## Packing, Storage and Transport of NORM

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<td>Revision no: 1</td>
</tr>
<tr>
<td>Revision no: 1</td>
<td>Date: 1/10/2006</td>
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**Reason for revision:**

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1. Introduction

Contaminated items may need to be transported between sites for maintenance, decontamination or storage. This procedure addresses related requirements.

1.1 Objective

To define the requirements for Packaging, Temporary Storage and Transport of NORM contaminated materials, equipment and waste at PDO.

1.2 Scope

This procedure applies to all NORM contaminated materials, equipment and waste requiring interim storage or transport prior to decontamination or disposal. It does not cover international transport or transport of other types of radioactive material such as ESP’s to Jebel Ali.

1.3 Responsibilities

1.3.1 Production Coordinator

Responsibility for the correct implementation of this procedure lies with the Production Coordinators as the owners of the NORM contaminated material. They will fulfil the role of Sender and Recipient. The Sender is responsible for ensuring that the conditions for packaging and transport are satisfied. He retains overall responsibility until acceptance by the Recipient.

The Production Coordinator or his delegate (Area Services) will be responsible for the NORM yards in conjunction with the Contractor.

1.3.2 RPS/CRFP

Provide specific instructions if stated levels in this procedure are exceeded. To audit the systems for transportation of NORM contaminated material and equipment.

1.3.3 RPS/RPT

Check radiological conditions, provide advice and complete relevant parts of the transport documentation.

1.3.4 Driver

Check the integrity of the load prior to transport, receive specific instructions from Sender as to transport arrangements, accept responsibility for the conveyance and ensure compliance with this specification during transport subject to Sender overall responsibility.

1.3.5 Rig Manager (Hoists and Rigs)

The Rig Manager shall be responsible for ensuring that these guidelines are adhered to when undergoing well workovers. Any equipment which is identified as NORM contaminated must be registered (Appendix C) and transported to the dedicated NORM storage Yard. The Rig Manager (or his delegate) is then responsible for ensuring that the equipment is transported to the Bahja NORM storage yard.
1.4 Definitions

Background level when taking a radiation or contamination measurement, the reading from the instrument arising only from the presence of natural ambient radiation where no extra radiation or contamination is present.

Recipient the person or department who receives a consignment.

Consignment any package, packages or load of radioactive material presented by a Sender for transport or storage.

Sender any person or department who prepares a consignment for transport and is named in the consignment documents.

Conveyance vehicle, tank or freight container, as applicable.

NORM Naturally Occurring Radioactive Material deposited as scales in equipment or distributed in sands, sludges or process fluids in tanks and vessels.

Non-fixed contamination radioactive contamination that can be removed from a surface during routine conditions of handling or transport. E.g. contaminated sludge

Package the packaging together with its radioactive contents as presented for transport. The packaging might be a box, drum or similar receptacle, or might also be a tank, tanker or freight container.

Surface Contaminated Object (SCO) an object which is itself not radioactive but which has NORM material distributed on its surfaces.

Surface contamination the presence of radioactivity on a surface in excess of > 5 cps above background with the Mini 900 with EP15 probe

2. Implementation

Items or waste contaminated with NORM shall not be stored or despatched unsealed, unmarked or without appropriate documentation. The material shall be correctly sealed, packaged, labelled, transported and stored according to this procedure.

3 Packaging

3.1 Surface Contaminated Object (SCO)

SCO consists of equipment such as pumps, valves, pipelines, Xmas trees etc., internally contaminated with NORM. Down hole equipment may be internally and externally contaminated such as ESP’s, tubulars which require additional precautions. Such equipment shall be properly sealed to prevent the escape of NORM and creating potential health risks.

3.1.1 Internal Surface Contamination

Internally SCO may be transported ‘unpackaged’, provided it is fully sealed and meets the following conditions:

- The external surfaces of SCO shall be free of non-fixed contamination. The RPT shall use the Mini 900 with EP15 Probe to measure exterior contamination or use the wipe test method.
Flanges shall be closed using blind flanges, metal dummies or foam plugs. Other openings shall be sealed using plastic caps, tape and foam plugs.

Small items may be placed in a sealed plastic bag, or in a sealed box or drum lined with plastic sheeting.

Large objects with fixed external contamination shall be wrapped in plastic (0.2 mm as minimum).

A radiation hazard trefoil warning sign shall be attached to the outer surface of the item or its wrapping (Appendix B). If the radiation trefoil is not available, the NORM Contaminated Labels are acceptable. If the cps exceed 100 cps, record the contact dose-rate in μSv/h. The dose should be entered on the label together with the United Nations identifier “UN 2913 - Surface Contaminated Objects - II”.

3.1.2 External Surface Contamination Packaging

Equipment which is externally contaminated shall be packaged in a robust container such as a wooden box, plastic or metal drum. The container shall be sealed after filling.

All openings and flanges shall be sealed. The container shall be chemically and physically compatible with the material it contains. It shall be generally robust so as to withstand the weight of the contents and the effects of transport or storage, such as heat, pressure, acceleration, vibration, handling, etc., without any deterioration in its effectiveness as a containment system over its intended use.

Tubulars which are externally NORM contaminated must be individually wrapped with 0.2 mm plastic to prevent scale from becoming airborne. A radiation hazard trefoil or NORM Contaminated warning label shall be attached to opposite sides of the package with the words External Contamination clearly written. NORM Contaminated tape should also be used to warn transport contractors and emergency personnel.

3.2 NORM Contaminated Waste

Radioactive wastes may comprise:

- Contaminated sludge, process water, scales, etc.
- Miscellaneous items such as contaminated clothing, gloves, rags, plastic, tissues, etc.

Prior to final disposal the radioactive waste needs to be temporarily stored or packaged for transport.

3.2.1 Solid waste and miscellaneous items

Solid waste and miscellaneous items should be placed in a drum and sealed. Avoid using plastic bags or bulky bags as they degrade or are prone to tearing. A radiation hazard trefoil warning sign shall be attached to opposite sides of the package and details entered as in 3.1.1, except that the United Nations identifier is changed to “UN 3321, Low Specific Activity - II”. Alternatively, if the radiation trefoil is not available, the NORM contaminated label may be used.

3.2.2 Liquid wastes and scales

Liquid waste and scales shall be packaged in metal containers. The container might be a drum or
tank or, for liquid wastes, a tanker. The container shall be effectively sealed, for example with a steel tie-wrap or locked flange. The container shall be chemically and physically compatible with the material it contains. It shall be generally robust so as to withstand the weight of the contents and the effects of transport or storage, such as heat, pressure, acceleration, vibration, handling, etc., without any deterioration in its effectiveness as a containment system over its intended use. Packaging of liquid waste in drums or tanks shall be carried out carefully to prevent spillage and surface contamination. A radiation hazard trefoil warning sign shall be attached to opposite sides of the package and details entered as in Paragraph 3.1.1, except that the United Nations identifier is changed to “UN 3321, Low Specific Activity - II”.

3.2.3 Monitoring requirements for packages

The external surfaces of packages shall be free of non-fixed surface contamination. The RPT shall carry out monitoring with the Mini 900 with EP15 probe to confirm the package is free of non-fixed surface contamination. Where external contamination is detected the Sender shall decontaminate the external surfaces of the package prior to sending.

The RPT shall measure the radiation levels at contact with the package (or unpackaged SCO) and note the highest level in μSv/h. This should not normally exceed 10 μSv/h. If the radiation level exceeds 10 μSv/h the CRFP shall be informed.

The monitoring information shall be entered by the RPT on the warning label (Appendix B) or the NORM Contamination Label (Appendix B).

4. Temporary storage

4.1 NORM yard

A fenced and lockable NORM yard shall be provided for temporary storage at each Asset (e.g. waste treatment facility). The NORM yard shall be located away from work and living areas and access shall be controlled at all times. The NORM yard should be indicated on the waste facility plot plans. The NORM yard will be sign posted on all sides with radiation warning signs. Radiation levels at the fence shall be below 0.5 μSv/hr. Once sufficient material is stored, it can be transferred to the NORM Yard in Bahja.

4.2 Registration

All contaminated equipment needs to be registered upon entry into the NORM yard.

5. Transport

5.1 Requirements

5.1.1 Driver training for Contractors

Drivers are to be competent when carrying NORM contaminated loads. This requires drivers to understand:

- NORM Awareness (Attendance to the NORM Awareness course)
- Emergency response measures (carry appropriate PPE in the event of a spill or accident (Disposable overalls, P3 disposable respirator, rubber gloves)
The Contractor shall maintain a register of drivers competent to transport NORM contaminated materials.

5.1.2 Preparing for transport

The Sender shall obtain permission from the Recipient for the transport prior to despatch. Any consignment presented for transport shall comply with the packaging and monitoring requirements outlined in Sections 3 and 4.

Any conveyance used to transport NORM material shall be at all times under the full control and supervision of the contractor (controlled transfer) with respect to all initial, intermediate and final (un)loading.

A tank or tanker used to store or transport NORM material shall never be used to store or transport potable, domestic or agricultural water. Tanks used to transport NORM material shall not be used to transport other goods unless decontaminated to background levels.

A radiation hazard trefoil sign shall be placed at all four sides of the conveyance. Where possible, a dedicated conveyance should be used for the transport of NORM material. The conveyance shall be manned by the driver and his assistant. No passengers other than the driver and his authorised assistant shall be allowed.

The conveyance shall be provided with the following equipment:
- Two portable dry chemical powder fire extinguishers
- Emergency repair tool-kit
- Two warning flashlights
- Written contingency instructions (in Arabic and English)

5.1.3 Monitoring prior to transport

The RPT shall record the following information on the NORM Record of Movement Form (ref. Appendix D):
- The highest dose-rate at contact to the sides of the conveyance
- The highest dose-rate at a distance of 1 metre from the sides
- The dose-rate in the driver’s cab.

The maximum dose-rate at any point on the outer surface of any vehicle loaded with NORM shall be 2 mSv/h. The maximum dose-rate at one meter distance from the outer surface of any vehicle carrying NORM shall be 0.1 mSv/h. The maximum dose at the driver’s seat shall be 2.5 uSv/hr. Inform the CRFP if these levels are exceeded.

5.2 Despatch and transport

The “NORM Record of Movement Form” (Appendix D) shall be filled in by the Transport Contractor. Transfer of responsibility for the consignment from the Sender to the driver will take place when the consignment is loaded on the conveyance and the transport documents have been completed.

The driver shall receive route instructions from the Sender and transport the materials accordingly. He shall be conversant with the contingency arrangements (Appendix E). The driver shall not stop or park his vehicle en route in the vicinity of inhabited areas or livestock. He shall maintain the designated road speeds at all times.
5.3 Receipt of consignment

The Recipient shall take responsibility for the consignment by signing the “NORM Record of Movement Form” (Appendix C). The integrity of the packaging shall be checked against the requirements of Section 3 and any deviations noted on the transport form, and rectified. After unloading, the conveyance shall be checked by the waste treatment facility RPT for contamination.

6. Deviations

Deviations from this procedure shall be corrected to the satisfaction of the CRFP and retroactively approved by the RAC.

7. References

This document is to be read in conjunction with the following documents.

1. MSE.00  Ionising Radiation
2. MSE.04  Carrying out, recording and interpreting NORM surveys
3. MSE.06  Registration of NORM contaminated materials, equipment and waste
4. MSE.22  Control of contaminated equipment
### Glossary of Abbreviations

**Appendix A**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>RAC</td>
<td>Radiation Advisory Committee</td>
</tr>
<tr>
<td>RPA</td>
<td>Radiation Protection Adviser</td>
</tr>
<tr>
<td>RPS</td>
<td>Radiation Protection Supervisor</td>
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<tr>
<td>RPT</td>
<td>Radiation Protection Technician</td>
</tr>
<tr>
<td>SCO</td>
<td>Surface Contaminated Object</td>
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<tr>
<td>CRFP</td>
<td>Corporate Radiation Focal Point</td>
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Figure 3. Category II - Yellow Label. The background colour of the upper half of the label shall be yellow and the lower half white, the colour of the trefoil and printing shall be black, and the colour of the category bars shall be red.
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<th>Date</th>
<th>Contaminated Equipment (tick)</th>
<th>Contaminated Sludge (tick)</th>
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<tr>
<td></td>
<td>Contaminated Pigging Debris (tick)</td>
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### EQUIPMENT AND MATERIALS IDENTITY

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### ACTIVITY CHECKED BY RPS OR RPT

<table>
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<tr>
<th>Highest Readings</th>
<th>Gamma: cps</th>
<th>Alpha &amp; Beta: cps</th>
<th>Dose: μSv/hr</th>
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<tr>
<td>Mini 900 44A probe</td>
<td></td>
<td>Mini 900 EP 15 Probe</td>
<td>Graetz Dose Rate meter</td>
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<tr>
<th>Sample taken: Yes / No</th>
<th>Analysis result (Bq/g for Ra-226): SQU Assigned GM No.:</th>
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Note: NORM contaminated sludge, sands and pigging debris shall also be transported under the waste consignment note of SP 1009. Attach this Form to the consignment note.
This NORM inventory form shall be used to record individual contaminated materials such as tubulars, e.s.p.’s., piping etc. These items must be individually tagged, logged and registered on this form before leaving the site and being transported to the Bahja NORM storage facility.

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<tr>
<th>FIELD:</th>
<th>LOCATION:</th>
<th>NOTES (IF APPLICABLE):</th>
<th>COUNT RATE Mini 900 44A Probe (CPS)</th>
<th>COUNT RATE Mini 900 EP 15 Probe (CPS)</th>
<th>DOSE RATE Graetz5x μSv/hr</th>
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<tbody>
<tr>
<td>DATE</td>
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<td>DESCRIPTION</td>
<td>γ / β</td>
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### NORM Record of Movement

(Completed by Transport Contractor)

**Appendix D**

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<th>Item No.</th>
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**Transportation**

From:  
Sender Name:  
Signature:  
Dispatch date:  
Driver:  
Vehicle No:  
Remarks:  
Route:  

To:  
Operator Name:  
Signature:  
Receipt date:  

CC: Interior Radiation Focal Point for Asset to maintain data base entry.
NORM Record of Movement
(Completed by Transport Contractor)

Appendix D

For Emergency – Day and Night - Contact:

OSO1M : Tel : 243 86269
OSO1B : Tel : 243 88702
OSO1N : Tel : 243 82552

ONO1F : Tel : 243 84790
ONO1Y : Tel : 243 81117
ONO1L : Tel : 243 82918
ONO1Q : Tel : 243 85540

Despatch survey details:
Maximum surface dose-rate of vehicle = ........................................................... μSv/hr
Maximum dose-rate at 1 metre from vehicle = ........................................................... μSv/hr
Dose-rate in driver’s cab = ........................................................... μSv/hr

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<th>Ref. indicator:</th>
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<td>Date:</td>
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Receipt survey details:

Contamination survey of vehicle
Indicate areas of contamination, with levels, on the diagram.
If no contamination is detected above background, state “Background”.

<table>
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<th>Ref. indicator:</th>
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<tr>
<td>Signature:</td>
<td>Date:</td>
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Action to be taken, in addition to normal transport accident, if radioactive material involved:

**DRIVER**

- Switch off the engine.
- Move away from load and keep other people away from vehicle and radioactive material.
- Keep upwind of the radioactive package to avoid possible exposure of windblown material; this is particularly important in the case of fire.
- View condition of the load from a distance, 10 metres if possible, and look for signs of damage or leakage.
- Contact emergency number and give as much information as possible about the accident, including the following information:
  - Location of accident
  - Type of accident and damage
  - Details of the radioactive load
  - Name of sender and recipient
- Ask the operator to pass the information to ONO/1x or OSO/1x
- After contacting the emergency number wait for assistance from the CRFP

**Production Coordinator to:**

- Inform CRFP MSE32
- Assess extent of damage to radioactive load and take measurements to determine if contamination has been spilled or released.
- Retrieve radioactive packages and contain contamination (by use of plastic wrapping, drums, etc.) as appropriate.
- If necessary, check surroundings for contamination and arrange clean up as required (for example, place contaminated sludge, soil, materials in drums).

**Note:** Treatment of serious injury takes precedence over all other actions.