

Drop Test of the HIC for the Multi-nuclide Removal Equipment

1. Drop test

*Previously announced in the document used in the 12th Mid-to-long Term Countermeasure Meeting (December 3, 2012)

Conditions

The test was done under the following conditions applied at hot testing using a HIC with a reinforcement ring attached.

	3rd drop test	4th drop test
Test sample	HIC with a reinforcement ring	
Test weight	Approx. 4.0t (Container weight: Approx. 0.3t, reinforcement ring weight: Approx. 0.2t, contents weight: Approx. 3.5t)	
Height at which the HIC was hung	3m	4.5m
Drop posture	Vertical free fall	
Drop surface	Steel plate	Rubber mattress shock-absorbing material (20mm thick x 4)

Results

Since no contents leakage or damage to the HIC was found as a result of the third and the fourth drop tests, it was confirmed that **the storage capability of the HIC can be ensured** under the conditions above.

Drop test using a HIC with a reinforcement ring attached
(Height at which the HIC was hung : 3m)



Before falling



After falling



After removing the reinforcement ring

No contents leakage or damage to the HIC was found though the lower part of the HIC was deformed.

Drop test using a HIC with a reinforcement ring attached
(Height at which the HIC was hung : 4.5m, with shock-absorbing material)



Before falling



After falling



After removing the reinforcement ring

No contents leakage or damage to the HIC was found though the lower part of the HIC was deformed.

2. Additional drop test (1)

*Previously announced in the document used in the 12th Mid-to-long Term Countermeasure Meeting (December 3, 2012)

Purpose of the additional drop test:

Though the height limit was set at 4.5m based on the test results (when the HIC was hung at 4.5m), additional drop tests were performed for the purpose of proving sufficient safety margin above 4.5m by confirming the soundness of HIC when falling from heights exceeding 4.5m.

Conditions

The test was done under the following conditions with the falling height set higher than that of the HIC transportation at the hot testing.

Test sample	HIC (with a reinforcement ring attached)
Test weight	Approx. 4.0t (Container weight: Approx. 0.27t, reinforcement ring weight: Approx. 0.2t, contents weight: Approx. 3.5t)
Height at which the HIC was hung	6m
Drop posture	Vertical free fall
Drop surface	Rubber mattress shock-absorbing material (20mm thick x 4)

Results

Since no contents leakage or damage to the HIC was found as a result of the third and the fourth drop tests, it was confirmed that **the storage capability of the HIC can be ensured** under the conditions above.

Additional drop test

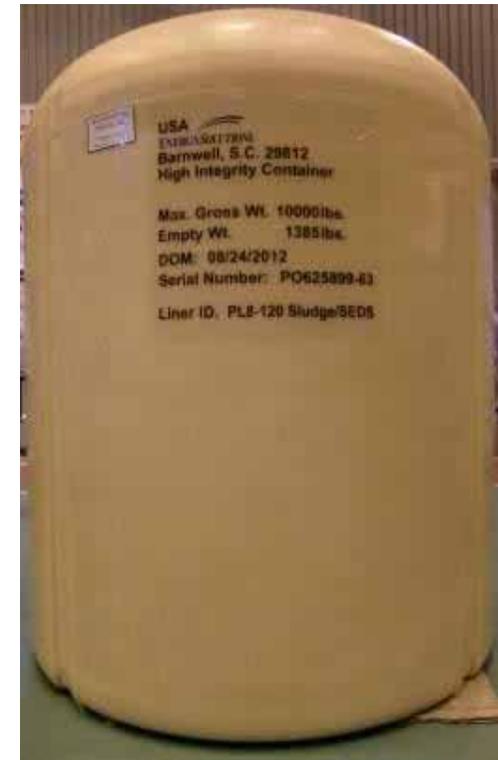
(Height at which the HIC was hung : 6m, with shock-absorbing material)



Before falling



After falling



After removing the reinforcement ring

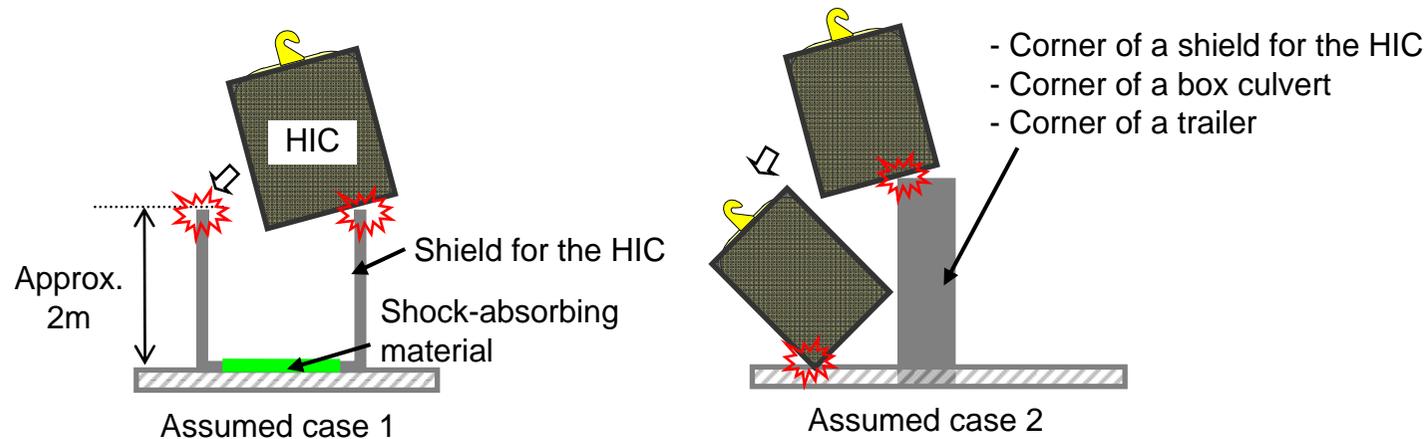
No contents leakage or damage to the HIC was found though the lower part of the HIC was deformed.

3. Additional drop test (2)

Evaluation

The falling conditions were arranged based on the following scenarios by taking into considerations the falling postures/heights assumed in the multi-nuclide removal equipment area and the primary storage facility area. The soundness of the HIC was evaluated based on these scenarios.

- Falling onto the corner of a shield or box culvert
 - Falling onto the back of a trailer
 - Falling at an angle taking into considerations the secondary collision
 - Falling on another HIC
- etc.



Drop test

Based on the preliminary analysis results, drop tests were done assuming 3 representative cases in which deformation was evaluated to be significant. (With stainless-steel reinforcements (20mm on the bottom and 10mm on the sides) of the HIC attached)

	Test sample	Falling surface	Falling height	Falling posture	Result
1	HIC (With SUS reinforcements attached on the bottom (20mm) and the sides (10mm))	Steel plate	3m	At an angle (Falling from the bottom corner of the test sample)	OK No leakage
2	HIC (With SUS reinforcements attached on the bottom (20mm) and the sides (10mm))	Steel plate	3m	At an angle in the opposite direction (Falling from the upper corner of the test sample)	Failed Leakage found
3	HIC (With SUS reinforcements attached on the bottom (20mm) and the sides (10mm))	Corner	2.6m	Vertical (Falling onto a 100mm square bar)	Failed Leakage found

Results

Case 1: Dropped from 3m at an angle (Falling from the bottom corner)



Case 1: Before falling



Case 1: After falling

No leakage from the HIC though deformation was found on the bottom corner of the reinforcement.

Results

Case 2: Dropped from 3m at an angle in the opposite direction (Falling from the upper corner)



Case 2: Before falling



HIC upper lid

Case 2: After falling



* The upper lid of the HIC came off when dropped. Damage found on the upper part of it.
The portion which got cracked

Results

Case 3: Dropped from 2.6m (Falling onto a 100mm square bar)



Case 3: Before falling



Square bar
(Width: 100mm)

Case 3: After falling



* Damage found on the area with shape inconsistency.

Ring on the upper part

4. Countermeasure

Measures towards safe HIC handling will be considered based on the obtained results.