NAIH. **INFORMATION SHEET 49**

National Association of Inflatable Hirers

Safe use and operation of inflatable play equipment, including bouncy castles.

Introduction:

This information sheet has been compiled following the Health and Safety Executive's withdrawal of their information sheet ETIS 7. Since the withdrawal of this sheet there has been no written information sheet on the subject apart from BS EN 14960, which most controllers have not purchased due to price, and The Inflatable Enterprise's (TIPE) Information Sheet that was produced for its subscribers in December 2006, and is now available to all.

This information sheet uses the applicable parts of BS EN 14960 in respect of registration requirements, testing, installation and supervision of inflatable play equipment. Controllers have to comply with their duties under Sections 2 - 6 of the Health and Safety at Work etc Act 1974. Operators need to take note of the relevant sections of the Provision and Use of Work Equipment Regulations 1998 (PUWER) and all other regulations that apply to the Controllers business. This information sheet acknowledges the work of all parties that were involved in the revised version of ETIS 7.

History:

Prior to 2004 inflatable play equipment was subject to inspection under the Amusement Devices Inspection Procedures Scheme (ADIPS). Following a delay in reaching agreement on suitable 'Service Quality Schedules' for the inspection of inflatable play devices, it was not possible for duty holders (operators) to comply with the requirements of ADIPS.

ETIS 7 was written as a guidance sheet for those involved with the design, manufacture, importation, supply, inspection and safe use of inflatable play equipment. It listed possible hazards and outlined the precautions that needed to be taken to avoid them. It covered inflatables used for bouncing and other purposes but not those used solely for protection or waterborne inflatables or other types not used by the public for entertainment purposes.

ETIS 7 was held back from publication due to a moratorium on HSE publications at the time but was freely produced by various sectors of the inflatable play industry.

ETIS 7 was produced in consultation with members of the Fairgrounds Joint Advisory Committee, Inflatable Play Manufacturers Association (IPMA), the Association of Play Industries (API), the Made Up Textiles Association (MUTA), the Association of Inflatable Manufacturers,Operators, Designers and Suppliers (AIMODS), the National Association of Inflatable Hirers (NAIH), the British Inflatable Hirers Association (BIHA, now Alliance) and other interested parties.

Definitions:

Inflatable devices - Fairground equipment consisting of air-filled structures designed to allow users to bounce, slide or climb on them. They are made from flexible fabric, kept inflated by one or more blowers and rely on air pressure to keep their shape.

Controller - The person, organisation, or hirer (those who hire to others) having the overall control, including responsibility for maintenance, of the inflatable device.
Operator - The person over the age of 18 and appointed by the controller to be in charge of the operation of the inflatable at any time when it is intended to be available for public use.

Attendant - Any person over the age of 16 and appointed to work under the control and direction of an operator to assist in the operation of the inflatable device.

Safety Critical Parts - those parts where there is real risk of failure leading to injury

Recognised hazards

The following hazards have been known to occur:

- Instability and blowing away in windy conditions
- Situations caused by loss of pressure as a result of:
  - failure of the fabric
  - failure or loss of power to the blower
  - disconnection of the blower
  - litter blocking the air intake and/or vents
- Falls from the structure
- Windows tearing or detaching
- Tripping (particularly over anchorages)
- Injury to users caused by boisterous behaviour, overcrowding or not separating larger users from smaller ones
- Access to dangerous (parts of) machinery (e.g. inadequately protected or unguarded blowers).
- Electrical hazards (e.g. shock or burns)
- Inadequate means of escape in case of fire
- Lifting injuries caused by manual handling
- Injury to users caused by wearing inappropriate clothes and shoes
- Suffocation
- Entrapment

Duties of manufacturers:

Manufacturers should ensure that they manufacture their products so that they are, so far as is reasonably practicable, safe in use. Inflatables should be manufactured in accordance with good manufacturing practice, using suitable quality materials and using a suitable design. Where there are relevant Standards, these should be followed (e.g. BS EN 14960).

Design considerations

The designer or manufacturer needs to make sure that:

1. There are no parts of the device or ancillary equipment accessible to users which will cause injury if contact is made with them e.g. Sharp exterior angles or edges
2. There are no significant trapping points between adjacent surfaces
3. For bouncy castles especially the walls all be high enough, strong enough and attached to the base to prevent users falling out, bouncing over or slipping through gaps in normal use or foreseeable misuse. As a general rule, the height of users using an inflatable should not exceed the height of the outside walls when the user stands on the bouncing surface. Walls of 1.8 m or higher (measured from the bouncing surface) are sufficient for users of any height.
4. The number and the maximum size of users that the structure can safely contain at any one time is specified in the operations manual
5. The number and the maximum size of users that the structure can safely contain at any one time is displayed on the inflatable device
6. The deflation time is sufficient to allow the structure to be safely evacuated - this can be considerably lengthened by using a non return valve or flap fitted to the blower or by fitting the blow tube to the lowest part of the structure, as near to the ground as possible

Anchorage:

Structures should be provided with an adequate anchorage and/or ballast system. Any anchorage points should be suitably protected where appropriate. The size, number and strength of anchorage points should be adequate for the structure and take into account likely wind loading (BS EN 14960 section 4.2.1), The designer/manufacturer should carry out research to determine maximum wind speed (Annex B BS EN 14960) and specify the type of anchorage for each inflatable device to be safely used. This information should be kept available.

Access/egress:

On any open side the maximum fall off height should be no greater than 630 mm (BS EN 14960 section 4.2.3). Any hard landing surface including grass, should be covered by soft landing material such as dense gym mats or equivalent material of at least 25 mm thickness but not more than 125 mm, extending for a distance of at least 1.2 m from the open side. Safety mats used indoors should be fire resistant. When it is necessary to have anchorage points near to an entrance/exit, they should be connected in such a way as to minimise the danger of tripping, abrasion or other injuries.

Blowers:

These should be suitably guarded at inlet and outlet (IP 23 B is satisfactory as defined in BS EN 60529 and section 4.2.4 BS EN 14960). The inflatable structure should be designed so that the user cannot contact the blower. This may be achieved by ensuring the length of the inflation tube is at least 1.4 m when positioned on a walled side and 2.7 m on any open side.

Blowers should not be sited internally unless they are in a part of the structure not used for playing and out of possible contact by the user. The fitting of an auditory or visual alarm to the blower unit should be considered to alert the operator of any failure in fans electric (or other) power supply.

Special considerations for totally enclosed structures:

In totally enclosed structures the following additional requirements should be satisfied:

- Signs should indicate exits, meeting the requirements of the Health and Safety (Safety Signs and Signals) Regulations 1996. (Free download http://www.hse.gov.uk/pubns/priced/l64.pdf)
- An independent support system should be provided for any lighting, emergency lighting and loudspeaker systems
- The electrical installation should, as a minimum, conform with the requirements of BS 7671. (Electrical installations)
- Structures designed to accommodate more than fifteen people 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 evacuated safely.
- Emergency lights should be provided as a backup if a lighting system is installed. The discharge period for the lighting following a supply failure should be sufficient to allow for the complete evacuation of the structure. Systems should be fully charged prior to the use of the inflatable. Lighting should be proved each day before a totally enclosed inflatable is put into use.
- Electrical cables should be kept adequately secured away from any users or spectators
- Electrical equipment exposed to the weather should be protected to BS EN 60529 or be located inside a weatherproof hut or cabin.

Materials:

Flexible fabrics (section 4.1.1 BS EN 14960) used in the construction of inflatables need to be of adequate tear and burst strength and have sufficient air retention to enable the structure, when pressurised to the level in the operations manual, to maintain its shape and prevent the structure from distorting under load in particular

- Fabrics should be flame resistant (see 'Further Reading') and meet current fire safety standards
- Adhesives should provide a bond of not less that the equivalent strength to the fabric being bonded
- Threads used for sewing should be strong enough for the purpose (section 4.1.2 BS EN 14960)
- Zips should be able to withstand the air pressures generated in the structure. Where they are used for emergency exits they need to be reliable, easy to use and operable from both sides. (Section 4.1.5 BS EN 14960)
- Netting should not create additional risks to users (section 4.1.3 BS EN 14960)
- Where windows or other similar openings are provided, the materials used, and the method of attachment to the rest of the structure, shall be of adequate strength to withstand impact of users
- Toxic decorative finishes must not be used. Paint and other decorative finishes shall comply with EN 71-3 (section 4.1.6 BS EN 14960)

Buying and selling inflatable devices

Inflatable devices should not be bought or sold unless the following documentation is available:

- For inflatables manufactured after January 2006, a declaration by the manufacturer that the inflatable has been manufactured to an appropriate design and in an appropriate manner (this may be achieved by a declaration of conformity to BS EN 14960) and an operating manual produced in the appropriate language which includes (section 6 BS EN 14960)
  Height clearance and space required to operate the unit safely
  Overall packed weights and dimensions
  Details of routine maintenance and inspections
  Appropriate daily checks
  Maximum numbers and heights of users
  Maximum safe wind speed
  Details on how to install the unit
  Method of anchorage and number of anchor points
  Maximum allowable slope of the site to be erected on
  Crowd control measures
  Details of safe operation
  Type and size of blower required
  Specification of mats used to protect entrance and exit points

This list is the basic guide and the full requirements of the manufacturer and others can be found in section 6 of BS EN 14960.

The operating manual can also be a good place to keep records of maintenance, modifications, daily checks and annual inspections

Where a device has been manufactured in Great Britain the duty to provide the information referred to falls to the manufacturer.

For a second-hand or hired device the duty falls on the controller.

However in the case of an imported device, new or second-hand, the duty falls to the importer

The controller of a newly acquired second-hand device should ensure that the operations manual is present and complete. The records of maintenance, modifications and inspections should accompany any second-hand device.

Duties of controllers and operators:

Owners or operators of inflatable devices will need to carry out a risk assessment of their activities to determine the control measures to avoid risk or reduce risk to acceptable levels. This is relatively easy to do using the manufacturer's information and instructions for safe operation. This is a requirement of the Management of Health and Safety at Work Regulations 1999 (download a copy http://www.hse.gov.uk/pubns/priced/l21.pdf)

The operations manual should be made readily available. This should not mean that it is kept next to the equipment or that it is written on paper. Computer storage systems may be acceptable for some information, but only if it can be accessed easily and a hard copy be produced if required.

Inspection, maintenance and modification.

The Provision and Use of Work Equipment Regulations 1998 (PUWER - more information http://www.hse.gov.uk/work-equipment-machinery/puwer.htm) require inflatable devices to be inspected at suitable intervals to ensure that safe conditions are maintained, and that any deterioration in the device is detected and remedial action taken in good time. The following paragraphs cover annual inspections and daily checks.

Annual Inspection

Each inflatable device should be thoroughly inspected at least once in 12 months. This procedure needs to be carried out by a competent person and it is up to the Controller to appoint their preferred tester. Register of Play Inspectors International (RPII) and ADIPS inspectors are currently accepted as competent to test inflatable play devices. It may be deemed necessary to test the competence of a controller's appointed tester in the event of an incident.

The annual inspection needs to include checks of the following

- Previous inspection reports and certificates where appropriate
- Provision of a blower unit as specified by the manufacturer, or one that at least provides sufficient pressure to allow the inflatable to be used safely, suitably guarded at the air inlet and outlet
- Condition of blower impeller and fan casing where practicable to inspect
- Condition of blower accessible wiring
- Condition of electrical installations
- Anchorage system for wear, rips or chafing
- Type and number of ground anchors or ballast for conformity with design specification
- Structure for wear or rips in the fabric

- Walls and towers (when fitted) are firm and upright
- Pressure is sufficient in the bouncing area and at the step/front apron to give a reliable and firm footing
- Internal ties for wear and tear, particularly at loose or exposed ends
- Bed seams, wall to bed seams and wall to tower connections
- Identification of the device
- If used on a fixed site, the location

Inspection of some of these features may need to be done inside the device. The above list is not exhaustive and the manufacturer may specify additional items. Annual inspection needs to include any part of the inflatable and its ancillary equipment that may affect the safe operation of the device. (See section 7.1.2 of BS EN 14960)

The PIPA and ADIPS schemes are national certification schemes for the inspection of inflatable devices under BS EN14960, and are supported by the Health and Safety Executive as best practice.

Daily checks

Checks should be carried out before the first use on any day using the advice given by the manufacturer in the operations manual and in section 7.1.1 of BS EN 14960. These should include checking the following

- The site remains suitable, with crowd control measures in place if appropriate
- Anchorages are intact, protected where necessary and ropes not worn or chafed
- Anchor system secures the inflatable device to the ground
- There are no significant rips or holes in the fabric or seams
- The correct blower specified for the device is being used and the air pressure is sufficient to give a reliable firm footing
- There are no exposed electrical contacts, there is no wear on electrical cables and plugs, sockets and switches are not damaged
- If an internal combustion engine is used, that the fuel cap is placed firmly on the fuel tank and any reserve fuel tank is suitable and remains in a safe position
- Bolts and screws of the blower are properly secured and that robust guards are secured over the air inlet and outlet
- The blower connection tube is in good condition and is firmly fixed to the blower
- The blower is positioned correctly, adequately protected or guarded and is not causing a tripping hazard

The public should not use the inflatable device until any defects identified during the daily check are rectified.

Maintenance

The inflatable needs to be properly maintained - the instructions contained in the operations manual should be followed. Where such instructions are not available, the controller should specify the procedures required, in conjunction with advice received from a competent person, the supplier or manufacturer. Details of all maintenance should be recorded in the operations manual. (See section 7.2 of BS EN 14960)

Modification

Safety-critical modifications are those where failure of the modified component or system would lead to a significant risk of injury to public or employees. They could include changes in the operating parameters of the device such as changing the height restriction of users. If in doubt take advice from a competent person.

Where a safety-critical modification is made (including the replacement of a component which departs from the original design specification), the modification needs to be carefully considered. The conclusions and justifications should be recorded in the operations manual before the change is made. If a device is CE marked, alteration may invalidate the declaration of conformity and the device may need to be reassessed against the relevant standard (see section 7.3 of BS EN 14960)

Safe Operation

It is essential for the safe operation of a device that the manufacturer's instructions regarding the use of anchorage points should be followed. The device should be secured to the ground with ground stakes (size of stakes is a minimum 16 mm x 380 mm) where the ground is suitable. Some equally effective method can be used on hard standing e.g. attaching the anchor ropes to fittings already in the ground or to sandbags or other weights capable of taking the load. The calculated load per anchor point is 1 600 N and the equivalent weight in sand per anchor point has been calculated at 164 kg. (See section 4.2.1 of BS EN 14960)

Inflatables can be tied to a vehicle or other movable machinery providing the vehicle or machinery is immobilised and under the control of the operator.

Inflatables should not be used when the wind or gusts are in excess of the maximum safe wind speed specified by the manufacturer.

The industry recommends a maximum wind speed of Force 5 on the Beaufort scale of 28 - 38 kph (19-24 mph). Force 5 is a fresh breeze when small trees in leaf begin to sway, whereas Force 6 is a strong breeze when large branches are in motion, whistling can be heard in telephone lines and umbrellas can only be handled with difficulty. Weather forecasts can be obtained from the Meteorological Office and small handheld anemometers are now available through a number of trade suppliers and manufacturers. (See Annex B of BS EN 14960 for the Beaufort Scale)

The controller or operator should ensure that the inflatable device is sited well away from possible hazards such as overhead power lines 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

The controller should determine the minimum number of attendants needed to operate the device safely and ensure that at least these number of attendants are on duty when the device is in operation. In deciding how many attendants are required, the controller needs to consider matters such as the number of people using the device, the age of the users and the type of environment in which the inflatable is being used. Attendants should be aged 16 or over and the operator should be 18 or over.

If the risk assessment carried out by the controller shows that control measures are required to handle large crowds in the immediate vicinity of the inflatable, then the crowd control barriers (see Figure 1) should be provided by the controller. Barriers should have the minimum dimensions shown at figure 1. They should be at least 1 m high and be capable of withstanding people leaning on them, or being pushed against them. Where public does not have access to the sides or the back of the inflatable or crowd pressures are not expected, then a lower standard is acceptable.

The perimeter fence should be at least I.8 to 2.5 m from closed sides and 3.5 to 4 m from the open side. Or, 50% of the highest platform

The gateway should be 1 m wide

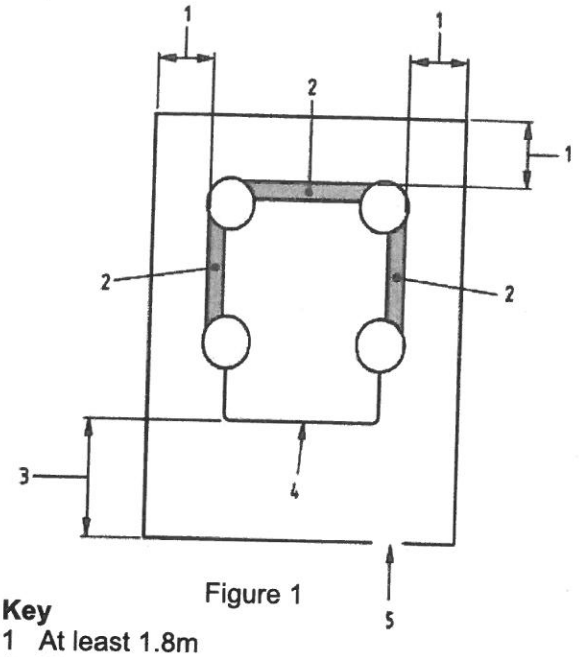

Figure 1

Key

1 At least 1.8m
2 Walled Side
3 At least 3.5m
4 Open Side
5 1m Gateway

The method of operation drawn up by the controller should ensure that users are admitted to the inflatable in a controlled and safe manner. In particular the operator and attendants should carry out the following instructions

- Ensure that users remove footwear (except socks) and any other hard, sharp or dangerous objects (such as buckles, pens, purses, badges etc) Glasses are best removed
- Do not allow users to consume food or drink or chew gum on the device
- Do not allow users to obstruct the entrance or exit of any inflatable device. Do not allow anyone to play on the step or front apron of a device
- Do not allow users to climb or hang on the walls
- Do not allow users who do not conform to height restrictions to use the device
- Keep the entrance/exit clear of onlookers so that the operator or attendant has a clear view and can ensure that users enter/exit safely
- Keep users off the device when it is being inflated or deflated. Deflate when not in use and isolate the blower

This is not an exhaustive list and controllers should refer to any manufacturers instructions and section 6.3 and 6.4 BS EN 14960

The operator and attendants should watch the activity on the inflatable constantly. They should use a whistle or other signal and take action at the first sign of any misbehaviour. Somersaults and rough play should not be allowed. Operators should be easily identifiable to users (e.g. company uniform).

It is the operators responsibility that the equipment is not overloaded with users. Larger, more boisterous users should be separated from smaller ones. The number of users should be limited to the number stated on the device or as calculated.

Training:

The controller should ensure that all operators receive effective training in the working of the device including

- The method of operating the device
- Safe methods of assembly/dismantling where applicable
- How to carry out a daily check

The controller should ensure that all operators and attendants receive effective training in the operation of the device including

- Safe entry/exit for users
- Safe anchoring of the inflatable
- Crown control measures and barriers
- Measures to be taken in the event of a power failure
- Procedures for reporting accidents, defects or breakdowns

All controllers should have in place a company training manual that includes all of the above, specific company regulations and all relevant requirements of Health and Safety.

The Register of Play Inspectors International (RPII) offer a training award for Supervisors and Attendants of Inflatable Play Equipment and is highly recommended as a good basis for any training manual. The NAIH have embraced the award as part of their criteria for membership.

Accident reporting:

Deal with any casualties first but report the event after the incident. Reportable accidents which cause injury, including acts of violence and dangerous occurrences, should be notified to the enforcing authority by the 'responsible person' (who is likely to be either the controller or the operator)

Further information is given in the HSE publication A guide to the Reporting of Injuries Diseases and Dangerous Occurrences Regulations 1995. (You can download a copy http://www.hse.gov.uk/pubns/priced/l73.pdf)

What to do if defects are found:

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 remedied. This may include checking all similar components. If there is any doubt about the continued safety, the device should not be used until a competent person has confirmed that it is safe to do so. Keep records of all incidents and significant defects in the operations manual and the action taken because they may be useful if you need to:

1. Give details to HSE, your trade association, insurers, the designer, manufacturer, importer or supplier
2. Discuss the safety implications with a competent person
3. Provide a detailed accident history to a buyer

Further reading:

Fairgrounds and amusement parks: Guidance on safe practice HSG 175 - HSE Books

A Guide to Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) Link http://www.hse.gov.uk/pubns/priced/l73.pdf

BS EN 60204-1 Safety of machinery. Electrical equipment of machines. Part 1. Specification for general requirements

BS EN 60529: 1992 Specification of degrees of protection provided by enclosures (IP Code)

BS 7671:1992 Requirements for electrical installation. IEE Wiring Regulation (17th Edition)

For further information on fire resistant materials refer to
BS EN ISO 6940:1995,
BS EN ISO 6941:1995,
BS EN 14960

Further Information

British Standards are available from British Standards Institute
www.bsi-global.com

Health and Safety Executive
www.hse.gov.uk

Register of Play Inspectors International
www.playinspectors.com

National Association of Inflatable Hirers
www.naih.org.uk

PIPA Testing Scheme
www.pipa.org.uk

The National Association of Inflatable Hirers has produced this document for the inflatable play industry in general following the withdrawal of ETIS 7. The Health and Safety Executive has welcomed this initiative. Whilst every effort has been made to ensure the accuracy of the references listed in this Information Sheet, their future availability cannot be guaranteed.

The documentation is not exhaustive and controllers should verify all information for themselves and ensure they comply with all other statutory regulations that apply to their business

Controllers may use this Information Sheet 49 for themselves but must not reproduce it for advertising, endorsement or commercial purposes.

Disclaimer: This document is for general guidance and research purposes only, and does not purport to give professional or legal advice.

Sources:
NAIH / TIPE / HSE / BSI / BS EN 14960

July 2013

Version 1 04/07/2013

ADIPS Fairgrounds Safety & Health Awareness Day 26/2/14 – individual seminars notes: Peter Grand, from Grand Affairs Group on Inflatable Play Equipment:

Peter used to operate his own inflatable equipment, before becoming a consultant on the equipment. Peter stressed that he was not there to tell delegate operators how to do their job.

Peter spoke of the 2006 European Standard (BS EN 14960:2006): BSEN 14960: 2013 (the revised version) came into force on March 1st 2014 with some alteration and clarifications. He explained that statistically, most accidents with inflatables are the result of poor management and that it is very rare to have equipment failure with technological improvements.

There have been four instances of 'blow aways' last year; Peter warned that as things stand at the moment, the water table in many parts of the UK is very high and will remain so until May, with the ground unstable; in fact there are already events planned for July that have been cancelled.

Blowers:

- Peter spoke of the 1.2 metre rule on distance from the inflatable. In fact the distance needs to be 1.4 metres to allow for the overlap on the blower attachment.
- Peter additionally warned that blowers should have the shields in place to stop injuries from children putting their hands into the blower and its exposed moving parts. There are cases where fingers have been lost due to this with prosecutions following.
- On distances, Peter reminded delegates of the safe distances for setting up inflatables (set out in HSG175) from static or moving objects, allowing for the fact that inflatables move during operation with customers on them.

Anchorage:

- new stronger anchor points on the inflatable are now to be used in the UK; new inflatables will already have them; older inflatables only need to have theirs replaced when that would be routinely due.
- Secondly, metal stakes need to be of a stipulated size with a minimum width of 16mm and 380mm long.
- Peter demonstrated the use of three metal anchors interlocked together on soft ground that would pull in different directions to provide adequate strength.
- Peter reminded delegates that anchors need to be hammered into the ground fully to be effective and not to create a trip hazard, even to staff.
- Also, the angle of anchors should be around 45 degrees to the area of inflatable attached to; otherwise they could strain the structure and rip away.
- Peter also explained the anchorage of top parts of an inflatable, with bungee-style attachments to take up the possible movement while still providing anchorage, especially with gusting wind. This is not law but Peter says that it will save your kit.

- The angle of anchorage from height must be correct and not too sharp to be effective; working to the ratio of the distance being 50% of the height of the fixing position at the top of the inflatable should work effectively.
- Sandbags are not acceptable as weights on anchors being ineffective; 163 kilos should be on every anchor point. Using large vehicles as anchor points can help.

Crash mats were also discussed:

- it was pointed out the minimum height of the inflatable from the ground that would require the use of crash mats;
- not all inflatables need them, though delegates preferred to routinely use them.
- Where they are used as a requirement, the density should be checked that it is sufficient.

All users of inflatables should be the same size, including not having adults riding with children and there should be a maximum number of participants related to the size of the inflatable.

Melvin Sandell, Head HSE Fairground Inspector Entertainment and Leisure Sector Presented the seminar on Inflatable Play Equipment:

Peter Grand, from Grand Affairs Group had prepared this and had he presented advice and safety tips to Showmen at the first Safety Awareness Day last February, Melvin elaborated on some issues, glossing over others and highlighted the legal responsibilities that go with operating inflatable play equipment.

Melvin spoke of the 2006 regulations: BSEN 14960: 2013 that are coming into force with many stipulations. He explained that statistically, most accidents with inflatables are the result of poor management and that it is very rare to have equipment failure with technological improvements. There have been four instances of 'blow aways' in 2013

On **Blowers**: Melvin spoke of the 1.2 metre rule on distance from the inflatable. In fact the distance needs to be 1.4 metres to allow for the overlap on the blower attachment.

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On distances, Melvin reminded delegates of the safe distances for setting up inflatables (set out in HSG175) from static or moving objects, allowing for the fact that inflatables move during operation with customers on them.

Anchorage was discussed: new stronger anchor points on the inflatable are now to be used in the UK; new inflatables will already have them; older inflatables only need to have theirs replaced when that would be routinely due.

Additionally, metal stakes need to be longer with a minimum width of 16mm and longer still, 380mm on soft ground.

Melvin demonstrated the use of three metal anchors interlocked together on soft ground that would pull in different directions to provide adequate strength. He also reminded delegates that anchors need to be hammered into the ground fully to be effective and not to create a trip hazard, even to staff.

Also, the angle of anchors should be perpendicular to the area of inflatable attached to; otherwise they could strain the structure and rip away.

Melvin also explained the anchorage of top parts of an inflatable, with bungee-style attachments to take up the possible movement while still providing anchorage, especially with gusting wind. This is not law but Melvin says that it will save your kit.

The angle of anchorage from height must be correct and not too sharp to be effective; working to the ratio of the distance being 50% of the height of the fixing position at the top of the inflatable should work effectively.

Sandbags are not acceptable as weights on anchors being ineffective; 168 kilos should be on every anchor point. Using large vehicles as anchor points can help.

Crash mats were also discussed: it was pointed out the minimum height of the inflatable from the ground that would mean needing crash mats. However, not all inflatables need them, though delegates preferred to routinely use them.

Where they are used as a requirement, the density should be checked that it is sufficient.

All users of inflatables should be the same size, including not having adults riding with children and there should be a maximum number of participants related to the size of the inflatable.

Check The Wind

e wind-speed must be no more than **Force 5** on
e Beaufort scale (**maximum 24 mph/38 km/h**)
hich is when small trees in leaf begin to sway. On
e morning of the event or the night before, listen
refully to the weather forecast so that you have a
od idea of what wind to expect. On the day and
ring the event, you can check the wind-speed
ing an anemometer

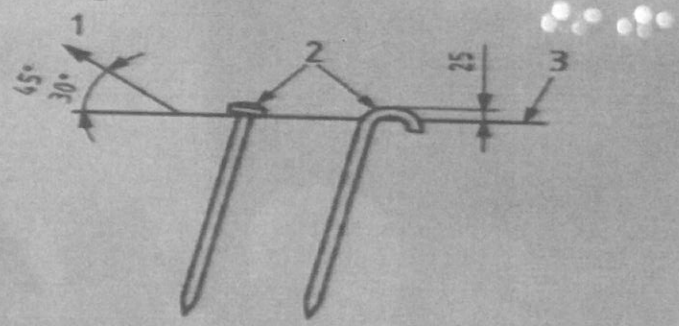
Anchor It Down Temporarily

ropes form part of the anchorage system, attach
em to the anchor-points. The windward side of th
flatable needs to be anchored temporarily while i
inflating so drive anchor-stakes into the ground
e windward side and loosely tie on the windward
de ropes. Using industry standard 380mm long x
inimum 16mm diameter stakes, there is little risk
penetrating underground services. However, yo
ould check that there are no obvious signs of
cavation for cable runs, pipes etc. and check wi
e client for the location of any underground
rvices before driving the stakes in.

The stakes need to be positioned so that the ropes or webbings go upwards from the stake towards the inflatable at between 30 and 45 degrees.

Moving the stake closer makes the angle bigger.
Moving it away makes the angle smaller.

e stakes should be driven into the ground slightl
lined away from the inflatable and the ropes or
bbings should not be pulled too tight. They
ould curve gently up to the inflatable so as to
ow movement of the inflatable up and down
en in use. They should not protrude more than
mm above the ground



1 Direction of force, 2 Inclined away 3 Ground level