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Sealed Inflatables –Safety in use

1 Introduction

1.1 This document is intended to provide advice on the requirements to ensure the safe supply, operation and inspection of sealed air inflatables used by the public for leisure and entertainment purposes. Sealed inflatables are becoming more numerous and their range of applications is increasing. Typical uses include devices such as:

- Trampolines.
- Mobile base units for water walkers or battery boats.
- Crash barriers for battery-operated bumper car devices.
- Floating static platforms.
- Climbing and jumping frames.

1.2 Sealed inflatables can place users and operators at risk of serious harm through a range of circumstances including the uncontrolled or explosive release of pressurised air, or loss of the device due to high winds.

2 Definitions

2.1 In this document, the following terminology describes the roles of people involved in the inflatable device lifecycle:

Manufacturer – The person or organisation responsible for:

- The design and construction of the sealed inflatable and demonstration that it is fit for its intended purpose (including any limitations in application).
- Provision of an operations manual containing all necessary information (including any limitations of use) to ensure continued safe operation of the device.
- Provision of a maintenance manual containing all necessary information to ensure the ongoing safe condition of the device.

Inspection body - An organisation, part of an organisation or individual with the appropriate technical skills and relevant practical experience to carry out one or more of the following inspections:

- Design review
- Initial test
- Annual thorough inspection

Controller * – The person, organisation or hirer (those who hire to others) having the overall control, including responsibility for maintenance, of the sealed inflatable device.

Operator – The person in overall charge of the operation of the sealed inflatable at any time when it shall to be available for public use.

** note: There may be circumstances where the roll of Controller and Operator are merged*

3 Legal Requirements

3.1 Legal responsibilities to ensure that sealed inflatables are correctly designed, maintained and operated safely are set out in Section 3 and Section 6 of the Health and Safety at Work Act (1974) and require, as far as reasonably practicable, that:

i. The article is designed and constructed in such a way that it will be safe and without risks to health at all times when it is being used for, or in connection with, the entertainment of members of the public.

ii. Persons not in employment who may be affected are not thereby exposed to risks to their health or safety.

iii. The equipment is maintained in a safe condition at all times and that it is subject to such testing and examination as may be necessary to maintain its safe condition

4 Essential documentation

4.1 Inflatable devices should not be operated unless the Controller/Operator are in possession of the following documentation, relevant to the specific inflatable(s):

- A detailed written assessment of the design against safety principles, that allows all parties to understand the basis of safety. This is normally undertaken by a competent person or organisation and is referred to as a “design review”. Wherever possible, reference to the relevant standards and guidance should be made, this could include, but is not limited to the following;
    - BS EN 13814 Fairground and amusement park machinery and structures.
    - BS EN ISO 25649 Floating leisure articles for use on and in the water.
    - ISO 17842 Safety of amusement rides and amusement devices.
    - BS EN 14960 Inflatable play equipment – Safety requirements and test methods.
- In line with HSG 175 – Fairgrounds and amusement parks: Guidance on safe practice. A report of initial test where a physical trial of the device takes place, to confirm the design review When necessary, these trials can be used to amend the design review or provide additional requirements for ongoing inspection and maintenance.

- A “Declaration of Operational Compliance” (DOC) resulting from a successful annual thorough inspection or an equivalent recognised means of providing evidence of a satisfactory examination carried out by a competent inspection body, e.g. relevant markings (see 5.3) etc.

- An Operations Manual containing all the relevant information for safe use including but not limited to the means of measuring internal pressure

- A Maintenance Manual containing all relevant information to ensure the continued safe condition of the sealed inflatable including sufficient information for the completion of the in-service inspection, which would normally include the following information:

    - the maximum operating pressure;
    - the test pressure, which must be above the maximum operating pressure
    - details of any necessary requirements to allow the Inspection Body to safely undertake the pressure test;
    - details of any repair criteria or repair procedures

4.2 There may be some inflatables that are either legacy play equipment, or of unknown origin (e.g. imported from outside the United Kingdom, historical equipment, or other items with no identification markings). The controller/operator of the inflatable should still ensure that the inflatable has been through a suitable design review and has an up to date in-service inspection record and is safe for use. All second-hand inflatables must be provided with maintenance records, details of any modifications, significant repairs, etc.

4.3 **For inflatable devices lacking the relevant paperwork, as detailed above, Inspection Bodies will be required to undertake additional work and investigation in order to satisfactorily complete the design review, initial test and in-service inspection.**

5 The Inspection Body's Responsibilities

5.1 The Design Review

The design review should be based on the information provided by the manufacturer and as a minimum should include the following information, but not limited to;

- Details of the construction of the inflatable, which may include where relevant, an assessment of the materials used, standard of fabrication and verification of any standards claimed in compliance.
- The intended use of the inflatable device, which may include where relevant, any limitations of use.
- Details of the fabric used for the device, which may include where relevant, appropriate strength considerations, with the safety factors that have been applied in the design being clearly stated.
- Details of the ability of the sealed inflatable to withstand, without risk of failure or degradation in performance, the mechanical stresses present in the fabric generated by the internal pressure, throughout all foreseeable operating and maintenance conditions, and may include where relevant, verification by engineering techniques such as stress analysis, pressure test etc.
- Details of the maximum inflation pressure, which must also be clearly and indelibly marked next to the inflation point.
- Details of how internal pressure can be monitored whilst the sealed inflatable is pressurised e.g. availability of tap-in point at the inflation inlet valve and any clarification that the device cannot be over-pressurised.
- Details of the intended number of anchor points that must be used, to resist foreseeable wind and/or other loads. This would normally be verified by the design reviewer through calculation and the total anchor points required must also be stated clearly in the Operations Manual
- Details of the maximum wind speed the device can safely operate in.

- Specification for all ancillary equipment (inflation devices, transport bags etc) deemed necessary to safely operate the inflatable and maintain it in good condition.
- The provision of a comprehensive Operations Manual.
- The provision of a comprehensive Maintenance Manual.

5.2 Initial test

An initial test is a test or series of tests to check that the device operates safely in accordance with the reviewed design specification and the instructions in the operations manual. This test should be carried out by, or on behalf of, the manufacturer, supplier or importer and witnessed by a competent person.

The initial test(s) shall ensure, as a minimum, that:

- The equipment functions safely and in accordance with the instructions contained in Operations Manual
- The overall dimensions of the equipment are in accordance with those contained in the Operations Manual
- All safety devices including pressure gauges, pressure relief valves etc. function correctly
- The equipment does not fail in a dangerous way due to any foreseeable internal over-pressure, including up to the designated safety factor determined by the manufacturer.
- The equipment does not fail in a dangerous way when subject to any foreseeable operational mechanical loads, including up to the designated safety factor determined by the manufacturer
- The equipment may be inflated, operated, deflated and packed away in readiness for removal and storage without the need for specialist knowledge, techniques or
- The maximum safe operating pressure is clearly and indelibly marked adjacent to the inflation port.

An initial test is needed at the following times:

- before first use of any device in Great Britain;
- before reuse after any safety-critical modification or repair, but this may only need to cover the parts affected;

The initial test/conformity test should include, where relevant, but not be limited to:

- Ensuring the device conforms to the specifications set out in the design review, including but not limited to the dimensions, materials specification and intended use. This is particularly relevant when one design review is being used for a series of devices.

- Ensuring the device can withstand the intended imposed loads. For example, if the device is to be a water tank then it should be filled to maximum (or a small recorded factor above maximum) and any deformations assessed.

- Ensuring any safety pressure limiting systems work as intended, including the stalling of the inflation system (blower fan or compressor) if required.

- Ensuring the process of monitoring the internal pressure during operation works as intended if required

- Ensuring all safety markings such as maximum operational pressure are clearly marked on the device.

- Other tests may be required depending on the intended use of the device.

When the initial test is complete, the competent person should discuss any unsatisfactory results with the designer, controller and the person coordinating the design review and document all results, including damage or failure. The competent person should document any repeat testing to be carried out after any required remedial action has been completed.

A report of initial test should be issued to the person who has commissioned the report for subsequent inclusion in the operations manual. A report of satisfactory initial test should not be issued unless the competent person has witnessed and verified that, at the time and place of test, the device performed safely.

5.3 In-service Inspection

An in-service inspection should be carried out periodically (maximum 12 months) to independently check that the inflatable device is in good condition and in good repair. This in-service inspection should be completed by a competent person, who determines the inspection interval. The Competent Person shall also ensure that all safety devices function correctly and within tolerance.

The key areas that the competent person should include as part of their annual in-service inspection should include, where relevant, but not be limited to:

- All anchor ropes and anchors are available and in good condition.
- The number of anchor points remains sufficient.
- The recommended anchor and anchor rope details are included within the operating instructions.
- The inflation device conforms to the original manufacturer's specification.
- Any devices fitted to the inflation source (blower fan or compressor) designed to prevent over-pressurisation are in good condition. Where possible, the device should be witnessed and tested to ensure either:
    - the blower fan is compatible and that it stalls before the maximum safe pressure is exceeded; or
    - the compressor is fitted with a safety cut out (pressure sensor or relief valve) to prevent over-pressurisation of the sealed inflatable.
- The fabric and joints are in good condition.
- **Where the failure of the device could result in injuries to persons the fabric strength remains within the manufacturer's specifications.**
- The maximum operating pressure is indelibly marked at the inflation point.
- The maximum operating wind speeds are clearly marked.

6 The Controller Responsibilities

6.1 Throughout the working life of the sealed inflatable, the Controller shall ensure that any significant concerns resulting from the periodic inspections (design review, initial test and annual thorough inspection) are adequately addressed prior to placing or returning the inflatable into service. The controller is responsible for ensuring that adequate maintenance

of the sealed inflatable is carried out, in line with requirements specified in the maintenance manual and any recommendations made by the Inspection Body.

6.2 The maintenance manual must include adequate instructions detailing the techniques required to repair damage to fabric such as tears, holes, worn or broken load tapes etc. Repairs to the inflatable fabric should only be undertaken in accordance with the manufacturer's instructions and should only be carried out by a competent person or organisation approved by the manufacturer and/or competent person

6.3 Completed repairs should be inspected and be accompanied by a certificate issued by the competent organisation (who completed the repairs) stating that the repairs have been completed to a satisfactory standard and in accordance with the manufacturer's instructions or those from another competent organisation/person. Such certificates should be retained by the controller of the inflatable and provided to the inspection organisation, who should record details of the repair as part of the annual inspection. All documentation is intended to demonstrate the ongoing maintenance of the inflatable during service.

6.4 Where a safety-critical modification is made (including the replacement of a component which departs from the original design specification) the modification must be subjected to a design review before the change is made. These could include changes in the operating parameters of a device, such as a replacement blower fan/compressor, change of use, changing the height restriction or number of occupants on the sealed inflatable at any time etc.

6.5 If at any time a defect is found which could possibly lead to danger, the public should not be allowed to use the device until the cause has been identified and the defect remedied. This may include checking all similar components. If there is any doubt about continued safety the device should not be used until an inspection body has confirmed that it is safe to do so.

7 Operator responsibilities

7.1 The Operator takes overall responsibility to ensure that the sealed inflatable is located well away from possible hazards such as overhead powerlines or other obstacles with hazardous projections (e.g. fences). If the ground surface is abrasive, oily or dirty, a ground sheet should be used to prevent wear and tear of the base material. Before siting the inflatable, a close visual inspection of the base area must be undertaken, to ensure any discarded objects or other debris are removed, to minimise the potential for tears or piercing of the sealed inflatable.

7.2 The person(s) filling the sealed inflatable must remain in attendance during setup at all times. The power source (i.e. blower fan or compressor) must always be physically disconnected from the sealed inflatable, once inflation pressure has been achieved. This is to ensure that the risks from inadvertent energisation or continuing to fill/overfill the sealed inflatable are minimised.

7.3 The operator should take regular measurements of the internal pressure using a suitable pressure measuring device to ensure that the internal pressure remains within the maximum and minimum operating range specified by the manufacturer, in the operations manual.

7.4 Note, that an increase in the internal temperature of the air within the inflatable could result in an internal increase in pressure. The colour of the inflatable can play a part in any temperature rise, with dark colours absorbing a lot more heat than lighter ones because

they absorb more light energy. The operator should consider whether there is a need to take additional pressure measurements on hot days and if necessary, adjust the internal pressure to the required level as stipulated in the operations manual.

7.5 When the inflatable is being operated outside, the operator should use a suitable hand-held anemometer to measure the wind conditions at regular intervals. The operator should visually check for changes in wind direction (e.g. by looking at how the trees are swaying) to make sure readings are taken in the direction of the wind. **If an anemometer is not available, the inflatable should not be operated outside**.

Smartphone weather applications are not suitable to assess wind speed as they do not take localised wind conditions into account.

7.6 Sealed inflatables should not be used when the wind or gusts are in excess of the maximum safe wind speed specified by the manufacturer. This information should be stated clearly both on the inflatable device and in the operations manual.

7.7 Safe use of the sealed inflatable is the responsibility of the Operator, throughout the ongoing day to day availability of the device to the public. Where appropriate the operator should ensure that:

- There is constant supervision by a suitably trained person, which would normally be by at least one person per item of equipment.
- Written safe operating instructions are always available with the inflatable.
- The number of users on the inflatable at the same time does not exceed the maximum number specified by the manufacturer.
- Users of the inflatable do not exceed the height limit and that bigger users are kept separated from smaller ones.
- Users can get on and off safely, with suitable safety matting at the entrance which complies with the requirements set out in BS EN 1177.
- People remove shoes and glasses, empty their pockets of all sharp or dangerous items.
- Anyone obviously intoxicated is not allowed on.
- Users do not climb or hang from the walls.
- Regular checks are undertaken to ensure that anchor points are still secure.

7.8 The operator should ensure that the inflatable is operated in accordance with the instructions contained within the operator's manual, and that any operational limitations are complied.