

# Safe operation of passenger carrying amusement devices - water chutes

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These Guidance Notes are published under five subject headings: Medical, Environmental Hygiene, Chemical Safety, Plant and Machinery and General.

## INTRODUCTION

1 The Code of Safe Practice at Fairs was published by the Health and Safety Executive (HSE) in April 1984. It is the result of a joint initiative of HSE and the associations\* representing the amusement industry designed to improve safety standards at fairgrounds. The Code describes general principles and procedures required to safeguard operators, employees and members of the general public against injury from fairground amusement devices.

2 This Guidance Note describes various factors that can contribute to accidents on water chute rides and the precautions that should be taken to avoid them. It is intended for controllers, operators, ride attendants and anyone else concerned with the safe operation of these rides.

3 The guidance is based on HSE reports of incidents, visits to fairgrounds by inspectors, and the considerable experience of fairground operators. The advice is not exhaustive and should be read in conjunction with the Code and its Technical Annex. However, compliance with this Guidance Note or the adoption of other equally effective measures will reduce the risk of accidents on these rides.

## SCOPE

4 This Guidance Note deals with the safe operation of a category of passenger-carrying amusement devices known as water chutes. These are a type of track-guided ride in which the passenger-carrying boats are released from a high point on a track, and are thereafter propelled by forces generated by gravity, passing through a water splash before returning to the station. The guidance does not deal with log flumes, wild water rides or roller coasters.

5 The guidance deals both with rides supported on steel structures and timber structures. Most water chutes in the United Kingdom are installed on fixed sites.

\* The British Association of Leisure Parks Piers and Attractions  
The Showmen's Guild of Great Britain  
The British Amusement Catering Trades Association

## DESCRIPTION OF RIDE

6 Passengers ride in boats fitted with castors and side wheels. After passengers have boarded the boats at the ride station, the boats are sent along the track to the start of an incline which normally rises to the highest point on the ride. The boats are then hauled up the incline to a point where the track peaks and at this point they are released. They then follow the track which ends at the top of the chute where the boats become supported on skids fastened to their base, thus disengaging the castors. They then slide down the chute on water lubricated track boards and pass through a tank of water, in which the track is submerged, before rising and re-engaging the castors to follow the track into the ride station. A number of boats can be in use on the track at the same time but should be correctly spaced. Brake units for controlling the speed of the boats are located on the section of the track leaving the tank and again before entering the station. There is also an emergency brake situated at the top of the chute to prevent more than one boat being on the incline at the same time.

## RISKS

7 The safe design and safe operation of water chutes should, so far as is reasonably practicable, guard against:

- (a) passengers falling or being thrown from boats;
- (b) collisions between boats;
- (c) injury to passengers by rapid deceleration of boats during emergency braking or as the result of mechanical failures;
- (d) failure of roll-back arresters;
- (e) unsafe working practices by employees during operation, inspection and maintenance of the ride; and
- (f) reckless behaviour by passengers.

## SAFE ACCOMMODATION OF PASSENGERS (paragraphs 31 to 40 of the Code)

8 Passenger accommodation should be constructed so that each passenger is safely carried in the boat

during the course of the ride by containment, restraint or a combination of both to the extent necessary to minimise the risk of injury. In determining what standards of containment and restraint are necessary, the assessment made should take account of forces generated by rapid deceleration both during emergency braking and resulting from mechanical failures in the boats or track, as well as those forces generated during the normal course of the ride.

9 The advice contained in paragraph 33 must be followed if any modification is planned which may affect the integrity of the passenger containment arrangements.

10 Areas alongside or above the track that may be reached by properly accommodated passengers should be clear of features which, because of their position, design or material, could cause reasonably foreseeable injury to anyone who leans out, or puts a limb outside the boat.

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### **SAFE OPERATION OF RIDE** **(paragraphs 41 to 70 of the Code)**

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11 Systems of work and standards of supervision play an important part in the safe running of any passenger carrying ride. The ride controller should ensure that the systems of work employed are safe and that employees operating a ride are adequately supervised.

12 The ride controller should decide how many attendants are needed to operate the ride safely and should ensure that the correct number are on duty and properly supervised when the ride is in operation.

13 The ride operator and attendants should ensure that boats are brought to a halt or held stationary relative to the platform before passengers are allowed to get in or out.

14 No boat should be sent from the loading station until all the passengers are properly accommodated. Clear instructions about how they should behave during the ride should be displayed on the ride.

15 Where a boat comes to a halt on the track, for example, because of mechanical failure or if the unit is arrested on an anti roll-back device, the ride operator should reassure passengers and instruct them to remain seated in the boats. (See paragraph 14).

16 The ride controller should make arrangements for the safe evacuation of passengers from boats which become stranded away from the ride station. Priority should be given to returning passengers to the station in the boat; they should only be asked to get out of the boat if it would be unsafe or impracticable for them to be returned to the station in the boat.

17 Water chutes which have manually operated braking systems and which operate with more than one boat free on the track beyond the hoist, should be supervised by a minimum of two people, one of whom should be able to operate the emergency braking

system at any time while the ride is in use. The person in charge of this braking system must be able to monitor effectively the progress of the boats on the track from the operating position and should be able, by utilising appropriate controls, to activate the emergency braking system and switch off the boat hoist. Where reasonably practicable, a single control device should be provided for this purpose.

18 The intervals at which boats are released from the hoist should be controlled so that the length of track separating consecutive boats at any point in the circuit has at least one emergency brake unit.

19 When in motion or use all dangerous parts of machinery should be securely fenced by suitable guards in accordance with the British Standard Code of Practice: *Safeguarding of Machinery* BS 5304: 1988 or equivalent standard.

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### **PASSENGER ACCESS TO THE RIDE** **(paragraphs 57 and 58 of the Code)**

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20 Low level sections of the track and any parts of the track support structure which young children might be able to climb should be fenced off. This fencing should be at least one metre high and should be constructed and positioned in such a way that people cannot reach over, through, or under it into areas where there may be danger.

21 Arrangements should be provided for preventing uncontrolled access to the loading platform.

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### **EXAMINATION AND INSPECTION OF RIDES** **(paragraphs 1 to 23 of the Code)**

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22 Each ride should be thoroughly examined at least once in every 14 months by an independent appointed person as required by the Code. This examination should, where practicable, be carried out before the season starts, but in any case within three months of its starting. This examination should be based on a check list prepared by the appointed person on the basis of experience, discussions with the ride controller and advice from the ride manufacturer (where available). The examination should, where applicable, include inspection of:

- (a) the track support structure, its foundations and any packing materials used;
- (b) the track, track joints and the fixing between track sections, or between the track and the support structure;
- (c) the pull-ups, their hoists, chains or ropes, and the dogs or grips which engage with them;
- (d) roll-back arresters and arrester dogs;
- (e) brake assemblies and their fixings;

- (f) the brake fin and/or other brake components mounted on the boat;
- (g) the boat structure;
- (h) passenger seating arrangements;
- (i) the location and condition of all boat position and brake condition sensors;
- (j) the assessment of the functioning of the ride control system during trial running of the ride;
- (k) the water level in the tank to ensure it is at the correct height and that the overflow is set accordingly; and
- (l) the water flow on the chute to ensure it is adequate and that deflectors are functioning.

This list is provided as a guide only and is not intended to be exhaustive; other parts of the ride may also require examination.

23 Where the appointed person directs, or where recommended by the manufacturer parts of the ride should be subjected to suitable non-destructive test. Such testing should be carried out by people who are competent to select and apply appropriate techniques and interpret the results.

24 There should be a daily inspection and trial run of the ride before it is brought into use. These operations should take account of information supplied by the manufacturer (where this is available) and should be based on a suitable check list which is signed by the person performing the inspection. Such inspections should be carried out by properly trained staff.

25 These operations should, where appropriate, include inspection of:

- (a) the dogs or clamps which engage with the hoist chain or rope of the pull-ups;
- (b) the roll-back arrester devices and their dogs;
- (c) the condition of the boat castors, side wheels, pins and bearings;
- (d) track joints and the condition of the track surface;
- (e) the operation and fixing of braking mechanisms and brake parts fixed to the boats;
- (f) passenger seating arrangements;
- (g) the boat transfer station and the transfer track positioning. This should be carried out before attempting a trial run;
- (h) the condition of the hoist ropes or chains at the pull-ups;
- (i) the condition and thickness of the brake members (steel angles) and adjustment by the use of shims;
- (j) correct operating water level in tank; and
- (k) correct water lubricating of chute.

The above list is not exhaustive and other features may need to be included in the daily inspection.

26 Following this inspection, a trial run should be carried out. This trial should involve all the boats to be

used that day, and should be used to check the boats, the operation of the brake units in normal use and the proper functioning of the control system.

27 People who ride during a trial run should travel in the normal riding position. The ride operator or other person conducting the trial run should ensure that the track is clear and that no one is in a dangerous position before the trial run is started.

28 The ride should not be made available to the public until any adjustments or repairs judged to be necessary as a result of this inspection have been satisfactorily carried out and a further trial run completed.

29 Records of all examinations and inspections should be kept by the operator and/or the ride controller in the form required by the Code.

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## **MAINTENANCE OF THE RIDE**

### **(paragraphs 24 to 30 of the Code)**

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30 In this guidance a distinction is drawn between routine maintenance operations and those operations involving modification or repair of the ride likely to affect the integrity of the device. This is an important distinction; when carrying out such modifications and repairs ride controllers should follow the advice contained in the Code of Safe Practice at Fairs (paragraphs 9 and 107 to 109) and the Technical Annex to the Code.

31 The ride should be maintained in accordance with the manufacturer's instructions. If such instructions are not available, the ride controller should prepare suitable instructions which should incorporate advice from the ride supplier, the independent appointed person and other sources of relevant expertise.

32 Where maintenance operations involve the replacement of parts, these parts should be of suitable design and specification. If the replacement parts used are of different design or specification than those specified by the manufacturer, their use may affect the integrity of the ride. In such circumstances the guidance in paragraphs 33 and 34 may need to be followed.

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## **MODIFICATION AND REPAIR**

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33 Where it is intended to carry out modifications or repairs which may adversely affect the integrity of a ride, the modifications should be devised in accordance either with the manufacturer's and designer's instructions, or with a plan and specification drawn up by a person competent to prepare such instructions. Once these instructions have been drawn up they should be submitted to an independent consulting engineer to establish that the design concept is sound and that any calculations are correct before changes are made.

34 Ride controllers should take care to ensure that their employees and others who may be involved with the maintenance, modification and repair of the ride, make a distinction between operations involving routine maintenance and those which involve modification and repair and should issue clear instructions regarding this distinction.

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## **ACCESS TO THE RIDE FOR MAINTENANCE AND REPAIR AND IN EMERGENCY**

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35 Ride controllers should make suitable arrangements for allowing access to the ride for the purposes of inspection, examination, testing, maintenance, repair and in emergency. In this context ride controllers should consider the use of suitable permit to work schemes and the provision of power isolators which can be locked in the off position by maintenance staff, contractors or any other people who may need access to the ride.

36 When maintenance personnel or other employees ride in the boats to test or examine the ride, they should, where reasonably practicable, ride in the normal riding position.

37 In view of the risk of injury to personnel in the event of a fall from one level to another during ride maintenance or repair, it is important that work of this kind on water chutes is properly planned and controlled.

38 Operations involving the construction, structural alteration, demolition or repair of the structure of a ride may well be subject to the Construction Regulations made under the Factories Act 1961.\*

39 Where it is necessary to gain frequent access to raised parts of the ride, for example brake units, or the ride support structure, for the purpose of inspection or maintenance then such access should be gained by safe means, for example via suitable fixed ladders, stairs or walkways or mobile access equipment.

40 Suitable working platforms should be provided adjacent to the emergency brake.

41 Where working platforms are provided and a person is liable to fall more than 1.98 metres (6 feet 6 inches) from any side of such platforms, then the platform should be provided with suitable guard rails and toe boards (as specified in paragraph 38) or other suitable means of preventing people or materials falling from the edge of the platform.

42 Walkways and inclined ramps adjacent to haul-ups and in other locations should have a surface which provides a secure foothold. Where any person is liable to fall a distance of more than 1.98m (6 feet 6 inches)

from the edge of a ramp, then guard rails and toe boards should be provided at that edge. The upper rail of the edge protection should be designed so that it can be used as a hand rail and easily gripped.

43 Where it is necessary for people to gain access to parts of the ride, or its supporting structure in positions where there is no permanent equipment provided for safe access and safe working, then suitable temporary arrangements should be made.

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## **TRAINING OF OPERATORS AND RIDE ATTENDANTS** **(paragraph 71 and 72 of the Code)**

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44 Each operator should receive suitable and sufficient training in the safe operation of the ride. Training should include adequate instruction on:

- (a) the method of operating the ride;
- (b) the maximum passenger loading of the boats;
- (c) the systems of work that should be followed to ensure the safety of ride attendants;
- (d) the systems of work that should be followed to ensure the safety of passengers and other members of the public;
- (e) the duties of ride attendants; and
- (f) how to carry out the daily inspection of the ride where undertaken by them.

45 It is desirable that operators are aware of the Code requirements relating to daily inspections, the intervals at which thorough examination and testing should be carried out and the reasoning behind such procedures.

46 Each attendant should receive suitable and sufficient training for the type of work he is expected to do. Training should include adequate instruction on:

- (a) control of passengers on the station platform and the loading and unloading areas;
- (b) safe systems of work and the risks which should be avoided;
- (c) the procedures for reporting defects or breakdowns; and
- (d) procedures that should be followed in the event of an emergency.

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## **RIDE CONTROL SYSTEMS**

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47 The control of existing water chute rides is a manual operation. An emergency brake is located at the top of the chute and can be activated at various points around the ride. Fail safe interlocking systems can be incorporated to ensure that no boat can be despatched down the chute until the preceding boat has cleared the long brake.

\* The Construction (General Provisions) Regulations 1961  
The Construction (Lifting Operations) Regulations 1961  
The Construction (Working Places) Regulations 1966 and  
The Construction (Health & Welfare) Regulations 1966

48 Markers of different colours spaced at intervals up the chain track give the minimum distance permitted between boats for differing services, ie number of boats in use.

49 Warning lights are provided at the start point of the ride to indicate that the brake man is in position; red STOP and green GO are automatically controlled by a device fitted to the brakeman's seat.

50 Chain 'stop' button stations are provided at a number of points on the platform and the brakeman's box has a 'stop' button which stops the chain and applies the emergency brake.

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#### **FURTHER INFORMATION**

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This Guidance Note is produced by the Health and Safety Executive. Further advice on this and any other publication produced by the Executive is obtainable from St Hugh's House, Stanley Precinct, Bootle, Merseyside L20 3QY, or from Area Offices of HSE.