 2000 $\mu\text{Sv/h}$	III-YELLOW

<sup>a</sup> If the measured T.I. is not greater than 0.05, the value quoted may be recorded as zero.

## MARKING

Packages and overpacks must be marked on the outside with the consignor and consignee and the UN number. For Type A and Industrial Packages the proper shipping name also has to be added.

All marking must be legible and durable.

## LABELLING

Type A and Industrial Packages must be labelled according to the category of package, as follows:



Contents section should be completed using the name of the radionuclide, e.g.  $^{226}\text{Ra}$ ,  $^{137}\text{Cs}$ , etc. For NORM contaminated equipment the name of the radionuclide should be followed by SCO-I. For LSA material, LSA-1 is all that is required.

Activity section should be completed using the maximum activity of the radioactive contents in Bq, or multiples of Bq. For LSA the activity must be calculated based on the specific activity (Bq/g) and the total mass. For SCO the activity must be calculated based on the measured surface

contamination ( $\text{Bq}/\text{cm}^2$ ) and the total surface area ( $\text{cm}^2$ ). Where the specific activity or surface contamination levels are not known a best estimate should be made based on previous results.

For overpacks and freight containers the 'contents' and 'activity' sections should be completed with the details from each package totalled together. In addition the Transport Index should be recorded as either the sum of the individual transport indices, or it should be measured and recorded.

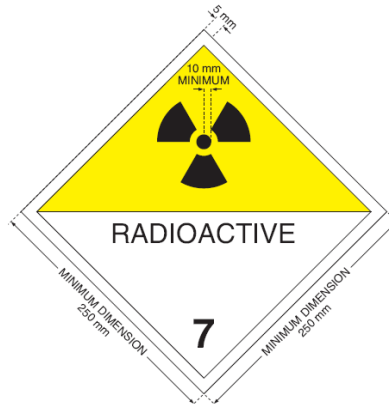
Labels must be fixed to 2 opposite sides of the outside of the package, or on the outside of all 4 sides of a freight container or tank. Any label that do not relate to the contents must be removed.

Care must be taken to ensure that any marking described above are not covered by labels.

In the case of surface contaminated equipment I-WHITE labels are to be fixed on bundles, baskets or slings carrying tubulars / equipment. Two labels are to be fitted to either side of the basket.

## PLACARDING

Large freight containers carrying packages (other than those for Excepted packages) must be placarded on all 4 sides using the placard below:



In the case of road transportation vehicles placards will be fixed to both sides and the rear of the vehicle. In addition, orange plates will be displayed, one at the front and one at the rear of the vehicle bearing the hazard identification number "70" and the UN number.

## DOCUMENTATION

A shipping manifest listing each item must be completed. In the case of tubulars, the number of tubulars of each size and the number of bundles should be recorded. In the case of NORM material, "NORM contaminated" must be marked on the manifest.

A Dangerous Goods Declaration must also be completed for all packages containing radioactive material, including Excepted packages. A Dangerous Goods Declaration form completed for NORM contaminated equipment / waste is included in Appendix B as an example (see red text).

## **CONTAMINATION LIMITS FOR PACKAGES**

The non-fixed contamination on the external surfaces of any package must be kept as low as practicable and must not, when averaged over 300cm<sup>2</sup> of any part of the surface, exceed 4 Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, and 0.4 Bq/cm<sup>2</sup> for other alpha emitters.

For sealed sources radiation monitoring is only required where leakage is identified, or suspected.

## **RADIOACTIVE MATERIAL POSSESSING OTHER DANGEROUS PROPERTIES**

In addition to the radioactive properties of a consignment, any subsidiary risk of the contents such as explosiveness, flammability, pyrophoricity, chemical toxicity and corrosiveness, also need to be taken into account in the documentation, packing, labelling, marking, placarding, stowage, segregation and carriage, in order to be in compliance with all relevant provisions of the applicable legislation.

This is applicable in particular to materials containing hydrocarbons that also contain LSA.

## APPENDIX B – DANGEROUS GOODS DECLARATION FORM – COMPLETED FOR NORM CONTAMINATED EQUIPMENT / WASTE IN ACCORDANCE WITH IMDG / ADR REQUIREMENTS (SEE RED TEXT)

### MULTIMODAL DANGEROUS GOODS FORM

This form may be used as a dangerous goods declaration as it meets the requirements of SOLAS 74, chapter VII, regulation 4; MARPOL 73/78, Annex III, regulation 4

1 Shipper/Consignor/Sender		2 Transport document number		
		3 Page 1 of    pages	4 Shipper's reference	
		5 Freight Forwarder's reference		
6 Consignee		7 Carrier (to be completed by the carrier)		
		<b>SHIPPER'S DECLARATION</b> I hereby declare that the contents of this consignment are fully and accurately described below by the Proper Shipping Name, and are classified, packaged, marked and labelled/placarded and are in all respects in proper condition for transport according to the applicable international and national governmental regulations.		
8 This shipment is within the limitations prescribed for: (Delete non-applicable)		9 Additional handling information		
PASSENGER AND CARGO AIRCRAFT				
CARGO AIRCRAFT ONLY				
10 Vessel/flight no. and date	11 Port/place of loading			
12 Port/place of discharge	13 Destination			
14 Shipping marks (m <sup>3</sup> )	*Number and kind of packages; description of goods		Gross mass (kg)	Net mass (kg)
	<b>UN2913</b> <b>RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECT, non-fissile</b> <b>Class 7</b> <sup>226</sup> Ra and <sup>228</sup> Ra and Daughters <b>Solid Sulphate Scale</b> <b>&lt; 10MBq,</b> <b>I-WHITE,</b> <b>0.0005A<sub>2</sub>,</b> <b>Unpackaged.</b>			
15 Container identification No./ vehicle registration No.	16 Seal number(s)	17 Container/vehicle size & type	18 Tare mass (kg)	19 Total gross mass (including tare) (kg)
<b>CONTAINER/VEHICLE PACKING CERTIFICATE</b>  I hereby declare that the goods described above have been packed/ loaded into the container/vehicle identified above in accordance with the applicable provisions. † <b>MUST BE COMPLETED AND SIGNED FOR ALL CONTAINER/VEHICLE LOADS BY PERSON RESPONSIBLE FOR PACKING/LOADING.</b>		<b>21 RECEIVING ORGANISATION RECEIPT</b>  Received the above number of packages/containers/trailers in apparent good order and condition unless stated hereon: RECEIVING ORGANISATION REMARKS:		

20 Name of company	Haulier's name	22 Name of company (OF SHIPPER PREPARING THIS NOTE)
Name/Status of declarant	Vehicle reg. no.	Name/status of declarant
Place and date	Signature and date	Place and date
Signature of declarant	DRIVER'S SIGNATURE	Signature of declarant

\* **DANGEROUS GOODS:**

You must specify: UN No., Proper Shipping Name, hazard class, packing group, (where assigned) marine pollutant and observe the mandatory requirements under applicable national and international governmental regulations. For the purposes of the IMDG Code see 5.4.1.4

† For the purposes of the IMDG Code, see 5.4.2

## Documentary Aspects of the International Transport of Dangerous Goods

### Container/Vehicle Packing Certificate

<p>The signature given overleaf in Box 20 must be that of the person controlling the container/vehicle operation.</p> <p>It is certified that:</p> <p>The container/vehicle was clean, dry and apparently fit to receive the goods.</p> <p>If the consignments include goods of class 1, other than division 1.4, the container is structurally serviceable.</p> <p>No incompatible goods have been packed into the container/vehicle unless specially authorised by the Competent Authority.</p> <p>All packages have been externally inspected for damage and only sound packages packed.</p> <p>Drums have been stowed in an upright position, unless otherwise authorised by the Competent Authority.</p> <p>All packages have been properly packed and secured in the container/vehicle.</p>	<p>When materials are transported in bulk packagings the cargo has been evenly distributed in the container/vehicle.</p> <p>The packages and the container/vehicle have been properly marked, labelled and placarded. Any irrelevant mark, labels and placards have been removed.</p> <p>When solid carbon dioxide (CO<sub>2</sub> - dry ice) is used for cooling purposes, the vehicle or freight container is externally marked or labelled in a conspicuous place, e.g. at the door end, with the words: DANGEROUS CO<sub>2</sub> GAS (DRY ICE) INSIDE - VENTILATE THOROUGHLY BEFORE ENTERING.</p> <p>When this Dangerous Goods Form is used as a container/vehicle packing certificate only, not a combined document, a dangerous goods declaration signed by the shipper or supplier must have been issued/received to cover each dangerous goods consignment packed in the container.</p> <p><b>Note:</b> The container packing certificate is not required for tanks</p>
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## APPENDIX C – RADIATION PROTECTION ADVISER / QUALIFIED EXPERT (RPA) CONTACT DETAILS

AzSPU has appointed Tracerco Radiation Protection Advisory Services as their Radiation Protection Adviser (RPA) (which is equivalent to the term Qualified Expert used by the IAEA and the EC).

The first point of contact is Donald Urquhart, who is based in the Tracerco office in Aberdeen, UK. However, all of the RPAs who are based either in the Aberdeen office or the Tracerco Billingham office are able to advise on any issues affecting BP.

*Contact details:*

Aberdeen RPAs	Email	Telephone
Donald Urquhart	<a href="mailto:donald.urquhart@matthey.com">donald.urquhart@matthey.com</a>	+44(0)1224576748 (direct) +44(0)7875384225 (mobile)
Graham Wales	<a href="mailto:graham.wales@matthey.com">graham.wales@matthey.com</a>	+44(0)1224576742 (direct) +44(0)7764836669 (mobile)
Bill Good	<a href="mailto:bill.good@matthey.com">bill.good@matthey.com</a>	+44(0)1224576743 (direct) +44(0)7801662320 (mobile)

Billingham RPAs	Email	Telephone
Andrew Smith	<a href="mailto:andrew.smith@matthey.com">andrew.smith@matthey.com</a>	+44(0)1642375462 (direct) +44(0)7764290567 (mobile)
Nick Hutchison	<a href="mailto:nick.hutchinson@matthey.com">nick.hutchinson@matthey.com</a>	+44(0)1642375463 (direct) +44(0)7919091388 (mobile)
Paul Warren	<a href="mailto:paul.warren@matthey.com">paul.warren@matthey.com</a>	+44(0)1642375461 (direct) +44(0)7889828968 (mobile)

### *Emergency Contact Details:*

If none of the above can be contacted outside normal hours then call +44(0)1642 375500 and ask to speak to the duty RPA.

### *Postal Addresses*

Aberdeen Office	Billingham Office
Tracerco Chattan Mews Office 18 Chattan Place Aberdeen AB10 6RD United Kingdom	Tracerco Technology Centre, Pavilion 10, The Moat, Belasis Hall Technology Park Billingham, Cleveland, TS23 4AZ, United Kingdom