

SAFETY NOTE REVERCHON LOG FLUME
INVESTIGATION DETAIL AND CONTROLLER ACTIONS REQUIRED

This alert is an update to the Reverchon Log Flume Safety Alert sent out 20 September 2011 and should be read in conjunction with it. Both Alerts refer to the same accident on 27 August 2011 involving a machine manufactured in 1998 which resulted in injuries to two riders.

The investigation remains ongoing but the following detail from the Health and Safety Laboratory and an HSE Specialist is released now in order to allow controllers to make adjustments to their machines and/or operating systems to prevent similar incidents.

The investigation was carried out following an incident involving a Reverchon log-flume ride. It identified that the safety of the ride was critically dependent on the level of water within the "splash zones" immediately after the drops. As the cars enter the splash zones they ride on supporting rails which set the cars at a shallow down angle. This means that the farther along the splash zone the car travels, the deeper the water it encounters. The front of the car is designed to generate a bow wave which resists forward motion (i.e. slows/brakes the car) as it moves through the water. Effective braking of the car therefore is totally dependent on the water being at the correct level in relation to the height of the rails. The water level in the splash zone is effectively the brake and is a safety critical element of the ride. It is this which prevents the log flume car hitting the 90° bend at the end of the splash zones at high speed, potentially ejecting any passengers. The optimum water level is achieved once the ride has achieved its steady state condition (i.e. the splash zone channel completely filled with water). If the main water pump is not running or is not pumping properly, the water will naturally flow back from the channels and into the main reservoir.



Splash tank and rails

Initial investigations have shown that in the following circumstances it is possible for log flume cars to be released from the top of the drop before the ride has achieved steady state water level conditions in the channels (i.e. the water level in the splash zones is too low):

1. **If the water level relays situated in the ride's control panel, were to either fail in the ON state, or were incorrectly calibrated.** In both circumstances it is possible for the cars to be released from the top of either drop with little or no water in the splash zones and therefore, little or no braking. To overcome this concern, it is recommended that an automatic check by the control system should be implemented prior to the start-up of the ride. If the water level sensor relay for either water splash is in the ON state before the main pump has been started, operation of the ride shall automatically be prevented. This check could be carried out either by the PLC or by simple hardwired means. It should be noted that this does not absolve the ride controller from carrying out appropriate pre-use and in-use checks.



Level Sensor Relays in Electrical Control Panel

2. **If the level probes for the water-level relays are positioned at too low a level.** This could allow the first car to descend either drop, particularly if the ride has been restarted with the car already positioned near the top of the drop, and to enter the splash zone before the system has reached its steady state condition. To prevent this from occurring, the water level probes should be relocated such that the relays are actuated with the water as near to steady state conditions as possible. In order to achieve this, the existing probe adjustment system may require modifying or redesigning.



Level Sensor Probe

Due to the complex nature of the electronic control system on this machine, controllers should ensure that any work done on it is completed and tested by a person competent to do so.

Controllers will also appreciate that the matters of concern identified are **safety critical** to the ride and should therefore be subject to the normal Design Review procedures.

During the investigation information was received from other controllers and operators that discarded paper, leaves and accumulations of human hair etc can become attached to the level sensor probes, sometimes causing false signals in the control system. Controllers should ensure that sufficient water is in the machine at all times when it is running and that the water is clear of rubbish and litter.

As part of the Fairground Inspection Plan for 2012/13 HSE NFIT Inspectors will be making checks to ensure the work has been done to prevent a similar occurrence.

Further information if required from:

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