REVISS

REVISS Services
Technical and Manufacturing Group

Test Report No. RTR 235

3981/01
1.2m Free Drop Test – Vertical Inverted

Author:		**Reviewer:**	
Name	P J G Robbins	Name	D W Rogers
Signature		Signature	
Date	02/07/09	Date	02/07/09

1. PURPOSE AND SCOPE

The purpose of this document is to record the performance of the R7021 specimen, 3981/01, in an IAEA drop test for Type A radioactive materials package designs. The full test programme is discussed, justified and detailed in the test plan, RTM 118.

2. DESCRIPTION

2.1 DESIGN

The outer components of the R7021, a cylindrical, insulated jacket, a top shield (with energy absorbing structures and insulation), and a pallet, are constructed predominantly from carbon steel. There is also a stainless steel grill around the top of the jacket to restrict access to hot surfaces. The flask is a stainless steel, lead shielded, upright, finned cylinder with a conventional plug type closure in the top and thermal insulation built into its top and bottom corners. The closure has a vent point and the cavity has a drain tube to allow the flask to be operated in ponds as well as in cells. The cylindrical cavity holds encapsulated radioactive material (solid cobalt metal) in a basket. Although primarily intended to carry Special Form capsules, the flask has a containment system as it may also be used to carry non-Special Form encapsulated cobalt. The closure and the vent and drain plugs are therefore equipped with testable O-ring seals. In addition, to prevent the migration of coarse solids outside the shielded volume, the top of the drain tube is fitted with a mesh filter and a spring gasket is used to seal the gap under the closure around the top of the cavity.

2.2 TEST

1.2 m Drop – Vertical Inverted (Drop 4, RTM 118). Free drop test for Type A packages (paras. 646 & 722, TS-R-1).

2.3 TEST INTENT

- To subject the closure fixings to a maximum tensile load.
- To subject the vent plug to a maximum tensile load.
- To subject the jacket fixings to a maximum shear load.
- To crush the top shield.
- To subject the drain filter thread to a maximum shear load.
- To subject the grill fixings to a maximum shear load.

2.4 PASS/FAIL CRITERIA

The pallet, top shield and jacket shall be secure in order for the specimen to continue to the next test.

2.5 TARGET

The R8085 target (Drawing No R8085/001) consists of a 50mm thick steel plate bonded to reinforced concrete of dimensions 4m square x 3m deep set flush with the ground. The total mass, 113000 kg, exceeds the RTM 118 minimum requirement of 45000 kg by 150%.

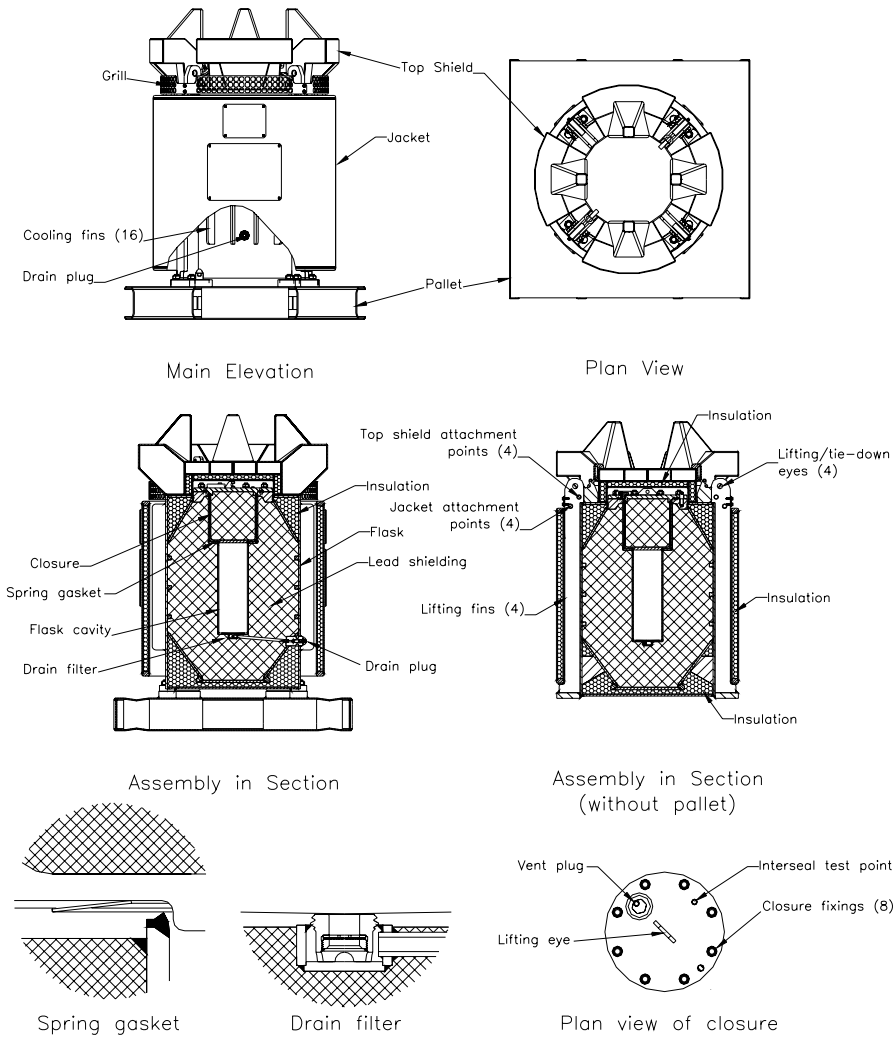

Figure 1: R7021 Constructional Details

2.6 SPECIMEN DETAILS (SEE ALSO IR 0672)

- Identity: 3981/01.
- Contents: A basket containing 48 stainless steel rods.
- Weight: 4374 kg.
- Existing Damage: See RTR 233 & 234.

2.7 TEST PROCEDURE

Drop Height: As the weight of the container assembly was less than the design maximum gross weight (4500kg), the drop height was increased pro rata to compensate. The test height was therefore (4500/4374) x 1.2 = 1.240m.

The test was conducted in accordance with OP 225. All key actions were recorded on the test record sheet (attached).

3. RESULTS

- The test was executed correctly (Figures 2-5). The angles measured for the drop were 89.2º & 89.8º from the vertical, i.e. 0.8 º & 0.2º from the horizontal (Figure 6).
- The pallet, jacket, top shield and grill were all securely attached (Figure 7).
- Top shield cones slightly crushed. Height above inner surface – 230, 233, 222, 214mm (Figures 8-12).

See Illustrations for photographic record.

For internal inspection see IR 0673.

4. CONCLUSIONS

The R7021 test specimen, 3981/01, was fit to continue to the next test.

5. REFERENCES

- IR 0672: 3981/01 Assembly Prior to Normal Conditions Drop Testing, REVISS Services (UK) Ltd.
- IR 0673: 3981/01 Inspection After Normal Conditions Drop Testing, REVISS Services (UK) Ltd.
- OP 225 issue 1: Drop Testing Procedure, REVISS Services (UK) Ltd.
- R8085/001 issue B: Drop Test Target, REVISS Services (UK) Ltd.
- RTM 118 issue 2: Test Plan for the R7021 Transport Container, REVISS Services (UK) Ltd.
- RTR 233: 1.2m Free Drop Test – Upright, REVISS Services (UK) Ltd.
- RTR 234: 1.2m Free Drop Test – Side Horizontal, REVISS Services (UK) Ltd.
- TS-R-1: Safety Standards Series, Regulations for the Safe Transport of Radioactive Material 1996 Edition (As amended 2003), IAEA, Vienna.

6. ATTACHMENTS

RTR 235: Drop Test Checklist, REVISS Services (UK) Ltd.

7. ILLUSTRATIONS

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Figure 11: Cone damage 10
Figure 12: Cone damage 11

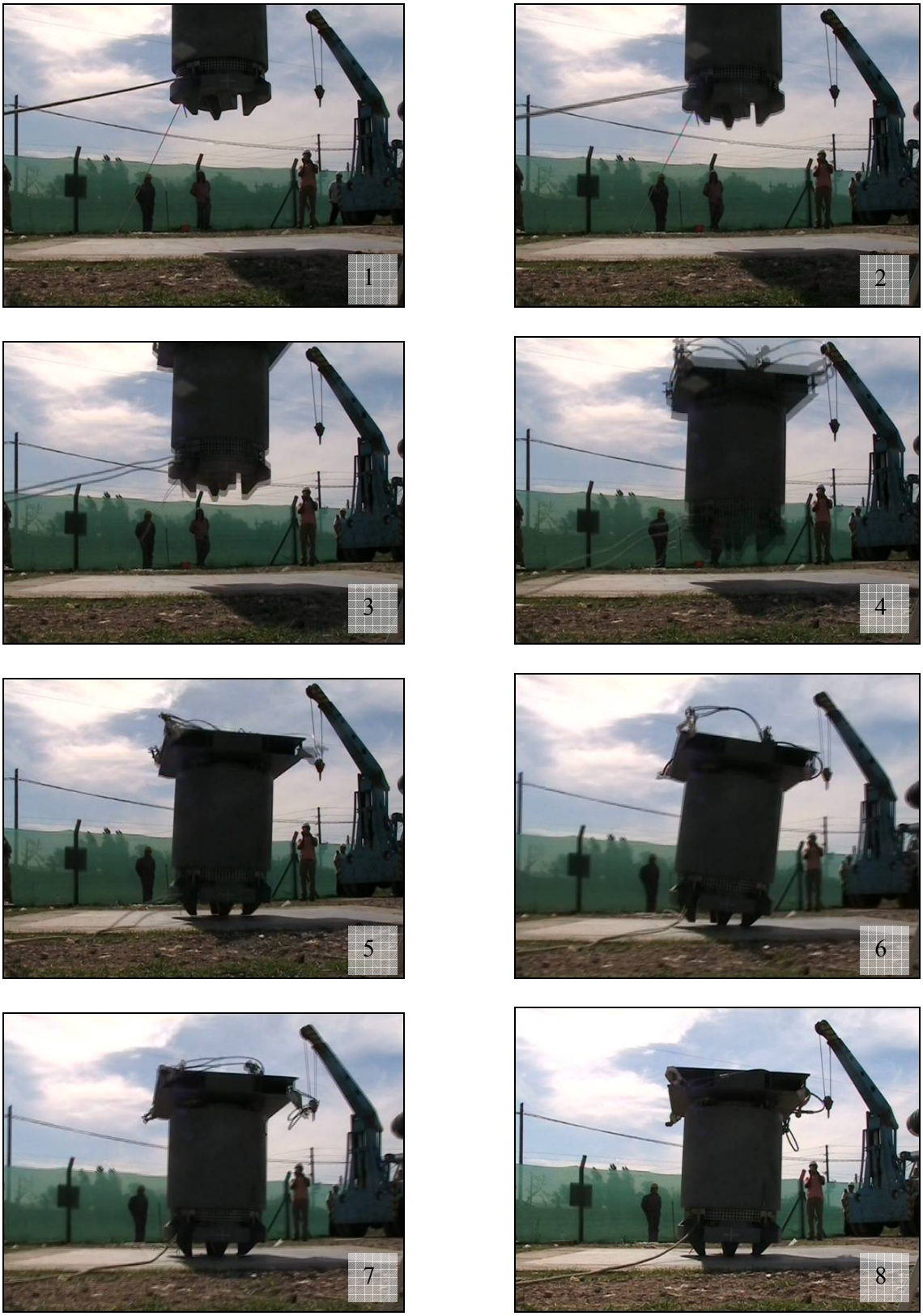

Figure 2: Test action sequence – Angle 1

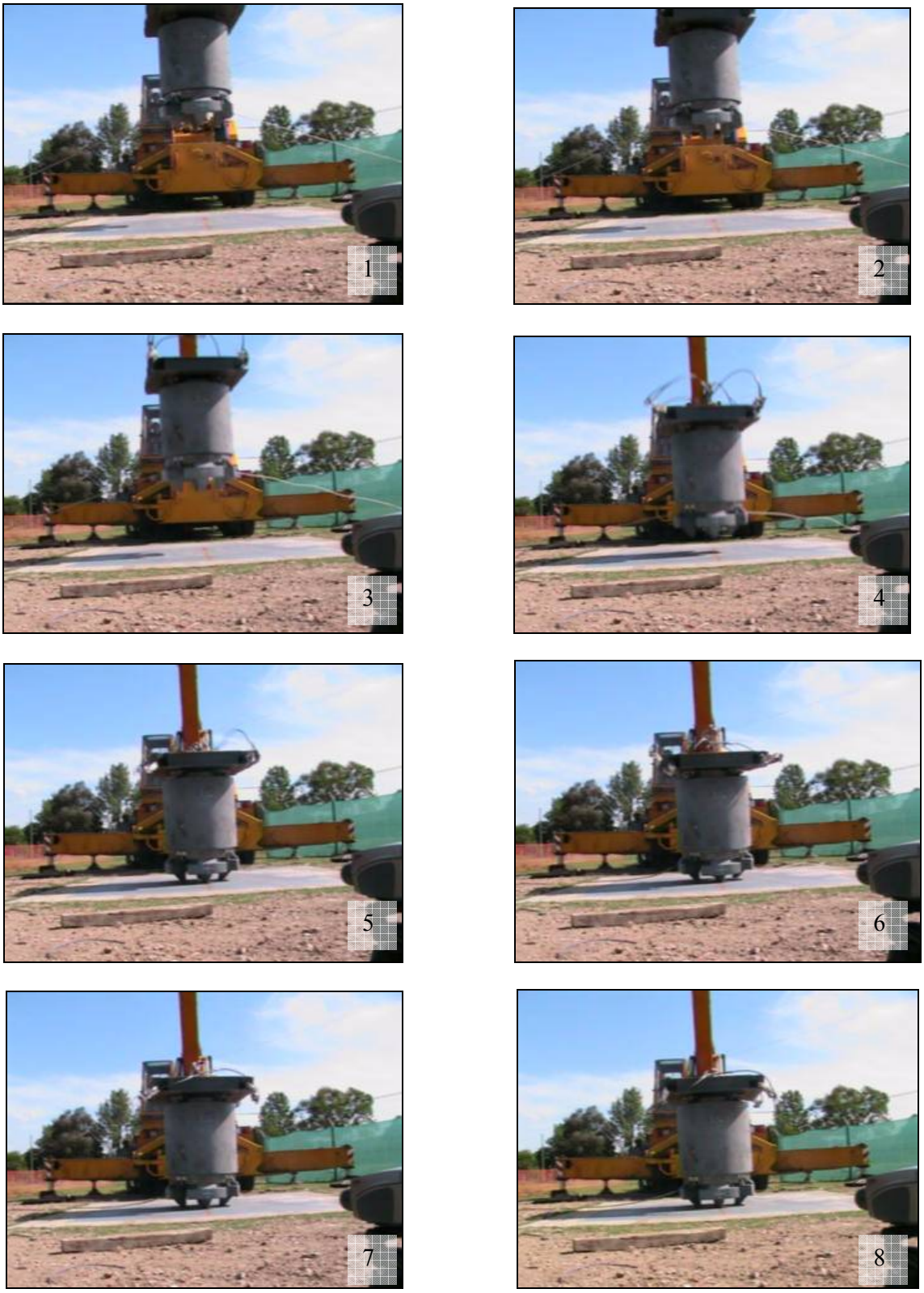

Figure 3: Test action sequence – Angle 2

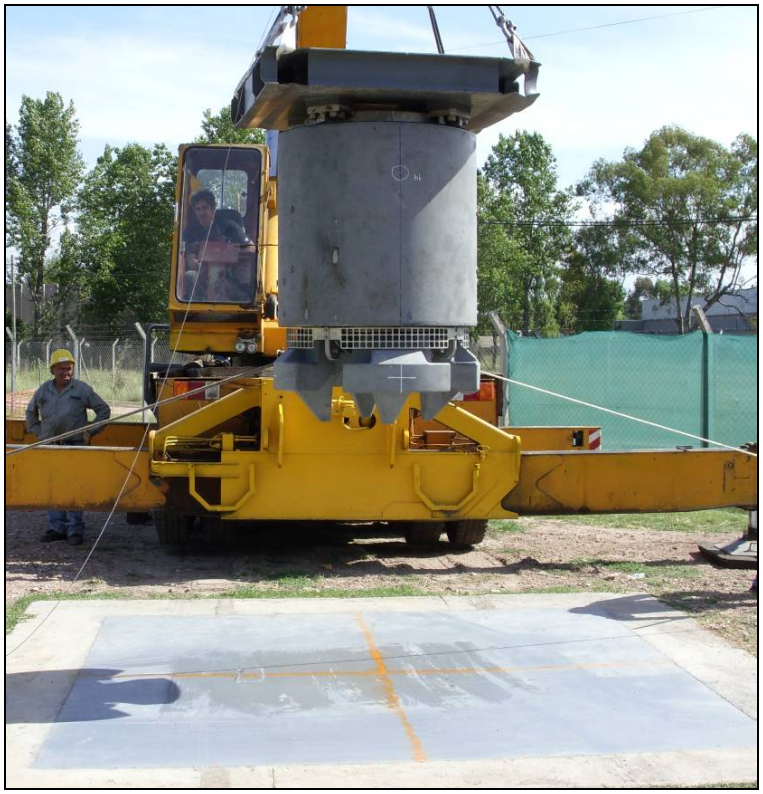

Figure 4: 1.240m above target

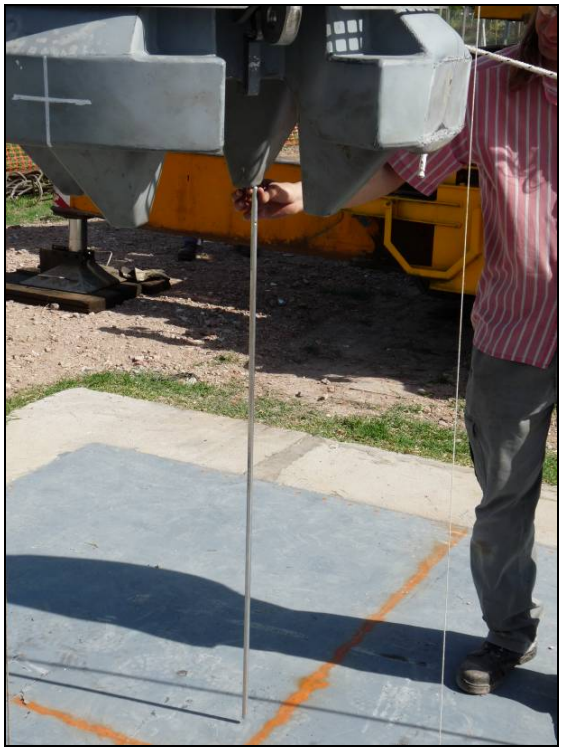

Figure 5: 1.240m above target (with height gauge)

Figure 6: Inclinometer readings (2 planes)

Figure 7: After drop

Figure 8: Cone damage

Figure 9: Cone damage

Figure 10: Cone damage

Figure 11: Cone damage

Figure 12: Cone damage

CONTROLLED DOCUMENT
(when in red)

REVISS

Reviss Services (UK) Ltd Drop Test Checklist (OP225)	RTR: 235 Date: 11/11/08
Test Description: 1.2m Drop Test : Vertical inverted (IAEA Type A)	
1. Confirm all personnel are aware of safety rules	✓
2. Test Plan/issue	RTM 118 issue 2, Drop 4.
3. Specimen Design/Serial No/Drg No.	3981/01
4. Height gauge	1-240m (R8083/005 issue A).
5. Target Drg No.	R8085/001 issue B.
6. Punch Drg No	N/A
7. Penetration bar No.	N/A
8. Other	N/A
9. Specimen prepared correctly	See RTR 234
10. Specimen orientated correctly	✓ 0.5° max on pallet base.
11. Photograph just above target	✓
12. Raise to correct height	✓
13. Release specimen	✓
14. Photograph in situ	✓
15. Photograph damage	✓
16. Confirm correct execution of drop	✓
17. Pass/Fail (if, applicable see Test Plan)	PASS (fit to continue)
18. Notes • Top shield cones slightly crushed. Height above inner surface – 230, 233, 222 & 214 mm. • Top shield, jacket, grill and pallet securely attached. • Inclinometer = Bosch DNM 60L (cal. due 30/09/09).	
19. Signed: D W Lyons	Date: 11/11/08
20. Witnessed: Michael Nixon	Date: 11/11/08