

NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Sub-Committee

TECHNICAL BULLETIN - SEPTEMBER 1994

097. Electric Shock Risk from DC Tracked Rides

A minor incident occurred recently, when a member of the public was subjected to a small electric shock, whilst simultaneously touching a metal handrail and the metal chassis of a DC fed Ghost Train type device. It must be stressed that, after investigation, the 'tingle' that the person received was proven to be insufficient to cause danger, but there was considerable embarrassment, coupled with down time for the ride, and a complaint (albeit unfounded) was made to the Health & Safety Executive.

The DC supply to the ride was provided by a central rectifier unit, that was also being used to supply several other devices. The rectifier complied with "Fairgrounds and Amusement Parks - A code of safe Practice" (hereafter referred to as the Code), in that it was a "full wave" three phase rectifier, providing "ripple free" DC, and it was this provision that prevented the incident from being more serious.

The fault path was caused by the recent accidental earthing of a positive supply conductor, that was running underground as a separate device. This resulted in the whole negative network being grounded, instead of being isolated, as required in the Technical Annex (paragraph 191). This in itself would not have caused any problem, but it was found that the cars of the tracked device had been wired such that the positive of the supply went to the chassis, and not the negative as would be normal.

The points to note, for this type of ride, where the protection from shock risk is provided by Safety Extra Low Voltage, are as follows:

1. It is extremely important that DC supplies are from a ripple free source, such as a DC generator or battery, or a full wave three phase rectifier. (From the electrical definitions at the back of the Code).
2. Neither the positive nor the negative supply should be connected to earth at any time. (the Code's Technical Annex, 1988 version, paragraph 191 a and t)
3. DC conductors, cables and all component parts connected to either the positive or negative supply, should be installed such that they do not come into contact with any earth. (the Code's Technical Annex paragraph 191 a and t)

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4. Tests should be performed during thorough examination to ensure that the DC supply system is free of earth faults. In the case of centrally supplied DC systems, these tests should ensure that faults on non SELV protected equipment do not affect rides that rely on SELV protection to guard against shock risk. (the Code's Technical Annex e paragraph 191 t).
5. It is advisable to ensure that any metal chassis of devices that may be touched by members of the public, at the same time as any external earthed structure, are connected to the negative of the DC supply, and not the positive. This is not part of any regulation, but would help, should any current carrying items, such as dodgem floor plates, accidentally come into contact with earth.

The following points apply to all DC supplied rides, where the voltage is less than 120V, and are included in this Technical Bulletin for guidance only. The list is not intended to be definitive, and all appropriate guidances and regulations should be followed.

1. Fuses should be fitted in each pole of the supply (the Code's Technical Annex e paragraph 191 c and q).
2. Fuses should be fitted, in each pole of the supply, at all points where they are required to protect the supply cables, due to change in cross sectional area.
3. All switches, isolators and disconnecting devices should be of the double pole type.
4. All exposed isolators, terminals, conductors and wires should be shrouded, using robust covers of insulating material. (the Code's Technical Annex e Paragraph 191 c and q).

More Information is provided in Technical Bulletins 031 (August 92), 043 (November 92) and 055 (February 93).

**PLEASE NOTE THIS REFERS
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