Test Report

Test Number:	UNITRAY TEST - CPS - 0001	**Tested By:**	James Burkwood (james@saltproductdesign.com) assisted by Brett Watson - Unitray
Product:	Large Unitray & support pillars	**Standard:**	NA
Test Description:	Structural load bearing during HWU failure	**Test Date:**	05 April 2017
Environment	Open air, roofed area. 23°C ambient.	**Test Time:**	10:28 am - 11:25am

Test Equipment:

Turnigy - non contact infrared digital thermometer - Emissivity set to 0.95
secondary water verification measurements made with Gameco DT-131 temperature probe

Test Objective:

To determine load carrying capability of the Unitray in a simulated worst case scenario involving elevated temperature.
(For certification for long term structural suitability i.e. loads leading to material creep see FEA Analysis -

Comments/Results/Conclusion:

PASS The Unitray Safe Tray System was found to be structurally sound and its load bearing capacity was not significantly decreased under elevated temperatures simulating various hot water unit (HWU) failure scenarios. Increased flexibility of the vertical side wall of the tray was observed under elevated temperatures but did not impact on performance. Rigidity across the base of the tray was maintained with only a minor deflection at the centre of the tray of 2.5mm +/-0.5mm - It was noted that the centre of the Unitray was not intended to contribute to load bearing as the load of the HWU was borne in the region of the Unitray above the support pillars. No loss of HWU stability was observed.

It was observed that, as expected, the tray absorbed heat from the water but the ribs beneath the tray dissipated heat to the ambient air resulting in a much lower temperature. The structural ribs on the underside of the tray were found to be at varied but significantly lower temperatures compared to the horizontal tray bottom (20-40°C cooler) and thus contributed to product performance.

The pillars were partially thermally isolated from conducted heat from the water/tray and only experienced a minor rise above ambient temperature and were not exposed to temperatures approaching the heat distortion temperature of the polymer under the applied load.

Test Method:

A size large Unitray was set up on a stable level reinforced concrete base elevated with 6 evenly spaced Unitray Elevating Posts as per the supplied installation instructions. The largest commercially available HWU (a "315" litre, three element hot water unit - Everhot brand) was loaded on top of the Unitray assembly. The HWU was filled to a static capacity of 325 litres. The outlet drain on the Unitray was capped to simulate a complete drain blockage.

Test A - Rapid water loss from HWU:
Note: it is expected that the temperature of expelled water during a rapid loss event would decrease significantly over time as the water in the HWU would not dwell within the tank long enough to reach temperatures set at the thermostat (77°C). To provide a safety factor, periodic high temperature water replenishment rather than continual resupply at lower thermostat controlled temperatures has been conducted so that this test exceeds the real world temperature and dwell time of heated water within the Unitray.
The Unitray was filled to the rim with ~98°C water (3.5 litres). To maintain an elevated temperature, additional lots of 4 litres of ~98°C water were added (with excess water overflowing the rim of the Unitray) at the intervals indicated below. Periodic temperature readings were recorded for the water, Unitray side wall, underside of Unitray between ribs, top component of support pillar assembly and bottom component of support pillar assembly. The test was conducted over a period of 30 minutes to simulate a rapid loss of water from a HWU failure. In the last minute of the test a physical inspection was conducted and the HWU was rocked repeatedly by 40mm from vertical in each direction to detect any structural weakness.

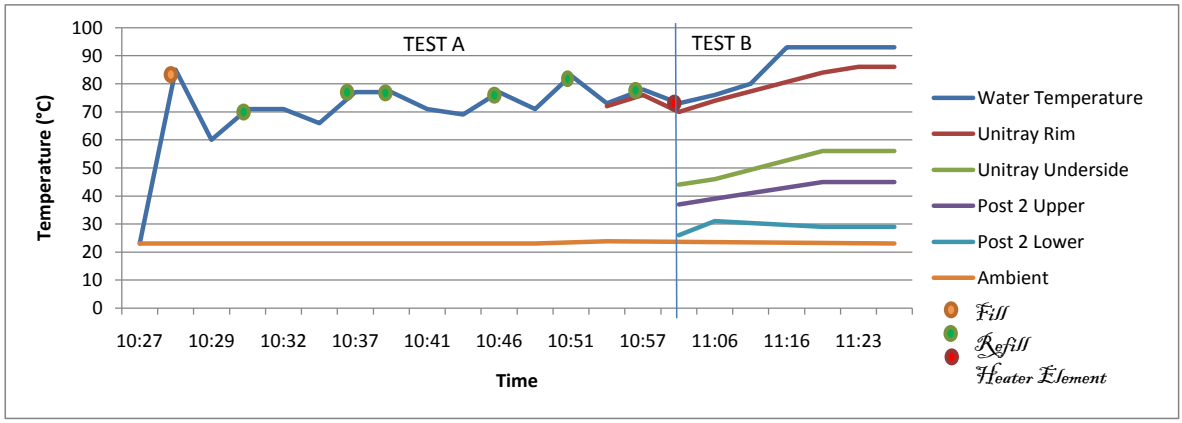
Test B - Gradual water loss from HWU:
Note: in certain ideal conditions a gradual loss of water from the HWU might allow the elements within the HWU to maintain an inner rated maximum HWU temperature of 77°C and supply that continuously to the tray. To provide a safety factor this test exceeds the rated water temperature and is continued until all components have reached thermally stable maximum caused by the elevated water temperature well above real world temperatures.
Immediately following Test A, the water temperature in the tray was artificially elevated up to a thermally stabilised water temperature of 93°C using a heater element mounted directly in the Unitray. Tray component temperatures were measured until thermally stabilised. In the last minute of the test a physical inspection was conducted and the HWU was rocked repeatedly by 40mm from vertical in each direction to detect any structural weakness.

Additional Notes:

Factors contributing to "worst case scenario" and/or adding an additional safety factor:
- Unitray elevated on support pillar kit and largest Unitray used - support pillars spaced at a greater distance, greater unsupported tray area.
- Complete blockage of drain - hot water held in tray to full depth of tray.
- Largest commercially available HWU used - increased water weight.
- HWU left full (not used to supply hot water) and additional hot water from an external source added to tray - maximum mass load maintained throughout test duration - note static capacity of HWU was 325 litres.
- Water temperature in tray elevated above HWU rated temperature of 77°C for an extended period in all tests.

Product Details:	
Batch #/Work Order:	
Bar Code: 0 680569 512499 (tray kit) + 0 680569 512505 (elevating support pillar kit)	

Plot:



Images: