NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Committee

TECHNICAL BULLETIN - SEPTEMBER 1999

191. Pinfari ZL42 Looping Coaster Axle Failure

Leisure Technical Consultants have informed us of an axle failure on a Pinfari looping coaster - the ZL42 model.

The photographs of the axle show a classic bending fatigue failure initiating from a very small, but sharp shoulder. Ultrasonic testing of 18 of these shoulders has indicated 4 more cracks and a possible 3 in the early stages of propagation. In most cases these axles are approximately 4 years old.

Pinfari have been forwarded failed components for their own investigation. It is thought that they will issue a modification to axle design at some future time (end of 1999 season) which will require a Design Review in Great Britain in accordance with HSG175.

We have previously reported on axle cracking of roller coasters from three other manufacturers and it occurs in axles of other ride types also. Where they are not welded, it is the character and detail of the shoulders, taken in conjunction with the axle diameter, which governs whether fatigue cracking will or will not occur. Even a very tiny shoulder, if it is sharp or has sharp machining marks, can reduce the endurance limit of the cross-section by 30%, say.

Of course, many axles are designed such that all shoulders have infinite fatigue life. But, in cases where the designer's calculations (as confirmed by the Design Reviewer) have not demonstrated infinite life for all the axle shoulders, an appropriate fatigue inspection programme (in contrast to deterioration / wear) is essential.

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