

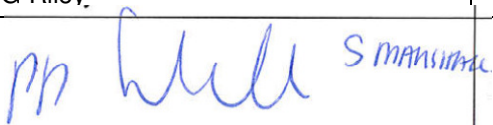




**9m drop test – HS-55x138-SS Insert Assembly  
DN3987 Assembly 'b'**

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**9m drop test – HS-55x138-SS Insert Assembly DN3987 Assembly 'b'**

Title	9m drop test – HS-55x138-SS Insert Assembly DN3987 Assembly 'b'	Number	TR 2013/02/02
		Issue	A
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Compiled		Checked	
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Approved	 S Mansingh	Issue Date	1/3/2013
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## **1 Proposal**

To conduct 9m drop tests on an Insert Assembly DN3987 as detailed in procedure CP 458 Issue B [Ref. 1].

## **2 Equipment**

- Drop test conducted at Croft’s drop test site, utilizing a suitable crane fitted with a release mechanism to drop the test item onto an embedded steel plate target that meets the requirements of 10 CFR 71.73 [Ref. 2].
- Test container housing the Insert Assembly – drawing 2C-6661 [Ref. 3]. Mass of the test container (e.g. body, cork packer, steel impact plate, lid and fixings) - 40.535kg.
- Measuring equipment – proprietary tape measure
- Bubble leak test rig (ISN 010) with calibrated pressure gauge (CC0032 – next calibration 5/2/2014), and ethylene glycol as the test liquid.
- Scales – CC0027 – next calibration 28/8/2013
- Still and movie cameras



### **3 Components tested**

Insert Assembly, serial number 3987/0002 – GRC 2129

O-ring containment seal - GRC 2093

The Insert Assembly’s cavity contained a steel cavity filler and water coloured with red dye to simulate liquid contents filling 50% of the remaining cavity; as detailed below.

### **4 Pre drop test details**

- Still photographs taken.
- Figure 1 shows the Insert Assembly and cavity filler prior to assembly.
- Figure 2 shows the cavity filler and liquid contents in situ.
- Figure 3 shows the alignment of the match marks of the assembled Insert Assembly.
- Figure 4 shows the proposed impact point.
- Appendix A shows the leak test results prior to drop test.
- Appendix B shows a summary of the mass of the tested items, (see section 6 - Post drop test summary - for comments).
- The following table details the mass of the items dropped:

Insert Assembly 3987/0002 with cavity filler and liquid contents.	2.583 kg
Mass of test container including polystyrene support structure.	40.607 kg
Total mass dropped.	43.190 kg



Figure 1 – Insert Assembly and cavity filler



Figure 2 – Contents in situ



Figure 3 - Match marks prior to drop test



Figure 4 - Indicated drop point prior to drop test



## **5 Drop test details**

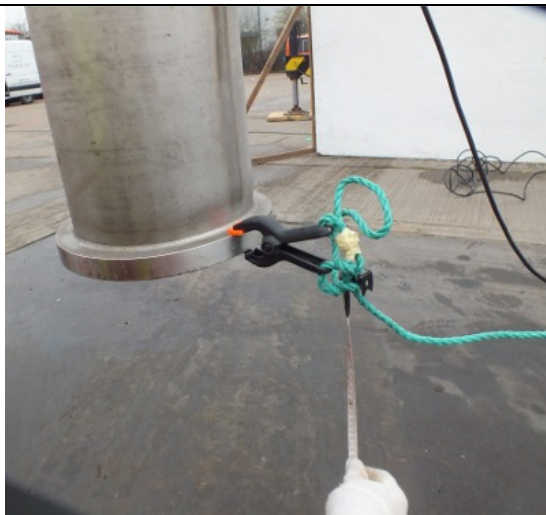
- Still photographs and movies taken during drop test.
- Figure 5 shows the test container with the cork packing and impact plate.
- Figure 6 shows the insert assembly within the test container supported by the polystyrene packing prior to the drop test.
- Figures 7 and 8 show the tape measure used for the 9m measurement.
- Figure 9 shows the typical setup employed, the test container at the drop height with the bottom of the tape measure off of the ground showing that the actual drop height is greater than 9m.
- Figure 10 shows the opened test container after the drop test, no indication of red dye leakage.



**Figure 5 - test container (lid not shown)**



**Figure 6 - Insert assembly in test container**



**Figure 7 - tape measure attached to bottom of test container**



**Figure 8 - tape measure showing 9m measurement**





**Figure 9 - test container at height prior to drop**



**Figure 10 - container opened post drop**

## 6 Post drop test details

- Still photographs taken.
- Figure 11 shows the damage at the impact point.
- Figure 12 shows the match marks after drop.
- Figure 13 indicates that there was slight distortion to the lid.
- Figure 14 shows the opened Insert Assembly, and the retained liquid contents.
- Figure 15 indicates no obvious damage to the inside of the Insert Lid.
- Figure 16 indicates no obvious damage to the inside of the Insert Body.
- Figure 17 indicates that there was slight distortion to the bottom of the insert body.
- Figure 18 indicates damage at a location on the bottom of the insert body.
- There was no obvious damage elsewhere to the Insert Assembly.
- Appendix C shows the leak test results after the drop test.
- Appendix B shows a summary of the mass of the tested items. The results indicate no loss of liquid contents.

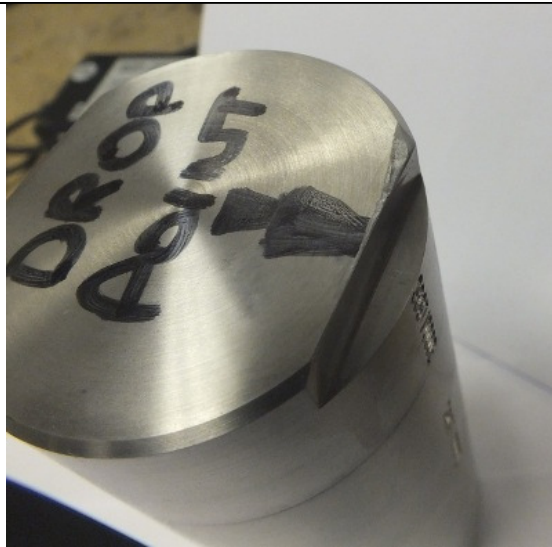


Figure 11 - showing damage at impact point



Figure 12 - showing match marks after drop

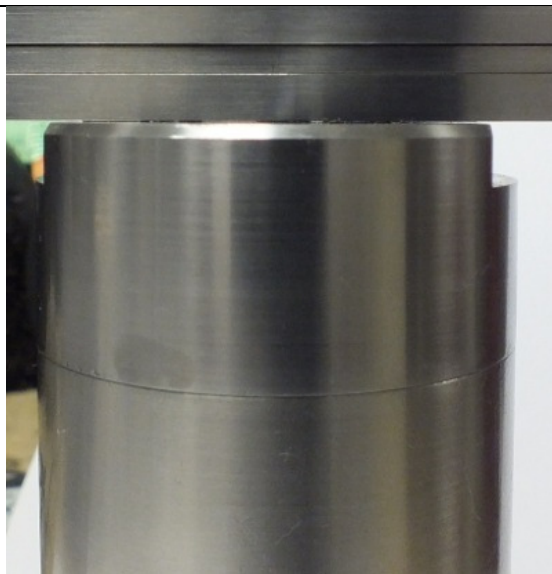


Figure 13 - showing slight distortion to insert lid



Figure 14 - showing opened insert with liquid still contained





Figure 15 - showing inside of insert lid



Figure 16 - showing inside of insert body

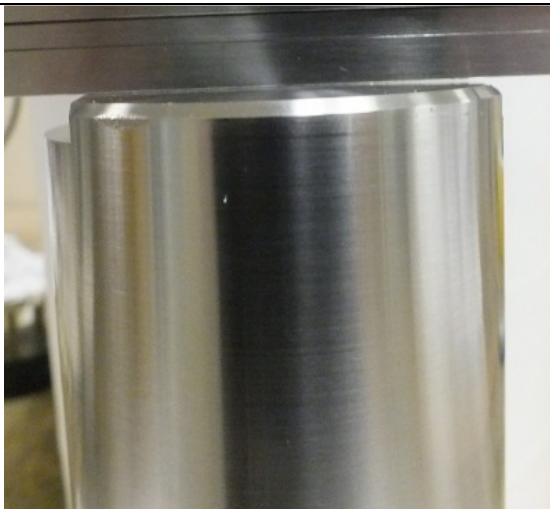


Figure 17 - showing slight distortion to bottom of insert assembly

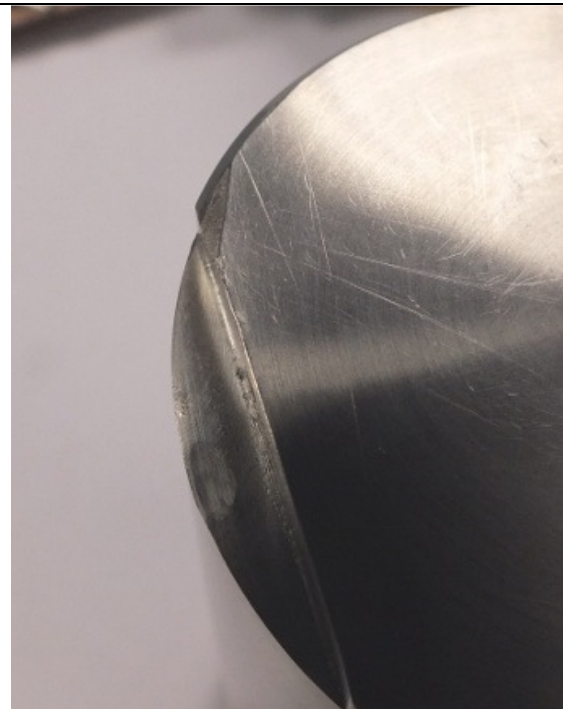


Figure 18 - showing damage to bottom of insert assembly



## **7 Summary**

- Figure 12 (post drop) indicates no unscrewing of the lid when compared to Figure 3 (pre-drop).
- The leak test results indicate that there were no leaks.
- The liquid was contained within the Insert Assembly.
- Obvious damage to the insert lid, e.g. impact direction, was local flattening at the impact point and slight bowing of the lid.
- The only other obvious damage was local flattening at a point on, and slight bowing to, the bottom of the insert base.

## **8 References**

1. CP 458 Issue B – Procedure for 9m Drop Test of Safkeg-HS Insert Assemblies
2. 10 CFR 71.73 – U.S.NRC Part 71, Packaging and Transportation of Radioactive Materials, Hypothetical accident conditions
3. 2C-6661 issue P3 – Drop test set-up HS Inserts (Appendix D – Drop test container)



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9 Appendix A, Form F 213, Vac Bubble Leakage Test Record – Pre 9m drop



Vac Bubble Leakage Test Record

Form F213

Procedure No CP 129

Test Liquid: ETHYLENE GLYCOL

Container Design/Serial No	Pass/Fail	Comments
DN 3987 INSERT ASSEMBLY (HS-55x138-SS) 3987/0002 PRE-9m DROP TEST LEAK TEST		Gauge CCG032 - CALIBRATION DUE 05/02/2014 REQUIREMENT <160 mbar ON GAUGE
UPRIGHT	PASS	BUBBLES FROM VENT HOLE DURING PRESSURE REDUCTION PRESSURE HELD AT <100 mbar NO BUBBLES, OBSERVED FOR > 2 MINUTES
INVERTED	PASS	AS ABOVE BUT LESS BUBBLES AT TEST LIQUID WAS ALREADY IN THE THREADS AREA. NO BUBBLES, OBSERVED FOR > 2 MINUTES

Signature

G. R. Oen GR

Date 19/2/2013

File ref

F213 Vac Bubble Leakage Test Record

Form Status

Rev 2



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10 Appendix B, Mass of tested Insert Assembly

File:///mass of tested inserts.xlsx

Test item DN	3987
Description	HS-55x138-SS INSERT ASSEMBLY
Serial number	3987/0002
Reason	9m Drop Test

Mass (kg):-

Insert Assy. inc. O-ring	1.188
Cavity Filler	1.303
Initial mass inc. liquid	2.580
Therefore liquid mass	0.089
Mass after leak test 1	2.583
Mass after drop test	2.582
Mass after leak test 2	2.583

Date: Initials:

14/2/2013	GR
"	GR
"	GR
"	GR
14/2/2013	GR
20/2/2013	GR
20/2/2013	GR

Comments:


Completed	G. R. GR
DATE	20/2/2013



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11 Appendix C, Form F 213, Vac Bubble Leakage Test Record – Post 9m drop



Vac Bubble Leakage Test Record

Form F213

Procedure No CP 129

Test Liquid: CHLORINE GAS

Container Design/Serial No	Pass/Fail	Comments
DN3987 INSERT ASSEMBLY (HS-55x138-SS) 3987/0002 Post 9m Drop Test Leak Test		Gauge C00032 - Calibration Due 05/02/2014
UPRIGHT	PASS	Requirement < 160 mbar on gauge  Process' AS FOR PRE 9m Drop Tests. < 100 mbar, observed for > 2 minutes <u>NO</u> BUBBLES
INVERTED	PASS	< 100 mbar, observed for > 2 minutes <u>NO</u> BUBBLES AND <u>NO</u> INDICATION OF RED DYE LEAKAGE.

Signature

G.R.

Date

20/2/2013

File ref

F213-Vac Bubble Leakage Test Record

File ref Status

Rev 2



## 12 Appendix D, Drop test container

