

SILO INCIDENT – 5 December 2013

Background

Three silos, purchased for the Encapsulation Plant, were being temporarily stored on the northern taxiway until they could be installed. Two silos were each 8.5 Te in weight, 4 m diameter and 9.5 m long. One silo was 4.75 Te, 2.9 m diameter and 9.5 m long. The construction of the Encapsulation Plant had slipped by three months, but the silos had to be delivered as per the contracted delivery date, on the original programme timeline.

The three silos, being stored on the northern taxiway were chocked using large timber wedges, as shown in the second photo below, and each secured by two straps fastened to reinforcement bars which were grouted into the concrete taxiway at either side of the silos. The arrangement appeared robust. No temporary works calculations were undertaken at this stage.

Incident

On the morning of 5 December 2013, it was noticed by a Graham Construction engineer that one of the silos had travelled approximately 450m across taxiways, the runway and neighbouring land coming to a rest in the field owned by D Henderson. Residents were immediately notified and action was taken to secure the silo using dumper trucks. It was apparent that the straps on this silo had failed at the connection with the grouted reinforcement bar. The other two silos remained securely in place. During that night/morning an average wind speed of 60mph with gusts of up to 80mph were recorded. Localised gusts could have been in excess of this.

The silo secured by dumper trucks



After the incident, the remaining two silos stored on the northern taxiway which had been strapped in a similar way, had the connection between the strap and the bar reinforced using a shackle fitted between the ratchet strap and the reinforcement bar. As a further measure a wind protection/anti-roll bund was installed using 6F2 material (graded crushed rock) on either side of the silo.

Following approval from B Grant on the morning of 6 December, once the wind speed had reduced, the silo was retrieved from D Henderson's field and re-located to the main runway where it was secured in

the same manner as the other two silos. Repairs have been completed to the damaged dyke and fences.

Investigation

It is unclear why these two particular fasteners failed, as exactly the same arrangements were used on the other two silos and there was no sign of fastener failure only slight movement of the timber chocks. No one witnessed the initial movement of the silo, so it is difficult to ascertain the exact reason for the fastener failure, however, it is thought that possibly the ratchet straps were able to work loose in the high winds allowing the silo to move, thus dislodging the timber chokes which allowed the silo to move even more, ultimately shearing the fasteners. However, we are aware of the high winds experienced in Caithness and this should have been considered further in early calculations.

One of the two silos that remained in position with anti-roll bund



Lessons Learnt

- More consideration is required on temporary locations, in particular of large items such as these.
- Belt and braces tie-downs should be considered – a back-up should always be used in the event that the original should fail. Temporary works calculations should be carried out.
- The extreme weather conditions experienced in Caithness should always be taken into consideration.
- Regular inspection of the items should be carried out.

Corrective Actions Going Forward

DSRL has initiated processes to ensure that any large component being stored outdoors has appropriate calculations to demonstrate the method of securing the equipment in accordance with British Standards. The calculations will identify what type of securing straps or block and bracing is required. The calculations will be checked by the Waste Directorate Engineering Manager and verified to be installed in the field by the DSRL project manager per the drawing/calculations.

In addition, any large waste packages delivered by the DSRL waste group will be properly secured by the project or the waste group will not deliver the waste package. This was further reinforced by communication to all DSRL staff.