

Inflatable Structures

Area: Dry Activities **Category:** Operations

Introduction

This guidance provides an overview of the general principles for the management of inflatable structures (including those used on water). These simple precautions can help avoid serious incidents, whether the equipment has been purchased or hired for an event. This guidance is applicable to all forms of recreational inflatable structures. This guidance does not consider the use of small inflatable toys in water. This is considered within the CIMSPA Swimming Pool Equipment guidance.

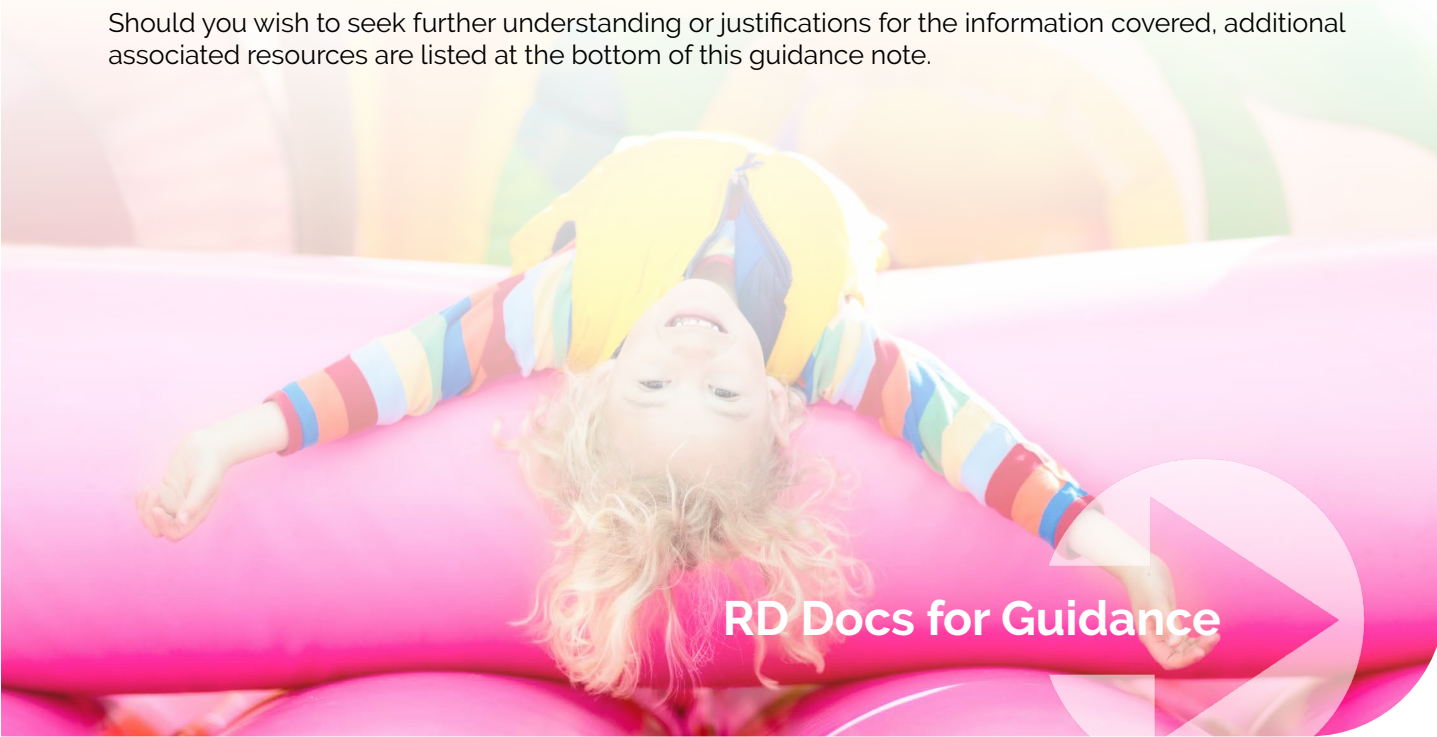
How to use the guidance notes

Operators have a legal requirement to manage health and safety. Employers must protect the 'health, safety and welfare' at work of all their employees, as well as others on their premises. This guide has been produced to help operators do this.

If the content of these guidance notes relates to aspects of your operation, it is recommended you review your risk assessments, policies, procedures, safe systems of work and training to ensure the content provided has been considered.

The guidance provided is not intended to be exhaustive and will be reviewed and added to from time to time by CIMSPA. CIMSPA and their contributors provide no warranty as to its accuracy or completeness.

Should you wish to seek further understanding or justifications for the information covered, additional associated resources are listed at the bottom of this guidance note.



RD Docs for Guidance

This guidance note covers:

- Hazards and risks
- Safe set up
 - Buying or hiring inflatables
 - Safe set up of inflatable structures on land
 - Enclosed inflatables
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- Operating standards
 - Land based inflatable structures
 - Water-based inflatable structures
 - Inflatable slides including those used on water
 - Safe operation for outdoor use
 - Private hire
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 - Repairs and safety-critical modifications
- Cleaning and hygiene (including storage)
- Supervision and Training
- Emergency procedures and first aid

Hazards and risks

Serious incidents have occurred where inflatables have collapsed or blown away in windy conditions. However, there are many other hazards and risks including slips and trips, collisions with other participants, incorrect handling, falls from the structure and injuries due to poor maintenance. A suitable and sufficient risk assessment should be undertaken before the activities take place on any inflatables.

Safe set up

When buying or hiring inflatables

The Health and Safety Executive (HSE) supports Pertexa Inflatable Play Accreditation (PIPA) and the Amusement Device Inspection Procedures Scheme (ADIPs). Both of these provide industry inspection schemes for inflatables. Fairgrounds and amusement parks: Guidance on safe practice HSG175, states there is no legal obligation to use an inspector from any particular registration scheme. However, most play inflatables will display either a numbered PIPA tag or an ADIPs declaration of compliance (DoC) to show they comply with the relevant British Standard.

The scheme's websites can be used to check that safety tests have been carried out and to find out what to do if the equipment has no PIPA tag or ADIPs DoC (people's safety may be at risk if the inflatable doesn't have one of these).

CIMSPA recommend land-based inflatables which fall within the BS EN 14960 Inflatable play equipment - Safety requirements and test methods, are PIPA inspected. More details are provided later in this guidance. The ADIPs scheme covers a wider range of inflatable play equipment as well as more traditional fairground rides. CIMSPA recommend where applicable, ADIP registered inspection bodies should be used to provide a declaration of compliance.

Sealed Inflatables

The HSE recommends the following documentation should be provided by the manufacturer and retained when buying or hiring a **sealed inflatable**.

- A 'design review', which is a detailed written assessment of the design against safety principles. This is normally carried out by a competent person or organisation and allows everyone involved to understand the basis of safety. Wherever possible, reference to the relevant standards and guidance should be made. This could include but is not limited to:
 - 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.
- A report of the initial test involving a physical trial of the device to confirm the design review (covered in HSE's Fairgrounds and amusement parks: Guidance on safe practice (HSG175)). 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 (read the advice on in-service inspection)
- A maintenance manual containing all the relevant information to ensure the condition of the sealed inflatable remains safe, including how to complete the in-service inspection. This would also normally have the following information:
 - The maximum operating pressure
 - The test pressure, which must be above the maximum operating pressure
 - Details of the requirements that will allow the inspection body to safely carry out the pressure test
 - Details of any repair criteria or repair procedures.

If the equipment is legacy play equipment, or of unknown origin, it should still have a suitable design review, have an up-to-date in-service inspection record and be safe for use. All second-hand inflatables must be provided with maintenance records and details of any modifications and significant repairs etc.

For inflatable devices lacking the relevant paperwork as detailed above, inspection bodies must carry out additional work and investigations satisfactorily complete the requirements of the design review, initial test and in-service inspection.

Inflatables which fall within the PIPA scheme

The PIPA scheme specifically covers inflatable devices that fall within the scope of the BS EN 14960. This applies to structures relying on a continuous supply of air to maintain its shape, either on or in which users may play, bounce and/or slide. A new inflatable which falls within this standard should have an 'initial test' to confirm it complies with BS EN 14960. PIPA is not applicable to inflatable water-borne play and leisure equipment, domestic inflatable toys, air-supported buildings, inflatables used solely for protection, inflatables used for rescue, or other types of inflatable toys where the primary activity is not bouncing or sliding. More information is provided in the Examination, Inspection and Maintenance section of this guidance.

Other inflatables

Where inflatables are not sealed or come under the PIPA scheme it is important they meet the relevant British Standard. Note: non sealed water-based inflatables come under BS 14960, but do not require a PIPA inspection.

Safe set up of inflatable structures on land

- Ensure that the inflatable is located well away from possible hazards, such as walls, doors, equipment and ceilings. They should not block fire exit routes
- Before siting the inflatable, a close visual inspection should take place of the base area to make sure that any discarded objects or other debris are removed, minimising the potential for tears or piercing of the sealed inflatable
- If the ground surface is abrasive, oily or dirty, a ground sheet should be used to prevent wear and tear of the base material
- Ensure the correct blower is being used (the blower specification, including output, will be given in the operating manual). For sealed inflatables, the power source (i.e. a blower fan or compressor) must always be physically disconnected from the sealed inflatable once inflation pressure has been reached.
- Ensure there are no obvious signs of over-tension or sagging of the structure. Also check if the anchor points have been pulled out during inflation and are intact. The inflatable should be secured in line with the manufacturer's instructions
- Ensure the connection tube and blower are firmly attached to each other
- Ensure impact-absorbing mats, that are no more than 5cm deep, with mats at least 25mm thick are in position with safety matting at the entrance/access points. Matting should comply with 'BS EN 1177 Impact attenuating playground surfacing, Determination of critical fall height.' It is recommended they extend for a distance of at least 1.2m from the open side
- Ensure there are no holes or rips in the fabric or seams
- Ensure it looks symmetrical – if it looks misshapen or deformed, there could be internal problems that make bouncing unpredictable and it should therefore not be used
- Refer to the manufacturer's operating manual for inflatable specific requirements, including anchoring requirements to maintain the shape of the device and prevent overturn. Anchorage points near to the entrance/exit of the equipment should be set up to minimise the danger of tripping, abrasion or other injuries
- The HSE recommend the blower should be positioned somewhere inaccessible to children and should be suitably guarded at the inlet and outlet. The length of the inflation tube must be at least 1.2m when positioned on a walled side of the equipment and 2.5m on any open side. Only electrical blowers should be used indoors.
- Electrical cables should be secure, away from users and not present itself as a trip hazard. Ensure the blower has no exposed wires or loose cables and the unit is secure with no loose fittings.
- The inflation tube must be at 90 degrees to the inflatable with no bends or kinks which could reduce the airflow – regular checks on the tube and blower position should be made throughout use
- Ensure zips are fully secured
- Restricting access to the inflatable when it is not supervised, e.g. locked room
- These relevant pre-use checks should be recorded.

Note: There is a legal duty to assess and eliminate or reduce the risk of injury to employees which can result from manual handling operations. This includes those associated to the set-up, operation and dismantling of inflatables. Manual handling risk assessments should be completed by the designated responsible person and operators trained in the systems of work.

Enclosed inflatables

In totally enclosed structures, the HSE recommend the following additional requirements should be considered:

- Signs should be displayed showing exits
- Equipment with maximum user numbers greater than 15 should have more than one exit so that the inflatable can be evacuated quickly
- Deflation time should be sufficient to allow the structure to be safely evacuated
- Emergency lighting should be provided, where applicable
- Lighting should be tested daily before use.

Safe set up of inflatable structures on water

The size and depth of the pool or body of water immediately dictates the type and size of inflatable that may be provided. As a part of the risk assessment process, it is important to follow the manufacturer's guidance when deciding on the appropriate inflatable and when setting up and using it. Consideration should be given to the depth of the water and the risk of falls from height. As referred to in HSE 179 Health and Safety in swimming pools, users need to be warned of the depth of the water. The distance the inflatable is from the edge of the pool surrounds and other hard objects should be considered to ensure there is an adequate fall of distance. Where adequate fall of distance is not possible, impact absorbing material should be considered as well as supervision by a trained member of staff. Consideration should be given as to whether there are enough anchorage points in the pool surround and in the inflatable itself, and that they are of suitable strength.

The structure should be checked prior to each session for integrity, with particular attention being paid to seams, connection points if it is a modular structure, anchorage points and other potential areas of weakness. This check should be recorded.

Note: Consideration should be given to the Manual Handling Regulations 1992 when setting up and taking down inflatables. A manual handling risk assessment should be completed to identify for example the equipment, number of people and the training required when moving inflatables.

The siting of blowers and electrical requirements.

- Ensure hands are dry before using any electrical equipment.
- Only safe electrical voltage equipment is allowed in a zone extending 2m around the pool or basin area when the pool is being used. Constant blow inflation units must be situated off poolside. For example, in a store, but as a minimum 2m away from the water and protected from access by swimmers via a wall or partition extending up to 2.5m high. At all times the blower should be kept dry.
- All sockets in swimming pool environments including those located in zone C beyond 2m should be to industrial standard 'BS EN 60309-2-1999, Plugs, socket-outlets and couplers' for industrial purposes and either protected by electrical separation or fitted with an RCD (residual current device).
- Electrical cables and the flexible hose must be safely routed to avoid tripping hazards with warning signs placed at strategic positions as necessary.
- The constant air blower must be placed on a mat, or other soft surface, to absorb vibrations and for increased electrical safety.
- A portable residual circuit breaking device should always be used and tested before use. Before use, check that the blower has not been damaged since the last time and that the mesh guards over the air inlet and outlets are secure. Check that the cables are not chafed or worn and that plugs, sockets and switches are not damaged in any way. Do not use if the unit is in any way damaged.

Further information can be sourced from IET Wiring Regulations BS 7671:2018+A1:2020 which sets out the Requirements for Electrical Installations.

Operating standards

Operating instructions must be supplied by the manufacturer and the following standards should be enforced:

Land based inflatable structures

The HSE recommend:

- Following the operator guidance on maximum occupancy and height. Don't exceed the height limit and keep bigger users separated from smaller ones. A risk assessment taking into account the manufacturer's operating instructions should be completed to ascertain any age limits.

- Anyone obviously intoxicated should not be allowed on
- Don't allow users to climb or hang on the walls
- Do not permit users to perform somersaults
- Regularly check that anchor points are still secure
- People should not wear shoes or glasses and should empty their pockets of all sharp or dangerous items. This includes food, drink and chewing gum.
- For sealed inflatables make regular measurements of the internal pressure using a suitable pressure-measuring device. This is to ensure that the internal pressure remains within the maximum and minimum operating range specified by the manufacturer in the operations manual. Take additional pressure measurements on hot days and, if necessary, adjust the internal pressure to the level stipulated in the operations manual.

Other recommendations include:

- The equipment should be deflated after use to prevent unsupervised use. This process should be supervised
- There should be identified controls for starting, stopping and controlling the inflatable, and that these control systems should be safe.
- No smoking or barbecues near the inflatable at any time

Water-based inflatable structures

As well as considering the rules in the land-based section above, additional considerations should be considered for water-based inflatable activities. There should be a suitable number of trained, qualified staff present both prior to the start of the session to ensure that the inflatable is inflated correctly and safely, during the session itself and during deflation. At no time should staff who are employed on normal pool supervision be responsible for the inflation or deflation of equipment. Consideration should be given to additional hazards present such as entry, exit points and vision under the inflatable. Consideration should also be given to swimming ability requirements.

Examples of advice to be given to users of water based inflatables

Do not

1. Enter the water until given permission to do so.
2. Push or throw each other off the poolside onto the inflatable.
3. Swing or pull on the anchor ropes.
4. Deliberately swim under the inflatable.
5. Dive off the inflatable into the water
6. Enter the water from the slide head first unless specifically permitted by the manufacturers.
7. Lift the inflatable in an attempt to dislodge others.
8. Attempt to stand upright on sealed units.

Do

1. Remove all sharp jewellery, watches and other sharp objects before mounting the inflatable.
2. For continuous blow inflatables – get onto the structure from the end tethered to the poolside, jumping on rather than stepping onto it to ensure forward projection, thus reducing the danger of falling back and hitting the poolside.
3. Access the inflatable when instructed by the lifeguards, who are responsible for preventing overcrowding.
4. Where the inflatable is an aqua-run type or has a slide off exit, users must swim to the nearest side, leave the pool and re-join the queue at the shallow end.
5. Listen to the lifeguards and obey any instructions given.

Note: Specific rules from the supplier and local requirements should also be communicated such as the design features of the pool.

This information should be communicated through providing information, instruction and training.

Inflatable slides including those used on water

If the inflatable is or includes a slide, it must meet the 'Water slides - Safety requirements and test methods BS EN 1069-1:2017+A1:2019'. The attendant must exercise active control over the use of the slide. Free fall slides have been subject to a number of accidents.

- Only one user at a time may be allowed onto the slide, in a central position at the top
- A feet-first, sitting up or lying down position (on backs only) with elbows tucked in should be insisted on. Waving of arms and legs is potentially unsafe.
- For land-based slides and to prevent friction burns on exposed skin, users should be fully-clothed, including socks
- The bottom of the slide must be kept clear.
- Each user should move quickly away from the bottom of the slide on arrival before the next user slides down.
- The surface of the slide must be kept clean and smooth to allow users to slide freely.
- Where the manufacturer has indicated a maximum weight of user this must be adhered to.

Safe operation of inflatables for outdoor use

The most significant risks are those associated with the risk of injury to users and/or the escape of the inflatable due to high winds. Advice provided by the HSE and ADIPS includes;

- Inflatable structures should not be used when the wind or gusts are in excess of the maximum safe wind speed specified by the manufacturer or winds above 24 mph (38 kmph), which is Force 5 on the Beaufort Scale (small trees in leaf begin to sway). Weather forecasts can be obtained from the Meteorological Office.
- When the inflatable is being operated outside, use an anemometer to measure the wind speed at regular intervals. If one of these is not available, the inflatable should not be operated outside (smartphones do not take localised wind conditions into account). Visually check for changes in wind direction (such as looking at how the trees are swaying). Make sure readings are taken in the direction of the wind.
- When using the inflatable outside, all the anchor points must be used, with metal ground stakes at least 380 mm long and 16 mm wide, with a rounded top. They should have a welded metal 'O' or 'D' ring fitted to the end.
- All inflatables must have at least 6 anchor points. The operator's manual will state how many there should be, and checks should be taken to ensure they are all still in place and have not been removed. The ropes used to secure the inflatable should be in good condition and not stretched, frayed or rotten. Never use improvised tow ropes, e.g. bungee cord.
- If ground stakes cannot be used because of the surface (e.g. tarmac) use ballast with anchor points each weighing at least 163 kg and with suitable fixings to attach the guy ropes. The inflatable should be tightly secured to the ground so that the wind cannot get under it and lift it up.
- All other associated equipment must be safe, including the blower. Electrical equipment exposed to the weather should be suitably protected.
- Ensure that the inflatable is sited well away from overhead power lines or fences.
- Where petrol fuelled blowers are used, a safe system of work is to be observed when refilling the tanks. Access to these blowers should be restricted.
- Crowd control barriers should be used to handle large crowds in the immediate vicinity of the inflatable.

- Barriers should be at least 1m high and be capable of withstanding people leaning on them, or being pushed against them.
- The perimeter fence should be 1.8m to 2.5m from closed sides and 3.5m to 4.0m from the open side.
- An access gateway should be a minimum of 1.0m wide.
- The barrier may need to have an alternative means of exit or escape for use in an emergency.
- Vacate users from the equipment once the inflatable becomes wet, unless designed for this purpose.

Other hazards include collisions with rocks, uneven surfaces in and out of the water and entanglement on weeds. Recorded inspection should take place to ensure these are not present and the risk lowered so far as reasonably practicable.

The operating area at the front of the step/front apron should be kept clear of onlookers so that the supervising member of staff has a clear field of vision and can ensure that users can mount and dismount safely. This is also essential to have a clear view of the inflatable.

Note: this is not an exhaustive list and a responsible person should refer to manufacturer's instructions and the BS EN 14960.

Private Hire

A suitable and sufficient risk assessment should be completed before deciding if the equipment can be used for private hire sessions. If the equipment is used for private hires, it must be supervised at all times by the hirer with the same level of relevant training (recorded) as an employee would receive if supervising the equipment.

The hirer should always be issued with the terms and conditions of hire.

Operating standards

External maintenance

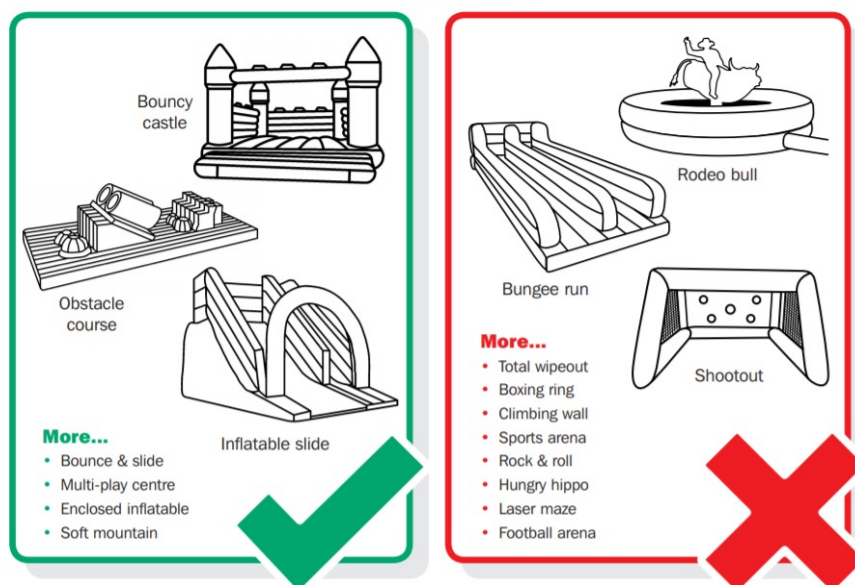
The HSE guidance states that each inflatable device should be thoroughly inspected at least every 12 months. This needs to be carried out by the competent person.

The Register of Play Inspectors International (RPII) and ADIPS inspectors are currently accepted as competent to test inflatable play devices. CIMSPA recommend inspectors registered to these bodies are used, however it is not a legal requirement to use inspectors from these schemes.

BS EN 14960 is the standard for design, manufacture and testing of certain types of inflatable play equipment. BS EN 14960 specifies the safety requirements for inflatable play equipment of which is a structure relying on a continuous supply of air to maintain its shape, on or in which users may play, bounce and/or slide. The PIPA scheme only covers inflatable play equipment within the scope of BS EN 14960. All inflatable equipment that falls within BS EN 14960, should be PIPA tested. The diagrams below are an indication of what inflatables can and can't be tested via the PIPA scheme.

Note: Water based inflatables are not required to be tested via the PIPA scheme but should be inspected at least annually by an independent inspector who CIMSPA recommend is registered by the RPII, ADIPS or PIPA.

RCDs should be tested every three months by an electrician using appropriate electrical test equipment. Any electric inflator should have portable appliance testing.



Abstract: www.pipa.org.uk/files/g1-the-scope-v1.pdf

Checks and inspections

For information on pre-use check of inflatables, refer to the manufacturer's guidance and the information provided in the safe set up of inflatables section of this guidance. These should be recorded.

Repairs and safety-critical modifications

Repairs to the inflatable fabric should only be made in accordance with the manufacturer's instructions and should only be carried out by a competent person. Repairs should be inspected and accompanied by a certificate issued by the competent organisation.

The HSE states where a safety-critical modification is made (including the replacement of a component which departs from the original design specification) the modification must go through a design review before the change is made.

Cleaning and hygiene (including storage)

Manufacturer's guidelines should be referred to when considering the cleanliness of the inflatables. Constant-flow inflatables can be wet on the outside and inside, and therefore support bacterial growth because they are by design pervious to water and air. They can be very difficult to disinfect and to dry inside and out.

The following recommendations are therefore advised:

- ensure the inflatable is dry before deflating and where possible, store off the ground, avoiding stacking
- store it in a dry place
- They should be frequently cleaned physically and periodically disinfected with 1000mg/l chlorinated water solution and air-dried prior to storage. Or alternatively, anything with an impermeable, non-porous surface could be wiped down with 60% v/v ethanol or 70% v/v isopropanol and then allowed to air dry
- Follow the manufacturer's guidance for both cleaning and storage requirements.

Where possible, only closed cell devices should be used and they should be cleaned regularly so that the exterior surfaces remain free from bacteria.

Supervision and training

The HSE states inflatables should have constant supervision by at least one suitably trained person. ADIPS state the supervisor must be over 18 years old. This normally means at least one person per item of equipment. Training should cover the operating procedures and supervision requirements for the inflatable and emergency procedures. Training should be documented.

Particular attention should be given to inflatables used on water. HSG179 recommends the risk assessment for additional CIMSPA recognised qualified lifeguard supervision should consider that:

- **inflatables restrict vision through the water, including people directly under the inflatable and that they encourage users to congregate in a small area;**
- **there may be a risk of entanglement;**
- **swimmers may be more likely to participate in boisterous behaviour.**

As a part of the risk assessment process and information provided by the manufacturer, consideration should be given to the swimming competency of participants. This should consider competency testing and the wearing of buoyancy aids.

A first-aid risk assessment should be completed to ascertain first-aid requirements and operation.

Emergency procedures and first aid

It is important ensure that emergency situations are dealt with in a manner which minimises the risk to customers and staff members. Emergency procedures provide a systematic approach to addressing medical, environmental, and security emergencies. Plans should be tailored to an organisation's specific venue, resources, and personnel. Emergency plans should assign roles and designate a chain of command.

Emergency procedures to consider.

- **Rapid deflation**
- **Injury (first aid accident procedures)**
- **Urination, defecation, blood spillage or vomiting**
- **Overcrowding**
- **Ensure there is means of escape in the event of an emergency such as a fire**
- **Adverse weather such as sudden high winds**
- **Action to be taken in the event of a spinal injury, or suspected spinal injury**
- **Action to be taken in the event of electrocution**
- **Action to be taken in the event of the discovery of a casualty in the water.**

For guidance on adverse weather including thunder and lightning refer to the CIMSPA Adverse Weather guidance.

Useful Resources

HSG 179 Health and safety in swimming pools

<https://www.hse.gov.uk/pubns/books/hsg179.htm>

HSE guidance on inflatables:

www.hse.gov.uk/entertainment/fairgrounds/inflatables.htm

Sealed inflatables: safe supply, inspection and operation

www.hse.gov.uk/entertainment/fairgrounds/inflatables/essential-documentation.htm

HSE; Sealed Inflatables –Safety in use

https://adips.co.uk/wp-content/uploads/2021/01/Sealed-inflatables-Guidance_.pdf

Inflatable standards relating to BS EN 14960

www.pipa.org.uk

Amusement Device Inspection Procedures Scheme (ADIPS)

www.adips.co.uk

HSE information sheet: Safe use and operation of play inflatables, including bouncy castles.

<https://adips.co.uk/technical-bulletins-library/Entertainment-Sheet-No.-7.pdf>

ROSPA,

<http://www.rospa.com/play-safety/services/advice/indoor-soft-play/>

The Association of Play Industries (API):

<http://www.api-play.org/>

Play England/Scotland/ Wales/Playboard Northern Ireland

<http://www.playengland.org.uk/>

PWTAG: hygiene of pool play equipment (TN29) 21 May 2019:

<https://www.pwttag.org/notes-on-the-hygiene-of-pool-play-equipment-january-2015/>

BS EN 14960 Inflatable play equipment - Safety requirements and test methods

<https://shop.bsigroup.com/Navigate-by/Standards/>

BS EN 60309-2-1999. Plugs, socket-outlets and couplers for industrial purposes. Dimensional interchangeability requirements for pin and contact-tube accessories

<https://shop.bsigroup.com/Navigate-by/Standards/>

Requirements for Electrical Installations IET Wiring Regulations BS 7671:2018+A1:2020

<https://shop.bsigroup.com/products/requirements-for-electrical-installations-iet-wiring-regulations-3>

CIMSPA Adverse Weather guidance

BS EN 1069-1:2017+A1:2019. Water slides - Safety requirements and test methods

<https://shop.bsigroup.com/Navigate-by/Standards/>

These guidance notes have been produced by Right Directions in partnership with CIMSPA.

For more information on inflatable structures or any other topics, please email Right Directions: info@rightdirections.co.uk or give us a call for a chat: (01582) 840098