

NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Committee

TECHNICAL BULLETIN - OCTOBER 1998

171. Bennett & Other Twist Rides

Page 1 of 2

In late 1997, BALPPA (the British Association of Leisure Parks, Piers and Attractions) circulated information concerning a capstan shaft failure on a Bennett's Twist ride operated by one of its British members. Fortunately no one was injured although the ride was in motion.

NAFLIC subsequently issued Technical Bulletin 158 on the subject. However, we recently received correspondence about such a failed Bennet's Twist capstan shaft and have decided that we should make further mention of this problem.

It has been known for many years that there is a limited fatigue life at certain cross-sections of the capstan shafts of this make of Twist and of other similar designs (e.g. Pollard, some of the very early Stevens, and maybe others). Please note that, although the BALPPA incident did not cause injury, a number of identical failures on these rides in the past resulted in death and serious injury.

Many such rides were modified in the 1970s and 1980s. The industry included guidance on the subject in *Guidance Note PM49 from the Health and Safety Executive: Safe operation of passenger carrying amusement devices - the Cyclone Twist*, published in September 1985 and still in print. Some comments on this particular design limitation and on Thorough Examination are in paragraphs 12(d), 14, 15 and 38(b) of that publication. (But please note, in relation to paragraph 14, that it is not just friction driven capstans that are affected by this problem).

In addition to PM49, published in 1985, the Health & Safety Executive expressed their views in widely distributed correspondence in August 1987 and May 1988. Some of the key points in the May 1988 letter (from John Gowling, HM Senior Principal Inspector of Factories) were :-

“During the past 10 years there has been a number of serious incidents caused by the failure of these shafts. Although the Health and Safety Executive published guidance on these rides in 1985 and made specific recommendations about the design, manufacture, modification, repair and examination of these shafts there have been further failures.”

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“The design and construction of the capstan shafts of all Twist rides should be re-appraised. These re-appraisals should be carried out by people competent to undertake such work.”

“The re-appraisal should include verification of the design specification, static and dynamic stress calculations, fatigue assessment and the materials and methods used to construct the shafts.”

“Where the appraisal shows that there are inadequacies in design or construction, the shafts should be redesigned, replaced or modified and allocated a finite life.”

“The manufacture of new shafts or the modification of existing ones should be carried out in accordance with a new specification laid down by the designer, and the guidance in the Code, dealing with the design and modification of rides. Any redesign should take into account the effect on other parts of the ride of any redistribution of stresses resulting from the new design.”

“The new specifications should state the maximum operating speed, the maximum out of balance load on the carousel units and the design life of the shafts.”

The letter then went on to explain interim requirements for the operation of Twists until the completion of the design re-appraisal. This involved an onerous inspection regime, including NDT, to be agreed with the ride examiner (now termed Appointed Inspection Body or AIB). The presence of any significant defect would require the ride to be taken out of service until the design reappraisal was complete.

We are particularly concerned that there may be Twists of Bennett manufacture (and similar designs) still operating in Great Britain without having received the required design re-appraisal. Clearly some rides may have inadvertently missed this process having come back into the country since 1988. It is obviously a responsibility of the controllers of amusement devices, first and foremost, to ensure that they are kept safe in line with HSE or other accepted technical guidance. AIBs have the secondary responsibility of confirming that such guidance has been followed. It is therefore our view that any AIB coming across such a Twist, i.e. lacking evidence of design reappraisal in line with the HSE stipulation, should consider that it does not satisfy paragraph 99(d) of *Fairgrounds and Amusement Parks - Guidance on Safe Practice* :- “... that devices have been upgraded, where necessary to avoid danger, for example, as advised in NAFLIC technical bulletins or HSE guidance.”

Presumably the vast majority of Twists were subjected to the process required by HSE. It is important for controllers of such Twists (i.e. predating May 1988 and appropriately reappraised), and those AIBs responsible for their thorough examination, to be familiar with the recommendations of the ride's design re-appraisal carried out at that time.